Texas A&M University

College of Geosciences Center/Institute Review Report

August 2013

The Center for Atmospheric Chemistry and the Environment

EXECUTIVE SUMMARY

The Center of Atmospheric Chemistry and the Environment (CACE) was established by the Board of Regents in 2003, under the auspices of the Vice-President for Research. The overall objective of the Center is to integrate research regarding the formation, transport, impact, and mitigation of air pollution with studies of the mechanisms by which the scientific results can best inform sound environmental policy. Specifically, the Center has established the following tasks: engaging broad inter-college scientific collaborations (Geosciences, Science, Agriculture and Life Sciences, School of Rural Public Health, and Engineering) with policy research (Institute for Science, Technology, and Public Policy, Bush School), approaching atmospheric chemistry, air pollution, and policy on the basis of interdisciplinary methodologies, enhancing collaborative and concerted opportunities in atmospheric chemistry research within Texas A&M and also with Texas industry, increasing visibility of Texas A&M atmospheric chemistry research to funding agencies and policymakers, encouraging/facilitating broad participation of Texas A&M scientists in state and federal air quality initiatives, facilitating interactions between A&M scientists and national/international scientists and government agencies, providing mechanism for outreach to the public and to students, and providing the coordinated impetus to make Texas A&M a recognized leader in the field of atmospheric chemistry.

The faculty members affiliated with the Center have participated in various teaching, research, and service activities. The Center has facilitated the recruitment of faculty, graduate students, and post-docs to TAMU in atmospheric chemistry and related fields, enhanced interdepartmental faculty interactions including joint faculty appointments, established multi-use observing facility for atmospheric chemistry field campaigns locally, national, and internationally, enhanced inter-departmental and inter-collegial faculty research, and forged national and international collaborations and activities. The Center has persistently pursued interdisciplinary research opportunities, and such an effort has lead to successful proposals funded at the University, State, and Federal levels. There are currently eight undergraduate and graduate courses offered in the area of Atmospheric Chemistry at TAMU. Another high level of research accomplishment by the Center affiliated faculty members is reflected by publications in top-tier and high impact journals.

Other professional activities of the Center include successful organizations of several workshops and symposia, including a symposium “Atmospheric Chemistry and Air Quality in Texas: Challenges and Opportunities” in 2010 to discuss the current status and future directions in atmospheric chemistry and air quality research in Texas, and to explore broad collaboration among the research communities both inside and outside the state, the 2011 International Year of Chemistry (IYC) “2011 IYC SYMPOSIUM ON STRATOSPHERIC OZONE AND CLIMATE CHANGE” on November 7-10, 2011 in Washington D.C. (2011-IYC-O3.org), and the 2013

American Meteorological Society's Robert A. Duce Named Symposium "Air-Sea Chemical Exchange: Impacts on the Atmosphere and Ocean".

The Center has clearly established national and international reputations in the areas of experimental, field, and modeling studies of atmospheric chemistry and is in an excellent position to respond to critical needs at the state, national, and international levels for major research initiatives concerning air quality and their impacts on human health, weather, and climate. The Center requests the following considerations from the Dean of the College of Geosciences:

1) Establish a feasible mechanism for the Center to achieve self-sustainability with a steady source for operating funds by matching the Vice President for Research's contribution of IDC to the Center;

2) Create a College budget to support teaching activities and secretarial support to assist the Director and Associate Director of the Center;

3) Support the Center effort to make Texas A&M home to a National Center relevant to atmospheric chemistry/air quality and associated environmental and climate impacts.

College of Geosciences Center Review:

Center of Atmospheric Chemistry and the Environment

TABLE OF CONTENTS

1. Introduction

The Center of Atmospheric Chemistry and the Environment (CACE) was established by The Board of Regents in 2003, under the auspices of the Vice-President for Research. The overall objective of CACE is to integrate research to provide the highest quality information based on laboratory, field and calculation relevant to sustaining our environment and maintaining air quality, and develops the expertise and infrastructure necessary to achieve this objective so that policy makers can be provided with the best quality information and can make the most informed policy decisions for solving pressing societal issues at local, national and global levels.

The Center was initially provided with a startup support in the amount of $1M from Texas A&M University. Subsequently, two major grants in the total amount of $1.4M was funded by the Environmental Protection Agency' (EPA) STAR program, to support the Center effort in air quality studies in Texas. During the period of 2004-2007, the affiliated faculty members were instructed to route research proposals thru the Center, which yielded an amount of $3.6M external grants and an amount of $780K in indirect cost (IDC) return. However, because of a lack of IDC policy in distributing the produced IDC to the Center and its participants, such a practice of routing research proposals thru the Center was dis-continued starting in 2008.

During the period of 2009-2012, the Center received an internal funding in the amount of $109,661, in support of several proposed activities, including graduate student recruitments, undergraduate summer research programs, seminar program, administrative Assistant, and the Center symposium and colloquium. The funding was provided jointly by Departments of Atmospheric Sciences, Civil Engineering, and Mechanical Engineering, Colleges of Geosciences, Science, and Engineering, and the Office of Vice President for Research (Table 1).

Table 1. Support for CACE (2009-2012)

Contributing Unit	College	FY2009	FY2010	FY2011	FY2012	TOTAL
ATMO-Atmospheric Sciences	CLGE		$4,583	$4,583	$ 4,583	**$13,749**
CLGE-College of Geosciences	CLGE	$4,583	$4,583	$4,583		**$13,749**
CLSC-College of Science	CLSC		$9,166	$9,166	$ 9,166	**$27,498**
CLEN-College of Engineering	CLEN	$3,055	$3,055	$3,055		**$9,165**
CVEN-Civil Engineering	CLEN		$9,000			**$9,000**
MEEN-Mechanical Engineering	CLEN		$3,000	$3,000	$ 3,000	**$9,000**
URES - Office of VPR	VPR	$27,500				**$27,500**
		$35,138	$33,387	$24,387	$16,749	**$109,661**

The Center has accomplished several of its originally proposed goals, which include facilitation of the recruitment of faculty as well as graduate students and post-docs to TAMU in atmospheric chemistry and related fields, enhancement in interdepartmental faculty interactions including joint faculty appointments, establishment of multi-use observing facility employed in atmospheric field campaigns in Houston, Beijing, and Mexico City, enhancement of inter-departmental and inter-collegial faculty research, and initiation of national and international collaborations and activities.

The faculty members affiliated with the Center have participated in various teaching, research, and service activities. Several Center-based interdisciplinary research proposes have been funded at the university, state, and federal levels. Currently, there are eight undergraduate and graduate courses offered in the area of Atmospheric Chemistry at TAMU. Other activities

sponsored by the Center include (1) organization of a symposium "Atmospheric Chemistry and Air Quality in Texas: Challenges and Opportunities" in 2010 to discuss the current status and future directions in atmospheric chemistry and air quality research in Texas, and to explore broad collaboration among the research communities both inside and outside the state, (2) organization of "2011 IYC SYMPOSIUM ON STRATOSPHERIC OZONE AND CLIMATE CHANGE" in observance of the 2011 International Year of Chemistry (IYC) on November 7-10, 2011 in Washington D.C. to recognize the contributions of scientists, policy decision makers, industry, and intergovernmental agencies to characterize and counteract the threat that industrially produced halocarbons posed to the Earth's protective stratospheric ozone layer (2011-IYC-O3.org), and (3) 2013 American Meteorological Society's Robert A. Duce Named Symposium "Air-Sea Chemical Exchange: Impacts on the Atmosphere and Ocean".

The Center's educational effort has excelled beyond the scope of conventional teaching in classroom instruction and undergraduate and graduate advising. Students have often been introduced and educated to contemporary environmental challenges as well as their societal impacts and reality. For example, the Center brought eighteen TAMU students from the Colleges of Science, Engineering, and Geosciences and the Bush School, including two undergraduate students, to attend the four–day IYC event in Washington DC. The A&M students had the opportunities to interact with many world prominent scientists, representatives from industry, policy makers, and media reporters.

This progress report summarizes the various research, teaching, and outreach activities sponsored by the Center during the period of 2007-2013.

2. Administrative Organization

The Center governance includes an Internal Advisory Board, an External Advisory Board, and an Executive Committee. The Executive Committee of the Center consists of the Director, the Associate Director, and two representatives from each college with extensive participation in the Center, and one from the ISTPP, George Bush School of Government and Public Service. The representatives are chosen by participating members within each college. Individual representatives may designate replacements for individual committee meetings. The Chair of the Executive Committee is elected by the Executive Committee, and needs not be a Director.

Internal Advisory Board

Dr. Glen A. Laine, Interim V.P. for Research, Chair
Dr. Kate C. Miller, Dean, College of Geosciences
Dr. Joe Newton, Dean, College of Science
Dr. Arnold Vedlitz, Director of the Institute for Science, Technology and Public Policy, Bush School
Dr. M. Katherine Banks, Dean of Engineering, Research

External Advisory Board

Peter H. McMurry, Department of Mechanical Engineering, University of Minnesota
A.R. Ravishankara, Director, NOAA, Member of NAS

Robert Harriss, President and CEO, Houston Advanced Research Center

Director

Renyi Zhang, Professor Atmospheric Sciences

Associate Director

Simon W. North, Professor, Chemistry

Executive Committee

Executive Committee: R. R. Lucchese, Professor, Chemistry (Chair)
Eric Petersen, Associate Professor, Mechanical Engineering
Qi Ying, Assistant Professor, Civil Engineering
D. Collins, Professor, Atmospheric Sciences
Shari Yvon-Lewis, Professor, Oceanography
J. W. Bevan, Department of Chemistry
A. Vedlitz, Associate Executive Dean George Bush School of Government and Public Service

3. Faculty Membership

The following faculty members have participated actively in the various Center related teaching, research, and service activities during the reporting period. The Curricula Vitae of the participating faculty of the Center are provided in Appendix I.

- Bill Batchelor, Professor, Civil Engineering, bill-batchelor@tamu.edu
- Fuller Bazer, Professor, Animal Science, fbazer@tamu.edu
- John W. Bevan, Professor, Chemistry, bevan@chem.tamu.edu
- Kenneth P. Bowman, Professor, Atmospheric Sciences, k-bowman@tamu.edu
- Sarah D. Brooks, Associate Professor, Atmospheric Sciences, sbrooks@tamu.edu
- Robert Burghardt, Professor, Veterinary Integrative Biosciences, rburghardt@cvm.tamu.edu
- Don Collins, Professor, Atmospheric Sciences, dcollins@tamu.edu
- Daikwon Han, Assistant Professor, Epidemiology & Biostatistics, dhan@srph.tamhsc.edu
- Gregory Johnson, Associate Professor, Veterinary Integrative Biosciences, gjohnson@cvm.tamu.edu
- Peter Liss, TIAS Fellow, ATMO/OCEAN, liss@geos.tamu.edu
- Robert R. Lucchese, Professor, Chemistry, lucchese@chem.tamu.edu
- William H. Marlow, Professor, Nuclear Engineering, w-marlow@tamu.edu
- John W. Nielsen-Gammon, Professor, Atmospheric Sciences, n-g@tamu.edu
- Jerry North, Professor, Atmospheric Sciences, g-north@geos.tamu.edu
- Simon W. North, Professor, Chemistry, north@chem.tamu.edu
- Eric Petersen, Professor, Mechanical Engineering, epetersen@tamu.edu
- R. Saravanan, Professor, Atmospheric Sciences, sarava@tamu.edu
- Carey Satterfield, Assistant Professor, Animal Science, csatterfield@tamu.edu

- Gunnar W. Schade, Associate Professor, Atmospheric Sciences, gws@tamu.edu
- Clifford Spiegelman, Professor, Statistics, cliff@stat.tamu.edu
- Anne M. Sweeney, Professor, Epidemiology & Biostatistics, sweeney@srph.tamhsc.edu
- Daniel Thornton, Associate Professor, Oceanography, dthornton@ocean.tamu.edu
- Arnold Vedlitz, Professor, Institute for Science, Technology, and Public Policy, avedlitz@bushschool.tamu.edu
- Terry L. Wade, Geochemical and Environmental Research Group, terry@gerg.tamu.edu
- Guoyao Wu, Professor, Animal Science, g-wu@tamu.edu
- Ping Yang, Professor, Atmospheric Sciences, pyang@geos.tamu.edu
- Qi Ying, Assistant Professor, Civil Engineering, qying@civil.tamu.edu
- Shari Yvon-Lewis, Associate Professor, Oceanography, syvon-lewis@ocean.tamu.edu
- Renyi Zhang, Professor, Atmospheric Sciences, renyi-zhang@tamu.edu

4. Education

The Center affiliated faculty members teach a wide variety of undergraduate and graduate courses as part of their teaching responsibilities to their home department and University. Currently, there are eight undergraduate and graduate courses offered in the area of Atmospheric Chemistry at TAMU. Undergraduate students have been provided with training opportunities to participate in research mentored by the Center affiliated faculty members, and graduate students have been provided with research opportunities with the Center affiliated faculty member as the chair of their graduate advisory committees.

ATMO 363: Introduction to Atmospheric Chemistry and Air Pollution

Descriptive introduction of the composition and chemistry of natural and pollutant compounds in the atmosphere; transport, cycling and reactivity of atmospheric material; atmospheric measurements, data processing, air quality and human health issues; air pollution trends and climate change. Prerequisites: CHEM 101 and 102 or approval of instructor.

ATMO 463: Air Pollution Meteorology

Problems of air pollution in our global atmosphere; environmental cycles; waste products in the biosphere; atmospheric pollution; natural concentrations of atmospheric constituents; pollution sources; atmospheric transport; pollution sinks; effects of pollution; monitoring and surveillance; and management of air quality. Prerequisite: ATMO 335 or approval of instructor

ATMO 602: Principles of Atmospheric Physics and Chemistry

Integrated treatment of fundamental aspects of physical meteorology and atmospheric chemistry; ultraviolet and infrared absorption and emission; radiative transfer; cloud and precipitation microphysics and thermodynamics. Prerequisite: ATMO 601.

ATMO 606: Introduction to Atmospheric Chemistry

Fundamentals of atmospheric chemistry; tropospheric ozone, NOx and HOx cycling, sulfur chemistry, stratospheric chemistry, and aerosol composition; analytical measurement methods; review of chemical basics as needed.

ATMO 613: Advanced Atmospheric Chemistry

An advanced survey of fundamental atmospheric processes involving biogeochemical cycles, air pollution, tropospheric chemistry, atmospheric aerosols and stratospheric chemistry. Prerequisite: ATMO 606.

NUEN 677: Aerosol Science

Multidisciplinary survey of methods for describing aerosol particles and systems: gas kinetics and transport theory, formation and growth thermodynamics, electrical properties, coagulation, light scattering; selected topics from current literature. Prerequisite: Graduate classification in engineering or approval of instructor. Cross-listed with MEEN 677.

CVEN 607: Engineering Aspects of Air Quality

Characterization of air contaminants; health effects and legal aspects; dispersion of pollutants in the atmosphere; technology for the control of gaseous and particulate emissions. Prerequisite: CVEN 311.

Furthermore, the Center's educational effort has gone well beyond the scope of conventional teaching in classroom instruction and undergraduate and graduate advising. Students have often been introduced and educated to contemporary scientific challenges as well as their societal impacts and reality.

In 2010, the Center organized a symposium "Atmospheric Chemistry and Air Quality in Texas: Challenges and Opportunities" to address the current status and future directions in atmospheric chemistry and air quality research in Texas and to explore collaboration among the research communities both inside and outside the state. Over 20 graduate students from the Colleges of Science, Engineering, and Geosciences attended this symposium, made research presentations, and interacted with scientists and state representatives (including the Commissioner of Texas Commission on Environmental Quality and President of Houston Advanced Research Center).

The Center led the effort in organizing the landmark "2011 IYC SYMPOSIUM ON STRATOSPHERIC OZONE AND CLIMATE CHANGE" in observance of the 2011 International Year of Chemistry (IYC). With the external grants (exceeding a quarter million dollars) secured from the United Nations Environment Program, National Science Foundation (NSF), Department of Energy (DOE), National Aeronautics and Space Administration (NASA), and other sources, the Center brought eighteen TAMU students from the Colleges of Science, Engineering, and Geosciences and the Bush School, including two undergraduate students, to the symposium. During the four–day event in Washington DC, the A&M students had the opportunities to interact with many world prominent scientists, representatives from industry, policy makers, and media reporters. The students directly engaged in panel discussions (including a congressional panel) and attended keynote lectures delivered by President of the

National Academy of Science, President of American Chemical Society, President of American Geophysical Union, the President of American Meteorological Society, Secretary General of the World Meteorological Organization, and President George H.W. Bush (via video presentation).

In 2013, the Center led the effort in the organization 2013 American Meteorological Society (AMS) Robert A. Duce Symposium, in honoring Dr. Duce, former Dean of the College of Geosciences and chairman of the Center Executive Committee. With funding provided by NSF and AMS, the Center provided support eight undergraduate and fifteen graduate students attending this symposium. The 2013 Duce AMS symposium provided important training opportunities for TAMU students and young scientists in the air-sea chemical exchange processes. Three TAMU graduate students received best student awards for their oral presentations and poster papers, which were selected by the AMS Atmospheric Chemistry Committee.

In addition, the Center has partially sponsored the exchanges of international students, who visited TAMU and conducted doctoral research in the area of atmospheric chemistry/air quality:

- Ms. Maria E. Huertas, 1/2011 – 12/2011, doctoral student, Instituto Tecnologico de Estudios Superiores de Monterrey, Campus Toluca, Mexico;
- Ms. Jessica G. Barrera, 1/2011 – 12/2011, doctoral student, Instituto Tecnologico de Estudios Superiores de Monterrey, Campus Toluca, Mexico;
- Mr. Jianfei Peng, 5/2011 – 10/2011, Doctoral Graduate Student, College of Environmental Sciences, Peking University, CHINA;
- Ms. Fei Xu, doctoral graduate student, 9/2010 – 4/2013, Shandong University, CHINA;
- Ms. Dingli Yue, 10/2007 – 1/2008, Doctoral Graduate Student, College of Environmental Sciences, Peking University, CHINA.

5. Research

Since its establishment, the center has engaged broad inter-college scientific collaborations (Geosciences, Science, and Engineering) with policy research (Institute for Science, Technology, and Public Policy (ISTPP), Bush School). The research accomplishments of the center include establishing multi-use observing facility for applications atmospheric chemistry/air quality field campaigns, enhancing inter-departmental and inter-collegial faculty research that would have not been possible otherwise, and forging national and international collaborations and activities. The Center has established substantial infrastructure in its capability for air quality monitoring and modeling and its affiliated faculty members have participated broadly in air quality field studies in Texas and worldwide. Those include the 2006 Texas Air Quality Study (TexAQS II), the Study of Houston Atmospheric Radical Precursors/Surface-induced Oxidation of Organics in the Troposphere (SHARP/SOOT) field campaigns, the 2006 the Megacity Initiative – Local and Global Research Observations (MILAGRO) field campaign in Mexico City, the 2010 air quality study at U.S. – Mexico border, and several field studies in China during the 2008 summer Olympic Games (CAREBeijing-08) and the Program of Regional Integrated Experiments of Air Quality in the Pearl River Delta (PRIDE-PRD). In particular, the atmospheric chemistry field studies in Texas, funded by EPA and the Texas Environmental Research Consortium (TERC), have advanced understanding of

rapid ozone production, the atmospheric budget of free radicals, multi-phase chemical processes, and the formation and transformation of PM in Texas, all of which are essential to development of the State Implementation Plan (SIP).

The Center has persistently pursued interdisciplinary research opportunities, and such an effort has lead to several successful Center-based multi-PI proposals funded at the University, State, and Federal levels (about $2.4M).

Center-Based Multi-PI Interdisciplinary Proposals Funded

Texas A&M Tier One Program (TOP): Enhancing Teaching and Learning in Health Impacts of Air Pollution; Renyi Zhang (**ATMO**), Alexei Khalizov (**ATMO**), Fuller W. Bazer (**ANSC**), M. Carey Satterfield (**ANSC**), Guoyao Wu (**ANSC**), Robert C. Burghardt (**VIBS**), and Gregory A. Johnson (**VIBS**); 2013-2016; $300,000

This project integrates interdisciplinary education and research goals, which together address one of the most critical issues facing the State of Texas today – air pollution and its impacts on human health. The project focuses on graduate and undergraduate training and research in air quality monitoring and animal model studies of exposure to multi-pollutants under simulated experiments characteristic of two geographic locations in Texas (College Station and Houston) that represent distinct air quality from clean to polluted conditions. Undergraduate students and graduate students have the opportunities to operate state-of-art analytical instruments at the two locations to identify and quantify ambient gaseous and particulate matter (PM) pollutants, measure two key criteria air pollutants (i.e., ozone and PM) using personal monitors across Texas, and employ the results from the field measurements to design animal exposure experiments to investigate the effects of multi-pollutants on reproductive health. Multipollutant conditions will be generated in controlled laboratory experiments for animal exposure studies to identify and isolate the health effects of PM size, concentration, chemical composition, and morphology. This proposal will enhance the learning and research experiences of undergraduate and graduate students in air pollution measurements and health impacts, and will engage faculty from the Colleges of Agriculture and Life Sciences, Veterinary Medicine, and Geosciences under the Texas A&M's "One Health" initiative. Ultimately, this project will enhance the possibility of establishing a national center at TAMU, to be affiliated with the Environmental Protection Agency (EPA) Clean Air Research Centers program by introducing a geographic region not currently covered.

National Science Foundation: Aerosol Growth and Chemical Compositions from Heterogeneous Processing of Organic Compounds; Renyi Zhang (**ATMO**), Alexei Khalizov (**ATMO**), and Brian Connel (**CHEM**); 12/1/2009-11/30/2013; $597,358

This project investigates heterogeneous processing relevant to growth of secondary organic aerosols (SOA). Laboratory experiments will be performed to quantify aerosol growth rates and chemical compositions using a number of model low- and semi-volatile organic compounds and seed aerosols. Heterogeneous processing will be investigated by exposing monodisperse aerosols in a flow reactor and particles deposited in an optical crystal cell to low gaseous concentrations of representative products from oxidation of volatile organic compounds (VOCs), including a-dicarbonyls, aldehydes, and alcohols. Alternatively, experiments will be conducted in a 1 m3 Teflon chamber with monodisperse aerosols exposed to organic compounds

generated in situ from photo-oxidation of VOCs. SOA formation will be quantified from concurrent measurements of the particle size, mass, density, and chemical compositions along with the gaseous organic concentrations. Seed particles will be chosen to represent primary and secondary atmospheric aerosols under conditions of different relativity humidity (RH), acidity, and reaction times. The changes in the particle size and mass due to heterogeneous processing will be measured using a combination of tandem differential mobility analyzer (TDMA) and differential mobility analyzer - aerosol particle mass analyzer (DMA-APM). Concentrations of gaseous reactants will be monitored by ion drift – chemical ionization tandem mass spectrometry (ID-CIMS/MS). The chemical composition of aerosol particles will be characterized using thermal desorption – ion drift - chemical ionization tandem mass spectrometry (TD-ID-CIMS/MS), attenuated total reflection Fourier transform infrared spectroscopy (ATR-FTIR), NMR spectrometry, and matrix-assisted laser desorption/ionization – time-of-flight mass spectrometry (MALDI-TOFMS). The scientific questions to be addressed include (1) what is the chemical mechanism of heterogeneous processing of different classes of oxygenated organic compounds on inorganic, organic, and soot aerosols, (2) what is the dependence of the heterogeneous processing on gaseous reactant concentrations, RH, particle acidity, and reaction time scale; (3) what are the synergetic effects between the first-generation and later generations of VOC oxidation products and the effects of the presence of oxidants in the particle phase, and (4) how can laboratory measurements be used to add interpretation of ambient measurements and simulations of atmospheric organic PM2.5? Intellectual merit. The proposed research will generate laboratory results on heterogeneous processing of a number of organic compounds on sulfuric acid, ammonium sulfate, organic, and soot aerosols. The research will provide insights into the dependence of heterogeneous processing under different environmental conditions and will provide important information on the chemical mechanisms contributing to organic aerosol growth and chemical compositions. The analytical methodology for measuring the particle size and mass growth and chemical composition analysis developed in this project will enhance the ability to measure organic aerosols in the atmosphere. Hence, this study will enhance the molecular-level understanding of heterogeneous chemical processes contributing to formation of organic aerosols and will improve the ability to develop predictive models for accurate simulation of atmospheric organic particulate matter and its effects on air quality, human health, and climate. Broad Impacts. Persistent exposure to elevated levels of particulate matter has adverse effects on human health. Also, atmospheric aerosols play an important role in regulating the solar radiation intake in the earth-atmosphere system. The information on formation and chemical compositions of organic aerosols generated from this project can be employed to assess human-health effects including respiratory and cardiovascular diseases. Hence, this proposed research not only will advance our knowledge of organic aerosol formation, but also will be beneficial to the public by identification of potential human health and climate issues and to policy-decision makers to development of effective control strategies for ambient particulate matter. The multidisciplinary nature of this project combines expertise of organic chemists and atmospheric aerosol chemists. The project will provide interdisciplinary research opportunities for undergraduate students and graduate students in the areas of organic chemistry and atmospheric sciences. They will have the opportunity to present their work at conferences and build connections within the two scientific communities, as part of their education and training on global environmental change research.

National Science Foundation: Generation, Characterization, and Atmospheric Aging of Soot Particles from Diesel Combustion; Renyi Zhang (**ATMO**), Alexei Khalizov (**ATMO**), and Eric Petersen (**MEEN**); 9/1/2009 – 8/31/2012; $330,000

Soot aerosols produced from diesel combustion represent one of the major forms of particulate matter pollution, profoundly impacting human health, weather, and climate. However, few experimental studies have been carried out to investigate atmospheric transformation and associated variations in chemical and physical properties of soot, because of difficulties in controlled generation and sampling of diesel soot particles under laboratory conditions. We propose to explore a novel approach to generate soot using a shock tube to mimic diesel engine combustion. Soot particles from the shock tube will be thoroughly characterized and compared against soot produced from diesel engines. Experiments will be carried out to simulate atmospheric aging of diesel soot aerosols by exposure to condensable gas-phase species (such as sulfuric acid and carboxylic acids) and semi-volatile organic compounds generated from oxidation of anthropogenic and biogenic volatile organic compounds. The changes in morphology, hygroscopicity, and optical properties of diesel soot aerosols during internal mixing will be quantified. Fresh and aged soot aerosol will be characterized from concurrent measurements of the particle size, mass, density, and chemical composition. A combined tandem differential mobility analyzer (TDMA) and an aerosol particle mass analyzer (APM) will be employed to determine the size distribution, mixing state, morphology and hygroscopicity of fresh and aged diesel soot, augmented by transmission electron microscopy (TEM) imaging. The extinction and scattering coefficients of diesel soot aerosol will be measured using a cavity ring-down spectrometer (CRDS) and a nephelometer. The chemical composition of soot particles will be analyzed using thermal desorption – chemical ionization mass spectrometry (TD-CIMS). Intellectual Merit. The proposed research will develop a novel method for generation of soot aerosols from diesel combustion under controlled experimental conditions and will provide important information on the particle mass-size relationship, internal mixing of soot with atmospherically important inorganic and organic species, and variations of hygroscopicity and optical properties of diesel soot during atmospheric aging. Results generated from this proposed research will directly benefit experimental studies, model simulations, and ambient measurements of soot-containing aerosols. The method for generation of diesel soot aerosols in shock tubes will help further laboratory studies to investigate soot atmospheric transformation and human health effects. The analytical methodology for measuring the particle size and mass growth, mixing state, morphology, and chemical analysis developed in this project will enhance the ability to measure soot aerosols in the atmosphere. The results on chemical and physical properties of soot aerosols can be incorporated into atmospheric models to evaluate the effects of soot on weather and climate. The information on the morphology and chemical compositions of soot aerosols can also be employed to assess human-health effects including respiratory and cardiovascular diseases. Broader Impacts. Atmospheric aerosols play an important role in regulating the solar radiation intake in the earth-atmosphere system. Soot particles, formed as a result of incomplete combustion of coal, diesel fuels, biofuels, and outdoor biomass burning, are of special interest because of their significant impacts on global radiative balance and climate. A better understanding of production and atmospheric transformation of soot aerosols will help to reduce uncertainties in climate prediction and assessment of soot human health effects, which are important for development of strategies for control policy. Hence, this proposed research not only will advance our knowledge of generation, transformation, and chemical compositions and contribute to improved model simulations and ambient measurements of soot aerosols, but also will be beneficial to the public by identification of potential health issues and to policy-decision makers for development of effective control strategies for particulate matter. The multidisciplinary nature of this project combines expertise of combustion researchers and atmospheric aerosol chemists. The project will provide interdisciplinary research opportunities

for undergraduate students, graduate students, and post-doctoral researchers in the areas of mechanical engineering and atmospheric sciences. They will have the opportunity to present their work at conferences and build connections with the two scientific communities, as part of their education and training on global environmental change research.

Texas Environmental Research Consortium/Houston Advanced Research Center: Surface-induced Oxidation of Organics in the Troposphere (SOOT), Renyi Zhang (**ATMO**), Don Collins (**ATMO**), Simon North (**CHEM**); 3/2008 – 12/2009, $550,000

This project will consist of two phases: (1) experimental studies of heterogeneous reactions using a flow reactor and an aerosol chamber and (2) field measurements of several key nitrogen compounds and aerosols during 2008/2009 in Houston.

Phase 1 - Laboratory Investigation: The contractor will conduct laboratory measurements of the heterogeneous chemistry of HONO using a flow reactor and an aerosol chamber. A fast-flow, wall-coated flow-reactor will be used to measure heterogeneous reactions of NO_2 on soot surfaces. The experimental setup will be similar to that discussed in prior publications [Zhang et al., 1994; *Levitt et al*., 2006; 2007; *Zhao et al*., 2005; 2006]. An inner glass tube, coated with soot, will be inserted into the flow reactor. The measurements include uptake coefficients on fresh and aged soot surfaces with variable amounts of organics, sulfate, and nitrate. Gaseous NO_2 will be introduced through a movable injector and diluted with helium. The soot surface will be exposed to organic acids, sulfuric acid, and nitric acid to produce internally mixed particles similar to those found in the atmosphere. Water vapor will be added through a side port to adjust the relative humidity. The reactants and products in the uptake experiments will be monitored using the ion drift – chemical ionization mass spectrometry (ID-CIMS), proton transfer reaction - mass spectrometer (PTR-MS), and proton transfer reaction - tandem mass spectrometer (PTR-MS/MS). The kinetics and mechanism of the heterogeneous reaction will be determined to obtain by observing the loss of reactant and formation of the product in the gas-phase [*Levitt et al*., 2006; *Zhao*, 2005; 2006]. The flow-reactor measurements will be complimented with laboratory experiments using an aerosol chamber. The composition and concentration of the injected particles will be controlled. Unlike in Phase 2, however, the initial gas phase composition will also be controlled to determine whether reaction rates measured on coated tubes reflect those occurring on suspended aerosols. The impact of condensed water on the surface of soot particles and of the ionic concentration in aqueous sulfate particles will be evaluated directly by varying the relative humidity in the chamber. The chamber experiments will also be conducted using more atmospherically-relevant gas phase concentrations as the time available for reactions to produce detectable concentrations of product species is considerably longer than with continuous flow configurations such as flow reactors. The aerosol properties will be characterized using a tandem differential mobility analyzer (TDMA), and the gaseous species will be monitored using ID-CIMS, PTR-MS, and PTR-MS/MS. In addition to the laboratory measurements described above, preparatory activities in anticipation of Phase 2 will be conducted as part of Phase 1. This will include preparation and calibration of the ID-CIMS, CRDS, TDMA – AMP, nephelometer, captured air chamber, and TDMA instruments.

Phase 2 - Field Measurements: The focused field component of this project will include simultaneous measurements of several key nitrogen compounds (HONO, HNO_3, HNO_4, N_2O_5, and NO_3) and aerosols during a one-month period in 2008/2009 at the University of Houston's Moody Tower to assess the impact of heterogeneous chemistry on the radical budget, VOC

oxidation, and ozone formation in the Houston area. A hybrid captured-air chamber will also be applied to examine the relevant heterogeneous reactions in a controlled environment with known aerosol concentration and composition. In addition, a constrained box model [*Fan and Zhang*, 2004] will be used to interpret the results from the field measurements. During Phase 2, the contractor will perform the following activities:

- Measurements of HONO, HNO_3, and HNO_4 using ion drift – chemical ionization mass spectrometry (ID-CIMS);
- Measurements of N_2O_5 and NO_3 using cavity ring down spectroscopy (CRDS);
- Measurements of soot aerosol content and mixing state using a combined TDMA – aerosol particle mass (APM) analyzer;
- Measurements of aerosol optical properties using CRDS for extinction and a nephelometer for scattering. The absorption will be coupled with the TDMA-APM data to infer the soot content and mixing state;
- Measurements of aerosol size distributions and hygroscopicity using a TDMA. Aerosol chemical composition and mixing state will be inferred from the analysis of measured hygroscopic growth [*Gasparini et al.*, 2004];
- Deployment of a captured-air chamber to investigate the heterogeneous conversion of NO_2 to HONO on soot by introducing known concentrations of soot, sulfate, and organic aerosols under partially controlled conditions. Outside air will be flushed through the chamber such that the gas phase composition inside will continuously mimic that in ambient air;
- Simulations using a constrained box model to compare the predicted concentrations to the measurements and to assess the importance of heterogeneous chemistry on the radical budget, VOC oxidation, and ozone formation in the Houston area.

Texas Air Research Center (TARC): The Center affiliated faculty members have continuously received funding from TARC on air quality related studies at the level of about $100,000 per year since 2007.

Center-Based Multi-PI Interdisciplinary Proposals Unfunded

In addition, the Center led several major initiatives of interdisciplinary projects submitted to various funding agencies, but unfunded. For example, a proposal was submitted in 2009 to establish a regional Environmental Protection Agency (EPA) Clear Air Research Center, which included twenty-nine investigators with a total budget of $8M (Table 2).

National Science Foundation MRI, 2012, $1,378,123: Development of an Integrated Mass Spectrometry System for Chemical Analysis of Nano- to Micron-Sized Aerosols; Renyi Zhang, Alexei Khalizov, Sarah Brooks, and Don Collins, Simon North, Qi Ying

An integrated mass spectrometry system will be developed for analysis of chemical compositions of nano- to micron-sized aerosols. A Thermal Desorption – Ion Drift – Chemical Ionization – High-Resolution – Time-of-Flight Mass Spectrometer (TD-ID-CI-HR-ToF-MS) will be constructed and integrated with a High-Resolution Time-of-Flight Aerosol Mass Spectrometer (HR-ToF-AMS, Aerodyne Research, Inc. (ARI)) to enable measurements of aerosols with an extended size range and a high degree of molecular speciation and quantification. The proposed

integrated mass spectrometry system will enhance the infrastructure of the Center for Atmospheric Chemistry and Environment (CACE) at Texas A&M University (TAMU) to tackle key aerosol-related challenges at the state, national, and international levels, by facilitating collaborative laboratory, field, and modeling studies for molecular-level understanding of aerosol formation and growth mechanisms and improvement in prediction and modeling of the impacts of aerosols on air quality, human health, weather and climate. This project will also provide a state-of-the-art instrumental facility for training of the next generation of experimentalists (i.e., undergraduate, graduate students, and post-doctoral researchers), in the area of aerosol science and technology at TAMU. Atmospheric aerosols impact the Earth-atmosphere system in several distinct ways. On the global scale, aerosols influence the Earth's energy balance, directly by scattering and absorbing solar radiation and indirectly by modifying cloud formation and altering the lifetime and albedo of clouds. Presently, the lack of understanding of the aerosol direct and indirect forcing represents the largest uncertainty in climate predictions. On the regional and local scales, aerosols represent a major contributor to air pollution. Adverse effects of fine particulate matter (PM) on human health constitute the most important element in formulating the National Ambient Air Quality Standards (NAAQS), and increasing evidence has implicated fine PM in exacerbation of existing health symptoms and the development of serious chronic diseases. The effects of aerosols on air quality, climate, and human health are largely dependent of their physical (i.e., the size, concentration, and morphology) and chemical (i.e., composition) properties. In particular, the ability of aerosols to activate as cloud droplets and ice crystals and to scatter and absorb visible and terrestrial radiation is strongly linked to their chemical composition. Also, there is ample evidence from epidemiological and toxicological studies that adverse health outcomes are closely associated with specific chemical properties of aerosols. This project represents a major undertaking to develop an advanced aerosol research facility, in support of diverse research endeavors by investigators affiliated with the CACE TAMU.

Environmental Protection Agency, 2010, $899,983: Assessing the Impacts of Atmospheric Aging of Black Carbon on Air Quality and Climate Forcing; Renyi Zhang, Alexei Khalizov, Don Collins, and Qi Ying

The primary objective of this project is to investigate the relationships between the mixing state and optical and cloud-forming properties of black carbon (BC) under various ambient conditions and to develop physically-based parameterizations for inclusion in atmospheric models to assess their impacts on air quality and climate. Although BC aerosols are produced from diverse sources such as fossil fuel combustion and biomass burning, aging of BC, caused by interactions with other atmospheric chemical constituents, considerably modifies the aerosol properties, making them largely independent of their origins. Currently, the processes responsible for BC aging in the atmosphere remain poorly understood, representing one of the largest uncertainties in the assessment of the impacts of BC on air quality and climate forcing. We hypothesize that aging of BC aerosols in the atmosphere, characterized by the parameters related to their mixing state (i.e., the mass ratios between elemental carbon, sulfate, and organics and the total coating mass), can be correlated with several key primary co-pollutants (i.e., NO_x, SO_2, and biogenic/anthropogenic volatile organic compounds) and can be derived from simulations using chemical transport models. The mixing state parameters, in turn, can be employed to predict the properties of BC, such as the particle size, morphology, hygroscopicity, and single scattering albedo, during atmospheric transport. A novel environmental chamber approach, which transmits UV sunlight and exchanges gases but removes particulate matter (PM) from ambient air, will be employed to investigate BC aging. Different types of

monodisperse BC aerosols, produced from burning of fossil fuels (including diesel) and biomass, will be injected into the chamber to mimic aerosol aging under ambient conditions. The evolution in the size, mass, effective density, mixing state, chemical composition, morphology, hygroscopicity, cloud condensation nuclei (CCN) activity, and optical properties of BC inside the chamber will be simultaneously monitored with a suite of state-of-art instruments. Concurrent measurements of ambient trace gases (CO, O_3, NO_x, SO_2, H_2SO_4, and VOC) and PM will also be conducted. Aging experiments of BC and ambient measurements will be carried out at three field sites located in College Station, TX (mostly biogenic and slightly polluted), Houston, TX (highly polluted and some biogenic), and Beijing, China (sulfur-rich and highly polluted) to reflect diverse ambient conditions. The results of field studies will be analyzed to develop physically-based parameterizations to correlate the mixing state of BC with concentrations of the primary co-pollutants and to predict the optical properties and CCN activity of BC from known mixing states. Those developed parameterizations will be incorporated into the WRF-Chem model to evaluate the impacts of BC on local and regional air quality and climate in relation to the BC source types and atmospheric transformations.
This project will develop novel experimental and modeling tools for investigation of atmospheric transformation of BC aerosols and will derive the relationship between the their properties and atmospheric aging. A better understanding of the impacts of BC aging on the climate forcing and air quality will reduce uncertainties in atmospheric models and will have important implications for development of effective control strategies by policy-decision makers.

Environmental Protection Agency - Clear Air Research Centers, 2009, $2,702,916: I - Formation and Transformation of Multi-Pollutant Atmospheres and Their Toxicological Implications; Don Collins, Renyi Zhang, Sarah Brooks, Bing Guo, Terry Wade, Alexei Khalizov, Jun Zheng, and Qi Ying

This Project will investigate formation, transformation, and transport of multi-pollutant atmospheres to identify and quantify major constituents relevant to human health effects, and to facilitate animal exposure to well-characterized and controlled multi-pollutants. Field measurements of atmospheric gaseous and particulate matter (PM) pollutants will be conducted at three sites representative of clean and polluted environments in Texas (i.e., College Station, Houston, and McAllen, Texas). The concentrations of gaseous primary and secondary pollutants will be monitored and related to measured properties of ambient PM. Concurrently with the field measurements, conditions of controlled multi-pollutants will be generated for animal exposure studies. Specifically, this Project involves (**1**) ambient monitoring of atmospheric multi-pollutants, including gaseous species (ozone, CO, NO_x, SO_2, volatile organic compounds (VOC), polychlorinated biphenyls (PCB), polycyclic aromatic hydrocarbons (PAH), HNO_3, and H_2SO_4) and ultrafine, fine and coarse mode PM (particle size distributions, morphology, density, mixing state, chemical composition, hygroscopicity, optical properties), (**2**) characterization of ambient PM for major metals (total metal and bioavailable metal), valence state of iron and chromium, and surface redox capacity, (**3**) collection of ambient $PM_{2.5}$ and PM_{10} for off-line chemical analysis and animal exposure studies, (**4**) generation of controlled multi-pollutant conditions for animal exposure (i.e., ambient air and PM-filtered ambient air with controlled PM, such as particle-free, and added soot particles with inorganic and organic coatings), and (**5**) model simulations to evaluate transformation and transport of gaseous secondary pollutants and PM. This project will investigate atmospheric transformation of gaseous and PM pollutants in relation to their health impacts. The measurements of ambient gaseous and PM pollutants will be employed to improve and validate air quality models. Atmospheric modeling will provide air

quality results with high spatial and temporal resolutions and detailed chemical compositions, which will be used in epidemiologic studies. Through a combination of measurements and animal exposure studies, we will identify specific constituents of multi-pollutant atmospheres responsible for negative health impacts of polluted air and assess possible synergetic toxic action. Results generated from this proposed research will directly benefit model simulations and ambient measurements of gaseous and PM pollutants. Accurate simulations of transformations and transport of primary and secondary pollutants will contribute to development of cost-effective control strategies and to evaluation of the effect of reduced anthropogenic emissions on toxicity of multi-pollutant atmospheres. Table 2 contains a list of participants of the proposed Texas AIR Center.

Table 2. A list of participants in the proposed EPA Texas AIR Center

Project I: Monitoring and Modeling	**Project II: Animal Studies**
• Don Collins (PI), Atmospheric Sciences • Renyi Zhang, Atmospheric Sciences • Sarah Brooks, Atmospheric Sciences • Bing Guo, Mechanical Engineering • Terry Wade, Geo-Environmental Research Group • Alexei Khalizov, Atmospheric Sciences • Jun Zheng, Atmospheric Sciences • Qi Ying, Civil Engineering	• Guoyao Wu (PI), Animal Science • Fuller Bazer, Animal Science • Robert Burghardt, Veterinary Integrative Biosciences • Gregory Johnson, Veterinary Integrative Biosciences • Thomas Spencer, Animal Science • Nancy Turner, Nutrition and Food Sciences • Robert Chapkin, Nutrition and Food Sciences • Raymond Carroll, Statistics • Cristine Heaps, Animal Sciences • Cynthia Meininger, Systems Biology and Translational Medicine
Project III: Epidemiological Studies	
• Scott Lillibridge (PI), School of Rural Public Health • Anne Sweeney, School of Rural Public Health • Daikwon Han, School of Rural Public Health • Hongwei Zhao, School of Rural Public Health	
	Project IV: Texas - Mexico Border Issues
Administrative Core Project	• Qi Ying (PI), Civil Engineering • Arnie Vedlitz, Bush School • Eric Lindquist, Bush School • Cliff Spiegelman, Statistics • Eun Sug Park, Texas Transportation Institute • Luisa Molina, Molina Center/MIT
• Renyi Zhang, Atmospheric Sciences • Fuller Bazer, Animal Science • Luis Cifuentes, Geosciences • Sarah Bednarz, Geosciences	

Environmental Protection Agency - Clear Air Research Centers, 2009, $2,731,725: II - Animal Proxy Studies of Exposure To Multi-Pollutants Under Ambient And Simulated Conditions; Guoyao Wu, Fuller Bazer, Robert Burghardt, Gregory Johnson, Thomas Spencer, Nancy Turner, Robert Chapkin, Raymond Carroll, Cristine Heaps, Cynthia Meininger

Animal models are effective proxies for humans in the study of health effects of hazardous environmental conditions. Animal models (rats) will be employed to investigate the effects of air pollution on three aspects of human health – obesity and vascular dysfunction, endocrine disruption and reproductive health, and colon cancer. These three health conditions are emphasized because large uncertainties exist in their association with air pollution. The animal exposure experiments will be conducted at three field sites (College Station, Houston, McAllen, Texas), representative of clean and polluted conditions. This Research Project will emphasize toxicological responses to short-term and long-term exposures to multi-pollutants, including (**1**) tetrahydrobiopterin (BH4) availability and nitric oxide (NO) synthesis in endothelial cells, as well as endothelium-dependent relaxation in diet-induced obese rats; (**2**) ovarian development

and function, age at puberty and the estrous cycle; (**3**) pre- and post-mating effects on growth and development of blastocysts, implantation and conceptus development to term; (**4**) generational and transgenerational effects on growth and development of offspring, as well as adult onset of reproductive deficits affecting age at puberty and sexual cycles, fetal-placental growth and development, litter size, birth weight of pups and post-natal growth and development of pups to weaning; and (**5**) oxidative stress in colonocytes from rats and enhancement of inflammation and colon carcinogenesis using a combined azoxymethane/dextran sulfate sodium (AOM/DSS) model of colon cancer. A matrix of environmental conditions for animal exposure will be designed and generated by the Research Project I group to mimic multi-pollutant environments and to identify their effects of cardiovascular, reproductive and intestinal health. The measurements of gaseous and PM pollutants, in conjunction with monitored animal breathing rates, will be employed to evaluate toxicology and doses in animal exposure. This Project will assess the toxic health impacts of PM size, number vs. mass concentration, chemical constituents, and morphology on adverse health outcomes and will focus on elucidation of the underlying biologic mechanisms. Information generated in the animal studies will guide epidemiological studies of human health records in monitored regions of higher risk sub-populations (Projects III and IV).

Environmental Protection Agency - Clear Air Research Centers, 2009, $1,133,181: III- Air Pollutants and Adverse Reproductive And Pregnancy Outcomes; Scott Lillibridge, Anne Sweeney, Daikwon Han, Hongwei Zhao, and Carey Mader

This Project will evaluate the impacts of air pollution on human reproduction. The overall goal of the study is epidemiologic assessment of adverse health effects and risks of exposure to air pollutants, in terms of magnitude/concentration, duration/frequency, and timing. The proposed study is centered on three major approaches. First, a population-based epidemiologic study will be conducted to evaluate adverse health effects of pregnancy outcomes associated with air pollution concentrations of multi-pollutants. The objective is to link a large and comprehensive birth database, based on birth certificates for the period 2000-2006 in Houston, McAllen, and College Station, with spatially and temporally varying exposure estimates from advanced exposure measurement and modeling methods. Results from ambient monitoring and modeling, supported by experimental evidence from animal studies, will be employed to correlate pregnancy outcomes with the ambient levels of gaseous and PM pollutants. The second project includes a semen quality study to investigate the relationship between air pollution and adverse reproductive effects, mainly to determine the relationship between air pollutants as measured by ambient air monitors and semen parameters, and to evaluate the correlation between selected air monitor pollutant levels (polychlorinated biphenyls, lead, and cadmium) and individual levels of exposure measured in blood sample analyses from the males in the semen quality study. This project also includes a pilot study to evaluate the methodology and tools to conduct a study of the relationship between multi-pollutants and adverse reproductive outcomes that utilizes air monitoring data, personal air monitors, biological sample analyses, and survey/diary information. The use of air pollution measurements and modeling and evidence from semen quality and personal air monitoring studies will significantly advance the scientific understanding of the effects of air pollution on human reproduction. The relationship between exposure to air pollutants and semen quality is a poorly understood and understudied area of critical importance in public health, since this relationship has the potential to affect not only fecundability and fertility, but children's health as well. Assessment of paternally- and maternally-mediated adverse reproductive effects due to air pollution will also greatly enhance

our efforts to conduct epigenetic research. By combining indirect and direct exposure assessment methods (biomarkers and personal exposure), as well as air quality measurements and modeling and experimental evidence from animal studies, this project addresses an important gap in the study of air pollution and human reproduction.

Environmental Protection Agency - Clear Air Research Centers, 2009, $757,625: IV - Origins and Regional Contributions of Multi-Pollutants and Associated Health Effects in South Texas and the Texas-Mexico Border; Qi Ying, Clifford Spiegelman, Eun Sug Park, Luisa T. Molina, Arnold Vedlitz, and Eric Lindquist

The objective of this project is to combine atmospheric monitoring and modeling, statistical, epidemiological, and social political science tools to improve the understanding of the sources, regional transport and formation of ozone, air toxics, and particulate matter (PM), the relationship between exposures to air pollutants and pregnancy outcomes and to make better decisions to protect public's health. A modified source-oriented Community Multiscale Air Quality (CMAQ) chemical transport model with air toxics and a novel multivariate receptor-oriented statistical model will be used to predict the source origin and geographical origin of ozone, air toxics, and PM in South Texas and Texas-Mexico border. The CMAQ model will predict O_3, air toxics, and PM concentrations with a 1-hr time resolution and 4 km spatial resolution in the two regions. The model periods will overlap with the intensive sampling periods (ISPs) described in Project I and air quality predictions will be compared with the field measurements. The source-oriented CMAQ model will separately resolve the contributions to O_3 due to major NO_x and volatile organic compound (VOC) sources. The elemental carbon, organic carbon and trace metals in primary PM from major sources will also be resolved. Calculations will be made to predict the concentrations of primary and secondary air toxics and determine their respective sources. The multivariate statistical model will determine the source contribution to primary VOCs and air toxics and contribution from Mexican sources based on the measured VOCs and air toxics concentrations during the ISPs and from Photochemical Assessment Monitoring Stations (PAMS) stations, providing an independent confirmation of the CMAQ source apportionment calculations. The predicted air pollutant concentrations and source contribution information will be utilized in an epidemiology analysis (Project III) to determine whether pregnancy outcomes are related with air pollution and the spatial heterogeneity can be explained by the difference in the composition and sources of air pollutants. Air quality modeling and source apportionment results, along with results from the other center projects, will be linked into decision tools that can be used by public and private decision makers and the general public to make informed personal, political and business decisions that can improve and protect both the public's health and the region's economic well being.

Early Career Awards

Two atmospheric chemists affiliated with the Center have received prestigious Early Career Awards.

National Science Foundation - Faculty Early Career Development Program: CAREER - Chemical Processing and Cloud Nucleation Activity of Soot Aerosols; Sarah Brooks; 1/1/2006-12/31/2012; $627,645

This proposal focuses on the interactions of soot particles with gas phase species and how this may alter their ability to act as ice and warm cloud nuclei. Using a diffusion chamber coupled with a chemical ion mass spectrometer, and a cloud condensation nuclei (CCN) counter, chemical aging of aerosols will be studied and ice nucleation observed under upper tropospheric conditions. Measurements of warm cloud condensation nuclei efficiency of aged soot will also be conducted. Questions to be addressed include: 1. Do soot aerosols react with oxidizing agents, such as ozone, OH radicals, and NO2? Is oxidation a significant sink for tropospheric soot aerosol? What are the major gas phase products of the oxidation? 2. What is the ice nucleation (IN) activity of soot aerosol? Is IN activity altered by oxidation reactions or by organic coatings? Is there a correlation between altered IN activity and increased CCN activity due to aging processes? In the educational component, high school students will measure precipitation in and near Houston, TX. Surface tension measurements of the precipitation samples will be made and used as an indication of pollutant levels as a function of locale. Undergraduates in a new atmospheric chemistry laboratory course will coordinate with the high school students to chemically characterize representative precipitation samples. Results will be used to identify compounds present in the urban environment that could act as ice nuclei or CCN, and to determine whether organic compounds present are surface active and therefore capable of altering cloud nucleation activity. Broader impacts also include teaching about air pollution and proper scientific methods to high school students who will be creating a location-specific data set of the volume and composition of precipitation in and around Houston. Graduate, undergraduate and high school students will work jointly on this project and publish the results. Data from this study will be put into formats useful for teaching about air quality issues at the high school level. The results will be disseminated broadly, including kickoff and summary lectures at the high schools.

Presidential Early Career Award in Science and Engineering: Sarah Brooks; 2007 (awarded by the White House, nominated through USDA)

National Science Foundation - Faculty Early Career Development Program: CAREER - Using an urban-to-rural gradient as a proxy for global change effects on selected biosphere-atmosphere trace gas exchanges; Gunnar Schade; 03/01/2010 – 02/28/2015; $531,926

The overarching objective is to investigate responses of biogenic volatile organic compound (BVOC) emissions to variations in climate parameters, such as temperature and humidity. BVOC emissions, particularly isoprene, exert an important direct influence on atmospheric chemistry and an indirect one on climate. Increased BVOC emissions in a warmer climate can exacerbate regional ozone pollution and reinforce global warming. However, future BVOC emissions are uncertain due to a lack of understanding of plant BVOC production and emissions' acclimatization to climate change. The specific objectives are to: determine urban-rural response gradients due to growth environment, such as T, [CO2], and [O3]; relate trace gas exchange to physical and biophysical drivers, including seasonality; and provide adequate flux data to improve isoprene response and feedback modeling on larger scales. Along four sites from central Houston to Sam Houston National Forest, biometeorological data, and [CO2] and [O3] will be recorded year-round. In addition, auxiliary data on microclimates and soil parameters will be collected. Local trees to be studied include five oak species, sweetgum, and loblolly pine. Expected temperature and CO2 gradients along the study sites are of order 1 K and 20 ppm, respectively. Controlled laboratory, branch-level experiments performed by undergraduate students will complement the field data. Research will be conducted by undergraduate and

graduate students. Undergraduate students will assist with field, and perform their own laboratory measurements and analyses. The high school program will involve teachers and students in research through jump starting related GLOBE program activities at the same schools we deploy the expanded weather stations measuring the climate and air quality gradient. Teachers and students can work with these data directly, generate their own earth science data, and interact with researchers during field measurements and workshops.

High Impact Journal Publications

A high level of research accomplishment of the Center affiliated faculty members is also reflected by the publications in high impact journals:

- Jimenez, J. L., 26 co-authors, Tomlinson, J. M., **Collins, D. R.,** et al., Evolution of organic aerosols in the atmosphere, *Science* **326**, 1525-1529 (2009).
- Smith, J. N., Barsanti, K. C., Friedli, H. R., Ehn, M., Kulmala, M., **Collins, D. R.,** et al., Observations of aminium salts in atmospheric nanoparticles and possible climatic implications, *Proc. Natl. Acad. Sci. USA* **107**, 6634-6639 (2010).
- **Dessler, A.E**., and S.C. Sherwood, A matter of humidity, *Science* **323**, 1020-1021, DOI: 10.1126/science.1171264 (2009).
- **Dessler, A. E**., A determination of the cloud feedback from climate variations over the past decade, *Science* **330**, doi:10.1126/science.1192546, 1523-1527 (2010).
- **Dessler, A.E**., Energy for air capture, *Nature Geosci*. **2**, DOI: 10.1038/ngeo691, 811 (2009).
- Hopkins, F.E., Turner, S.M., Nightingale, P.D., Steinke, M., Bakker, D. and **Liss, P.S.**, Ocean acidification and marine trace gas emissions. *Proc. Natl. Acad. Sci. USA* **107**, 760-765 (2009).
- Duce, R.A., LaRoche, J., Altieri, K., Arrigo, K.R., Baker, A.R., Capone, D.G., Cornell, S., Dentener, F., Galloway, J., Ganeshram, R.S., Geider, R.J., Jickells, T., Kuypers, M.M., Langlois, R., **Liss, P.S.**, et al., Impacts of atmospheric anthropogenic nitrogen on the open ocean, *Science* **320**, 893-897 (2008).
- Hopkins, F.E., Turner, S.M., Nightingale, P.D., Steinke, M., Bakker, D. and **Liss, P.S.** (2009). Ocean acidification and marine trace gas emissions. *Proc. Natl. Acad. Sci. USA* **107**, 760-765.
- M. P. Grubb, M. L. Warter, H. Xiao, S. Maeda, K. Morokuma, and **S. W. North**, No Straight Path: Multistate Roaming as the Only Route for the $NO_3 \rightarrow NO + O_2$ Reaction, *Science* **355**, 1075 (2012).
- **S. W. North**, Roaming in the Dark, *Nature Chem.* **3**, 504 (2011).
- Balaguru, K., P. Chang, **R. Saravanan**, and L. R. Leung, 2012: Effect of Ocean Barrier Layers on Tropical Cyclone Intensification, *Proc. Natl. Acad. Sci. USA* **109**, doi/10.1073/pnas.1201364109, 14343-14347 (2012).
- Addona, T., Abbatiello, S., Schilling, B., Skates, S., Mani, D., Bunk, D., **Spiegelman, C**., et al., Multi-site assessment of the precision and reproducibility of multiple reaction monitoring–based measurements of proteins in plasma", *Nature Biotechnol.* **27**, 633 – 641 (2009).

- Kessler, J.D., D.L. Valentine, M.C. Redmond, M. Du, E.W. Chan, S.D. Mendes, E.W. Quiroz, C.J. Villanueva, S.S. Shusta, L.M. Werra, **S.A. Yvon-Lewis**, and T.C. Weber, A persistent oxygen anomaly reveals the fate of spilled methane in the deep Gulf of Mexico, *Science* **331**, 312-315 (2011).
- Valentine, D.L., J.D. Kessler, M.C. Redmond, S.D. Mendes, M.B. Heintz, C. Farwell, L. Hu, F. Kinnaman, **S.A. Yvon-Lewis**, M. Du, E.W. Chan, F. Garcia Tigreros, C.J. Villanueva (2010), Propane respiration jump-starts microbial response to a deep oil spill, *Science* **330**, 208, DOI: 10.1126/science.1196830
- **Zhang, R.**, A.F. Khalizov, L. Wang, M. Hu, X. Wen, Nucleation and growth of nanoparticles in the atmosphere, *Chem. Rev*. **112**, 1957-2011, DOI: 10.1021/cr2001756 (2012).
- **Zhang, R.**, Getting to the critical nucleus of aerosol formation, *Science* **328**, doi:10.1126/science.1189732, 1366-1367 (2010).
- Wang, L., A.F. Khalizov, J. Zheng, W. Xu, V. Lal, Y. Ma, and **R. Zhang**, Atmospheric nanoparticles formed from heterogeneous reactions of organics, *Nature Geosci*. **3**, doi:10.1038/ngeo778, 238-242 (2010).
- **Zhang, R.**, L. Wang, A. F. Khalizov, J. Zhao, J. Zheng, R. L. McGraw, and L. T. Molina, Formation of nanoparticles of blue haze enhanced by anthropogenic pollution, *Proc. Natl. Acad. Sci. USA* **106**, 17650-17654 (2009).
- **Zhang, R.,** A.F. Khalizov, J. Pagels, D. Zhang, H. Xue, and P.H. McMurry, Variability in morphology, hygroscopic and optical properties of soot aerosols during internal mixing in the atmosphere, *Proc. Natl. Acad. Sci. USA* **105**, 10291–10296 (2008).

6. Synergistic and Professional Activities

Several professional activities have been sponsored by the Center, including seminars given national and international renowned atmospheric chemists and organizations of a retreat, workshops, and symposia. The workshops and symposia include (1) organization of a symposium "Atmospheric Chemistry and Air Quality in Texas: Challenges and Opportunities" in 2010 to discuss the current status and future directions in atmospheric chemistry and air quality research in Texas, and to explore broad collaboration among the research communities both inside and outside the state, (2) organization of "2011 IYC SYMPOSIUM ON STRATOSPHERIC OZONE AND CLIMATE CHANGE" in observance of the 2011 International Year of Chemistry (IYC) on November 7-10, 2011 in Washington D.C. to recognize the contributions of scientists, policy decision makers, industry, and intergovernmental agencies to characterize and counteract the threat that industrially produced halocarbons posed to the Earth's protective stratospheric ozone layer (2011-IYC-O3.org), and (3) 2013 American Meteorological Society's Robert A. Duce Named Symposium "Air-Sea Chemical Exchange: Impacts on the Atmosphere and Ocean". The program and abstracts of the Center sponsored workshops and symposia are included Appendix II.

Atmospheric Chemistry and Air Quality in Texas: Challenges and Opportunities

The symposium was held in the Annenberg Presidential Conference Center, College Station, TX on April 22-23, 2010. The event was jointly sponsored by the Center and the Office of the Vice President for Research. The objectives of the symposium were to discuss the current status and future directions in atmospheric chemistry and air quality research in Texas and to

explore broad collaboration among the research communities both inside and outside the State of Texas. The symposium emphasized on the following areas:

- National Ambient Air Quality Standard (NAAQS) and State Implementation Plan (SIP)
- Air pollution and health impacts
- Air Pollution and policy decision-making
- Gaseous pollutants and air toxics
- Particulate Matter pollutants
- Air pollution in the Texas-Mexico bi-nation context
- Findings from the 2009 SHARP field campaign
- Funding opportunities (state and federal)

Several invited talks and research presentations were scheduled from representatives of national labs, universities, and state and federal agencies to address the above issues. Invited distinguished speakers include Dr. Bryan W. Shaw, Commissioner of the Texas Commission on Environmental Quality, and Dr. Robert Harriss, President of Houston Advanced Research Center. The symposium included a poster presentation session, and over 20 graduate students from the Colleges of Science, Engineering, and Geosciences presented research at this symposium.

2011 IYC Symposium on Stratospheric Ozone and Climate Change

In observance of the 2011 International Year of Chemistry (IYC), a symposium will be organized on November 7-10, 2011 to recognize the contributions of scientists, policy decision makers, industry, and intergovernmental agencies to characterize and counteract the threat that industrially produced halocarbons posed to the Earth's protective stratospheric ozone layer (2011-IYC-O3.org). The IYC Ozone symposium was held in The Ronald Reagan Building and International Trade Center, 1300 Pennsylvania Avenue NW, Washington, D.C. 20004. The American Meteorological Society (AMS), American Geophysical Union (AGU), and American Chemical Society (ACS) were the primary co-sponsors for this symposium. International co-sponsors for this event included the United Nations Environment Programme (UNEP - Ozone Secretariat), World Meteorological Organization (WMO - Research Department), and the International Commission on Atmospheric Chemistry and Global Pollution (ICACGP) of the International Association of Meteorology and Atmospheric Science (IAMAS).

The symposium was open to scientists, government and non-government policy officials, and representatives from industry, who were interested in science and policy addressing environmental protection, in general, and climate change, in particular. World-renowned atmospheric chemists and other scientists, who have made important contributions to stratospheric ozone research, were invited to deliver keynote speeches. In addition, invited presentations on the regulatory and policy aspects of stratospheric ozone and climate changes were planned from the policy and industry communities. A young scientist forum was organized in the symposium, and the agenda included oral and poster presentations from young scientists on the subjects of research in atmospheric sciences and climate change and integration between science and policy.

The symposium included keynote lectures, invited and contributed presentations, and working sessions that reviewed and updated stratospheric ozone layer research, the development

and assessment of policies to mitigate stratospheric ozone loss, possible parallels and relevant lessons learned that might benefit climate change science and policy, and communication of climate change to the public.

Keynote speakers of this symposium included Ralph Cicerone, president of National Academy of Sciences; Mario J. Molina, 1995 Nobel laureate in chemistry; Robert T. Watson, chief scientific adviser of Department for Environment, Food and Rural Affairs of the United Kingdom and former chair of the Intergovernmental Panel on Climate Change; C. Boyden Gray, White House Counsel (1989-93); Susan Solomon, winner of the National Medal of Science; and William K. Reilly, Administrator of U.S. Environmental Protection Agency (1989-93). Former President George H. W. Bush, senior cabinet members, and congressional representatives discussed the history, implementation, and impacts of the 1990 Clean Air Act Amendments (CAAA). A session on Education, Outreach, and Communication: Telling the Stories of Stratospheric Ozone Layer and Climate Change was organized at the symposium.

This symposium provided interdisciplinary training opportunities for over twenty TAMU undergraduate and graduate students and post docs, in the areas of atmospheric chemistry, climate changes, and policy decision-making. They had the opportunity to present their own work at the conference and build connections with these communities, as part of their education and training on global environmental change research.

The Center received funding from the following agencies in support of the IYC Ozone and Climate Change symposium:

- $25,000, National Science Foundation (NSF);
- $49,130, National Aeronautics and Space Administration (NASA);
- $20,000, Department of Energy (DOE);
- $10,000, United Nation World Meteorological Organization (UN-WMO).

More information on this symposium can be found at (http://2011-iyc-o3.org/).

2013 American Meteorological Society Robert A. Duce Named Symposium

A named symposium to honor Dr. Robert A. Duce was be held as part of the 2013 American Meteorological Society Annual meeting in Austin. The AMS Annual Meeting was held in Austin, TX from 6-10 January 2013, with the Duce Symposium on Tuesday the 8th. The theme for the 2013 Robert A. Duce Named Symposium was "Air-Sea Chemical Exchange: Impacts on the Atmosphere and Ocean".

The 2013 AMS Duce Symposium honored Dr. Duce's distinguished contributions to research related to chemical cycles of pollutant and natural substances in the global atmosphere and, in particular, atmospheric transport of chemicals from the continents, their deposition to the ocean and impact on marine biogeochemistry, atmospheric chemistry and climate, with studies in Antarctica, the Arctic, and all the world's ocean. The symposium also recognized his leadership of the atmospheric/oceanic science community both in the US and internationally. The symposium included keynote lectures, invited and contributed presentations. Papers were presented on all aspects of air-sea exchanges, including atmospheric and marine chemistry, air-sea interaction, global biogeochemical cycles, and climate change. The sessions for the

symposium included (1) Air-sea exchange and coupling between atmospheric and marine chemistry, (2) Global biogeochemical cycles, (3) Long range transport of dust and associated effects on climate, (4) Deposition of anthropogenic pollutants to open-oceans and associated effects on oceanic biological productivities, (5) Trace gases and greenhouse gases in the marine atmosphere, (6) Formation and transformation of marine aerosols and their climate impacts. In addition, a joint session entitled "Chemistry-Aerosol-Cloud/Climate Interactions: From Ocean to Continents" was held with the Fifth Symposium on Aerosol-Cloud-Climate Interactions and 15th Conference on Atmospheric Chemistry.

The Center received funding in the amount of $10,000 from NSF to support early career scientists (i.e., undergraduate students, graduate students, and post docs). In addition, the AMS provided $1500 for student travels and best paper awards for this symposium.

Seminar Program

The Center regularly sponsored seminars, in conjunction with the Department of Atmospheric Sciences, Oceanography, Chemistry, Civil Engineering, etc. Below is a list of seminar visitors partially sponsored by the Center during the reporting period:

- Allison Steiner (2013). The Surface Forcing of Atmospheric Aerosols: From Local Observations to Regional Circulation. Department of Atmospheric, Oceanic and Space Sciences, University of Michigan.
- Daniel Rosenfeld (2012). Aerosol Impacts on Microstructure and Intensity of Convective Storms and Hurricanes. Institute of Earth Science in the Hebrew University of Jerusalem, Israel
- Neil Donahue (2012). Old Aerosols Never Die, They Just Get Oxidized. Chemistry and Chemical Engineering Director for Center for Atmospheric Particle Studies, Carnegie Mellon University
- Donald Stedman (2012). The Science and Politics of Motor Vehicle Emissions, Department of Chemistry and Biochemistry, University of Denver
- Jon Thompson (2012). Atmospheric Aerosols & Climate: Optical Properites, Chemical Composition, and Open Challenges. Department of Chemistry & Biochemistry, Texas Tech University
- Lea Hildebrandt (2012). Formation and Transformation of Atmospheric Particulate Matter: Measurements and Models. Chemical Engineering, University of Texas
- Ronald Cohen (2012). Observational Insights in Atmospheric Chemistry: NO X Trends and the Role of Organic Nitrates. Department of Chemistry and Department of Earth and Planetary Science, University of California, Berkeley
- Yangang Liu (2012). Fast Processes in Climate Models, Their Parameterization and Evaluation. Brookhaven National Laboratory, Atmospheric Sciences Division
- Yangang Liu (2012). Seeking Entropy-Related Principles for a Top-Down View of the Multiscale Climate Hierarchy. Brookhaven National Laboratory, Atmospheric Sciences Division
- Peter Liss (2011). Marine geo-engineering: Miracle cure or snake oil? School of Environmental Sciences, University of East Anglia

- Eric Saltzman (2011). Reactive chlorine in the marine atmosphere. Department of Earth System Science, University of California, Irvine
- Patrick Arnott (2011). Multispectral Photoacoustic Analysis of Atmospheric Aerosol. Department of Physics, University of Nevada - Reno
- Paul Shepson (2007). Connections between biogenic volatile organic compound emissions and the fate of atmospheric NOx. Department of Chemistry, Purdue University

BILL BATCHELOR

Professor and holder of the R.P. Gregory '32 Chair
Zachry Department of Civil Engineering
Texas A&M University
3136 TAMU
College Station, Texas 77843-3136

Voice: 979-845-1304
Fax: 979-862-1542
Email: bill-batchelor@tamu.edu
Web: http://batchelor.tamu.edu/bill

Education:

Rice University	Chemical Engineering	B.A.	1971
Rice University	Environmental Science and Engineering	M.S.	1974
Cornell University	Sanitary Engineering	Ph.D.	1976

Professional Registration:

Registered Professional Engineer, Texas No. 47095

Experience:

R.P. Gregory '32 Chair in Civil Engineering, Zachry Department of Civil Engineering, Texas A&M University, since 2011.
Arthur McFarland Professor, College of Engineering, Texas A&M University, 2007-2011
Professor, Water Management and Hydrological Science, since 2005
Director, Institute for Environmental Engineering, Texas Engineering Exper. Stn., 1992–1998.
Professor, Civil Engineering Department, Texas A&M University, since 1986
Associate Professor, Civil Engineering Department, Texas A&M Univ., 1981-1986
Assistant Professor, Civil Engineering Department, Texas A&M Univ., 1976-1981

Society Memberships:

American Chemical Society
American Society of Civil Engineers
American Water Works Association
Association of Environmental Engineering Professors
Water Environment Federation

Honors:

R.P. Gregory '32 Chair in Civil Engineering, Zachry Department of Civil Engineering, Texas A&M University, since 2011.
Arthur McFarland Professorship, College of Engineering, Texas A&M University, 2007-2011.
Truman R. Jones Excellence in Graduate Teaching Award, Zachry Department of Civil Engineering, Texas A&M University, 2007.
Charles H. Barclay Jr. '45 Fellow, College of Engineering, Texas A&M University, 2006-2007.
Klotz Associates Fellow, College of Engineering, Texas A&M University, 1997-1998.

E.D. Brockett Professor, College of Engineering, Texas A&M University, 1995-1996.
Environmental Science and Engineering Fellow, American Association for the Advancement of Science, 1989.
Halliburton Professor, College of Engineering, Texas A&M University, 1986-1987.
Select Young Research Fellow, Texas Engineering Experiment Station, 1985.
Harrison Prescott Eddy Medal, awarded by Water Pollution Control Federation for "Outstanding research contributing in an important degree to the existing knowledge of the fundamental principles of wastewater treatment," 1983
Association of Environmental Engineering Professors, Engineering Science Inc. Award for best thesis relevant to environmental engineering practice, 1977
Standard Oil of Indiana Fellow in Environmental Engineering, 1971-73

Research Interests:

Simulation, design and operation of chemical, physical and biological processes for treating water, wastewater and hazardous wastes and remediating contaminated media.
Cooling water chemistry, treatment and impacts.
Reductive treatment processes for chlorinated organics, arsenic, chromate and nitrate.
Water management in energy systems
Desalination
Water reuse and recycle
Solidification/stabilization of hazardous wastes

Funded Projects as Principal or Co-principal Investigator (last 5 years):
"Modeling Land Application of High Salinity Wastewaters", Texas Hazardous Waste Research Center, July 5, 2012, July 15, 2013; 25,000; with principal investigator Dr. Gretchen Miller.
"Disinfection Byproducts Removal from Water Using Advanced Reduction Processes", National Priorities Research Program, Qatar National Research Fund, January 15, 2012 to January 14, 2015; with co-investigators Dr. Ahmed Abdel Wahab, and Dr. Krishnapuram Karthikeyan; $1,021,537.
"Removal of Mercury from Wastewater Using Reactive Adsorbent/Membrane (RAM) Hybrid Filtration Process", National Priorities Research Program, Qatar National Research Fund, January 15, 2012 to January 14, 2015; with co-investigator Dr. Ahmed Abdel Wahab, and Dr. Patrick Linke; $830,289
"An Advanced Reduction Process Using Sulfite and Ultraviolet Light", Texas Hazardous Waste Research Center; September 1, 2010 to June 30, 2012; $24,000.
"Advanced Reduction Processes for Hazardous Waste Treatment", National Priorities Research Program, Qatar National Research Fund, $1,021,537, September 1, 2009 to September 30, 2012; with co-investigators Dr. Ahmed Abdel Wahab, Dr. Patrick Linke.
"Study of Residual Chlorine and Chlorinated By-Products in Sea Near Mesaieed Industrial Area", Qatar Fertiliser Company, February 2009 to February 2010, $880,000; with Dr. Ahmed Abdel Wahab, Dr. Mahmoud El-Halwagi, Dr. Patrick Linke.

Additional Activities:

University Contact, Gulf Coast Hazardous Substance Research Center
Member, Steering Committee, Texas Hazardous Waste Research Center
Member, Technical Coordination Council, Texas Air Research Center
Reviewer for *Water Research, Journal of Environmental Engineering, Waste Management, Journal of Hazardous Materials, Environmental Science and Technology*
Reviewer for Environmental Protection Agency, National Science Foundation, National Research Council

Patents

"Method for Remediating Contaminated Soils", U.S. Patent 5,789,649, August 4, 1998; B. Batchelor, A.M. Hapka, G.J. Igwe, R.H. Jensen, M.F. McDevitt, D. Schultz, J.M. Whang.
"Method for Remediating Contaminated Soils", U.S. Patent 6,492,572, December 10, 2002; B. Batchelor, A.M. Hapka, G.J. Igwe, R.H. Jensen, M.F. McDevitt, D. Schultz, J.M. Whang.

Publications and Presentations (last 5 years):
Refereed Journal Articles (* indicates student for whom Bill Batchelor was the major advisor or co-advisor):

Liu,* X., Yoon, S., Batchelor, B., Abdel-Wahab, A., "Degradation of vinyl chloride (VC) by the sulfite/UV Advanced Reduction Process (ARP): effects of process variables and a kinetic model", *Science of the Total Environment*, 454-455: 578-583, 2013.
Abdel-Wahab, A., Batchelor, B., "Evaluating alternative aluminium sources for chloride removal from recycled cooling water", *International Journal of Environmental Technology and Management*, 16: 234-243, 2013.
Vellanki,* B.P., Batchelor, B., Abdel-Wahab, A., "Advanced Reduction Processes: A new class of treatment processes", *Environmental Engineering Science*, 30(6): 2013.
Liu,* X., Yoon, S., Batchelor, B., Abdel-Wahab, A., "Photochemical Degradation of Vinyl Chloride with an Advanced Reduction Process (ARP) - Effects of Reagents and pH", *Chemical Engineering Journal*, 215-216: 868-875, 2013.
Han, D.S., Song,* J.K., Batchelor, B., Abdel-Wahab, A., "Removal of arsenite (As(III)) and arsenate (As(V)) by synthetic pyrite (FeS2): Synthesis, effect of contact time, and sorption/desorption envelopes", *Journal of Colloid and Interface Science*, 392: 311-318, 2013.
Han,* D.S., Batchelor, B., Abdel-Wahab, A., "As(V) adsorption onto nanoporous titania adsorbents (NTAs): Effects of solution composition"', *Journal of Hazardous Materials*, 229-230: 273-281, 2012.
Do,* S., Batchelor, B., "Reductive dechlorination of chlorinated hydrocarbons as non-aqueous phase liquid (NAPL): Preliminary investigation on effects of cement doses", *Science of the Total Environment*, 430: 82-87, 2012.
Park,* S.H., Batchelor, B., Lee,* C., Han,* D.S., Abdel-Wahab, A., "Degradation of perchlorate in water using aqueous multi-valent titanium: Effect of titanium type, ionic strength, and metal and solid catalysts", *Journal of Colloid and Interface Science*, 380: 128-133, 2012.
Park,* S.H, Batchelor, B., Lee,* C., Han,* D.S., Abdel-Wahab, A., "Perchlorate degradation using aqueous titanium ions produced by oxidative dissolution of zero-valent titanium", *Chemical Engineering Journal*, 192:301-307, 2012.

Lee,* C., Batchelor, B., Park,* S.H., Han,* D.S., Abdel-Wahab, A., Kramer, T.A., "Reduction of perchlorate using zero-valent titanium (ZVT) anode: reaction mechanism", *Advances in Environmental Research*, 1(1):37-55, 2012.

Han,* D.S., Batchelor, B., and A. Abdel-Wahab. XPS analysis of sorption of selenium(IV) and selenium(VI) to Mackinawite (FeS). *Environmental Progress & Sustainable Energy*, accepted and published online, (doi: 10.1002/ep.10609), 2011.

Atilhan, S., Bin Mahfouz, A., Batchelor, B., Linke, P., Abdel-Wahab, A., Nápoles-Rivera, F., Jiménez-Gutiérrez, A., El-Halwagi, M.M., "A Systems-Integration Approach to the Optimal Design and Operation of Macroscopic Water Desalination and Distribution Networks: A General Framework Applied to Qatar's Water Resources", *Journal of Clean Technologies and Environmental Policy*, 14: 161-171, 2012.

Park,* S.H, Batchelor, B., Lee,* C., Han,* D.S., Abdel-Wahab,* A., "Perchlorate degradation using a titanium and membrane hybrid (TMH) system: Transport, adsorption, chemical reduction", *Journal of Membrane Science*, 390-391: 84-92, 2012.

Bin Mahfouz, A., Atilhan, S., Batchelor, B., Linke, P., Abdel-Wahab,* A. and El-Halwagi, M.M., "A systems integration approach to the optimum operation and scheduling of biocide usage and discharge for seawater cooling systems", *International Journal of Process Systems Engineering*, 2(1): 1–35, 2012.

Han,* D.S., Batchelor, B., Abdel-Wahab, A., "Sorption of selenium(IV) and selenium(VI) onto synthetic pyrite (FeS_2): Spectroscopic and microscopic analyses", *Journal of Colloid and Interface Science*", 368: 496-504, 2012.

Abdel-Wahab,* A., Batchelor B., "Simulation Model for Multicomponent Removals from Recycled Cooling Water", *Journal of Environmental Engineering*, 137(12):1199-1204, 2011.

Bin Mahfouz, A., Atilhan, S., Batchelor, B., Linke, P., Abdel-Wahab, A., El-Halwagi, M.M., "Optimal Scheduling of Biocide Dosing for Seawater-Cooled Power and Desalination Plants", *Journal of Clean Technologies and Environmental Policy*, 13:783-796, 2011.

Lee,* C., Batchelor, B., Park,* S.H., Han,* D.S., Abdel-Wahab, A., Kramer, T.A., "Perchlorate Reduction During Electrochemically Induced Pitting Corrosion of Zero-Valent Titanium (ZVT)", *Journal of Hazardous Materials*, 197:183-189, 2011.

Han,* D.S., Batchelor, B., Abdel-Wahab, A., "Sorption of Selenium(IV) and Selenium(VI) to Mackinawite (FeS) :Effect of Contact Time, Extent of Removal, Sorption Envelopes", *Journal of Hazardous Materials*, 186: 451-457, 2011.

Ko,* S., Batchelor, B., "Effect of Cement Type on Performance of Fe(II)-based Degradative Solidification and Stabilization", *Environmental Engineering Science*, 27(11): 977-987, 2010.

Han,* D.S., Abdel-Wahab, A., Batchelor, B., "Surface complexation modeling of arsenic(III) and arsenic(V) adsorption onto nanoporous titania adsorbents (NTAs)", *Journal of Colloid and Interface Science*, 348: 591- 599, 2010.

Jung,* B., Batchelor, B., "Kinetics of transformation of 1,1,1-trichloroethane by Fe(II) in cement slurries", *Journal of Hazardous Materials*, 163: 1315-1321, 2009.

Kim,* E.J., B., Batchelor, B., "X-ray photoelectron spectroscopic investigation of interactions of arsenic with microwave synthesized pyrite as a function of pH", *Environmental Engineering Science*, 26(12): 1785-1793, 2009.

Lee, H., Do,* S., Batchelor, B., Jo, Y., Kong, S., "PCE DNAPL Degradation using ferrous iron solid mixture (ISM)", *Chemosphere*, 76(8): 1082-1087, 2009.

Kim,* E.J., B., Batchelor, B., "Macroscopic and X-ray Photoelectron Spectroscopic Investigation of Interactions of Arsenic with Synthesized Pyrite", *Environmental Science and Technology*, 43(8): 2899-2904, 2009.

Do, S.-H., Batchelor, B., Lee, H.-K., Kong, S.-H., "Hydrogen Peroxide Decomposition on Manganese Oxide (pyrolusite): Kinetics, Intermediates, and Mechanism", *Chemosphere*, 75(1): 8-12, 2009.

Kim,* E.J., Batchelor, B., "Synthesis and Characterization of Pyrite (FeS2) using Microwave Irradiation", *Materials Research Bulletin*, 44: 1553-1558, 2009.

Jung,* B., Batchelor, B., "Dechlorination of Trichloroethylene formed from 1,1,2,2-Tetrachloroethane by Dehydrochlorination in Portland Cement Slurry including Fe(II)", *Chemosphere*, 71(4): 726-734, 2008.

Jung,* B., Batchelor, B., "Analysis of Dechlorination Kinetics of Chlorinated Aliphatic Hydrocarbons by Fe(II) in Cement Slurries", *Journal of Hazardous Materials*, 152(1): 62-70, 2008.

Choi,* J., Batchelor, B., "Nitrate reduction by fluoride green rust modified with copper", *Chemosphere*, 70(6): 1108 – 1116, 2008.

Song, H., Carraway, E.R., Kim, Y.H., Batchelor, B., Jeon, B.H., Kim, J.G., "Amendment of hydroxyapatite in reduction of tetrachloroethylene by zero-valent zinc: Its rate enhancing effect and removal of Zn(II)", *Chemosphere*, 73(9):1420 – 1427, 2008.

Book Chapters:

Han*, D.S., Kim*, E.J., Batchelor, B., Abdel-Wahab*, A., "Sorption of Mercury to Synthesized Pyrite (FeS_2) and Stabilization via Surface Reaction", in *Pyrite*, N. Whitley, P.T. Vinsen (eds.), Nova Science Publishers, 2013.

Son*, S., Batchelor, B. "Reductive Dechlorination Using Modified Green Rusts In Degradative Solidification/Stabilization", in Proceedings of the Third International Conference on Remediation of Chlorinated and Recalcitrant Compounds, A.R. Gavaskar, A.S.C. Chen (eds), Monterey, California, Battelle Press, ISBN:1-57477-132-9, pp 2046-2051, 2002.

Hwang*, I., Batchelor, B., "Degradative Solidification/Stabilization Technology for Chlorinated Hydrocarbons", *Physical and Thermal Technologies: Remediation of Chlorinated and Recalcitrant Compounds*, G.B. Wickramanayake and A.R. Gavaskar (eds.), Batelle Press, Columbus, Ohio, 2000.

Cook*, E.R., Batchelor, B., "Stabilization/Solidification of Hazardous Wastes in Soil Matrices", Chapter 4, Advances in Porous Media, Volume 3, M. Y. Corapcioglu (Ed), Elsevier Science B.V., Amsterdam, The Netherlands, 1996.

Trussell*, S., Batchelor, B., "Chemical Characterization of Pore Water of a Solidified Hazardous Waste", in *Stabilization/Solidification of Hazardous, Radioactive and Mixed Wastes: 3rd Volume*, ASTM STP 1240, T.M. Gilliam and C.C. Wiles (eds.), ASTM, West Conshohocken, Pennsylvania, pp 94-115, 1996.

Batchelor, B., and Wu*, K., "Effects of Equilibrium Chemistry on Leaching of Contaminants from Stabilized/Solidified Wastes", in *Chemistry and Microstructure of Solidified Waste Forms*, R.D. Spence (ed), Lewis Publishers, Boca Raton, Florida, 1992.

Batchelor, B. and Lawrence, A.W., "Stoichiometry of autotrophic denitrification using elemental sulfur," in Chemistry of Wastewater Technology, A.J. Rubin, ed., Ann Arbor Science Publishers, Inc., Ann Arbor, Michigan, 1978.

Technical Reports:

Bond, R., Klayman, B., Spencer, C., Veerapaneni, V., Davis, T., Batchelor, B., "Zero Liquid Discharge Desalination", Water Research Foundation, Denver, CO, 2011.

Batchelor, B., Han, D.S., Kim, E.J., "Final Report: Novel Adsorbent-Reactants for Treatment of Ash and Scrubber Pond Effluents", National Energy Technology Laboratory, Pittsburgh, PA, 2010.

Lee, C., Kramer, T., Batchelor, B., "Final Report: Perchlorate Ion (C1O4) Reduction Using an Electrochemically Induced Catalytic Reaction on Activated Carbon", Final Report, Texas Hazardous Waste Research Center, Lamar University, Beaumont, Texas, November, 2008.

Batchelor, B., Do, S.H., "Final Report: DNAPL Source Control By Reductive Dechlorination With Iron-Based Degradative Solidification/Stabilization", Texas Hazardous Waste Research Center, Lamar University, Beaumont, Texas, April 2008.

Other Publications:

Bond, R., Batchelor, B., Davis, T., "Zero Liquid Discharge Desalination of Brackish Water with Electrodialysis Metathesis", *Florida Water Resources Journal*, 63(7): 36-44, 2011.

Mahfouz, A.B., El-Halwagi, M.M., Batchelor, B., Atilhan, S., "Process Integration And System Analysis For Seawater Cooling In Industrial Facilities", Proceedings of the International Conference on Foundations of Computer-Aided Process Design, accepted 2009.

Abdel-Wahab, A., Linke, P., Alfadala, H., El-Halwagi, M., Batchelor, B., "Towards a Holistic Approach to the Sustainable Use of Seawater for Process Cooling", Proceedings of the 1st Annual Gas Processing Symposium, H. Alfadala, G.V. Rex Reklaitis and M.M. El-Hawagi (Editors), Elsevier Press, January, 2009.

FULLER WARREN BAZER
DEPARTMENT OF ANIMAL SCIENCE, TEXAS A&M UNIVERSITY.
2471 TAMU, COLLEGE STATION, TX 77843-2471

Tel.: (979) 862-2659; Fax: (979) 862-3399
fbazer@cvm.tamu.edu; http://animalscience.tamu.edu/facultystaff/faculty/dr-fuller-bazer/

Research Interests

- Reproductive biology with emphasis on uterine biology and pregnancy.
- Mechanisms of action of pregnancy recognition signals from the conceptus to the maternal uterus, including interferon tau and estrogen from ruminant and pig conceptuses, respectively, are studied at the molecular and cellular levels.
- Roles of uterine secretions as transport proteins, regulatory molecules, growth factors and enzymes and endocrine regulation of their secretion.
- The endocrinology of pregnancy, especially the roles of lactogenic and growth hormones in fetal-placental development and uterine functions.
- Mechanism(s) of action and potential therapeutic value of conceptus interferons and uterine-derived hematopoietic growth factors with both pigs and sheep as models for human disease.

Education

Ph.D. Animal Science (Reproductive Biology), 1969
North Carolina State University, Raleigh, NC
Dissertation: 'An Explanation for Increased Rates of Embryo Death in Gilts Subjected to High Energy Intake and Embryo Superinduction'
Advisors: Professors Lester C. Ulberg and Albert J. Clawson.

M.S., Animal Science, 1963
Louisiana State University, Baton Rouge, LA
Thesis: 'An *in vitro* radioisotope procedure for estimating thyroid status in sheep.
Advisors: Dr. John C. Glen and Professor Samuel L. Hansard.

B.S., Biology, 1960

Centenary College of Louisiana, Shreveport, LA

Research Experience

Regents Fellow, Distinguished Professor and O.D. Butler Chair, Department of Animal Science, Texas A&M University, 1992 to present

Director, Center for Animal Biotechnology and Genomics, 1992-2001

Interim Head, Department of Veterinary Pathobiology, 2008-2009.

Associate Vice President for Research, Texas A&M University, January 1, 2005 to December 31, 2008

Associate Vice Chancellor and Executive Associate Dean, College of Agriculture and Life Sciences, and Associate Director Texas Agricultural Experiment Station, 2001- 2004

Director, Institute of Biosciences and Technology, Texas A&M Health Science Center, Texas Medical Center, Houston, 1994- 2001

Vice President for Research and Interim Dean of the Graduate School of Biomedical Sciences, The Texas A&M University System Health Science Center, 1999-2000

University of Florida (1968-1992), Assistant Professor, Associate Professor, Professor and Graduate Research Professor

Teaching Experience

Department of Animal Science, Texas A&M University

ANSC 630: Physiology of Reproduction I	1992-2013
ANSC 631: Physiology of Reproduction	1992-2013

Graduate Student Advising and Co-Advising at Texas A&M University

PhD Degrees

- Thomas H. Spencer - Dissertation entitled "Mechanisms Regulating Steroid Hormone Receptor Gene Expression in the Ovine Uterus: Effects of Trophoblast Interferon Tau". He graduated in 1995 with the Ph.D. in Physiology of Reproduction.
- Jeffrey A. Bowen (Co-Chair with Robert C. Burghardt, Department of Veterinary Anatomy and Public Health) - Dissertation titled "Development and Characterization of an In Vitro Model System of Porcine Uterine Epithelial Cells." He graduated December 1996 with Ph.D. in Veterinary Anatomy and Public Health.
- Tammie K. Francis - Dissertation titled "Maternal Recognition of Pregnancy in the Ewe: The Structure/Function Relationship Of Ovine Interferon Tau." She graduated from the University of Florida, December 1997.
- Shyh-Hwa Liu - Dissertatioin titled "Expression of Keratinocyte Growth Factor and its Receptor in the Uterus and Their Regulation During the Estrous Cycle and Pregnancy in Pigs." He graduated from Texas A&M University, December 1997.
- Hun-Taek Kim (Co-Chair with Dr. Gheorghe Stoica, Veterinary Pathobiology), Dissertation titled Interferon-tau-Induced Acute Hepatopathy in Sheep: Biochemical and Molecular Characterization of Apoptosis in Hepatocytes. December 1999.

- Hak-Hyun Ka - Dissertation titled "Identification and characterization of keratinocyte growth factor in the porcine uterus." He graduated in May 2001.
- Yong-sok Choi [with Dr. T.E. Spencer] - Dissertation titled "Interferon regulatory factors in the ovine uterus." He graduated in August 2002.
- Allison Gray [with Dr. T.E. Spencer] – Dissertation titled "Identification of endometrial genes important for conceptus survival and development in sheep. She graduated in May 2005.
- Karen Carpenter, Graduated August 2005; Dissertation entitled "The Roles of Estradiol-17β and Prolactin in Uterine Gland Development in the Neonatal Ewe".
- Kathrin Dunlap [with Dr. T.E. Spencer] – Dissertation titled "Role of endogenous retroviruses in ovine uterine biology." She graduated in August 2006
- Gwon Hwa Song [with Dr. T.E. Spencer] - Program in progress Dissertation titled Identification and characterization of STAT1-independent interferon tau-stimulated genes in the ovine uterus. He graduated in May 2007
- Cary Satterfield - [with Dr. T.E. Spencer]-Progesterone regulation of endometrial factors supporting conceptus growth and development in the ovine uterus. He graduated in May 2008.
- Jennifer Farmer –[with Dr. T.E. Spencer] Biological Functions Of Galectin 15 (LGAL15) In The Ovine Uterus." She graduated in December 2008.
- Arantzazu Lassala – [with Dr. Spencer] – Arginine and fetal growth in ovine models of intrauterine growth restriction. She graduated in December 2008.
- Jin Young Kim – [with Dr. Spencer] – Select nutrients, secreted phosphoprotein 1 and insulin-like growth factor 2: effects on trophectoderm of ovine conceptuses. She graduated in May 2010.
- Shaye Lewis – [with Dr. T.E. Spencer] Transcriptional regulation of galectin 15 (*lgals15*): an Implantation-related galectin uniquely expressed in the uteri of sheep and goats. He graduated in August 2009.
- Haijun Gao – [with Dr. G. Wu] Nutrient signaling, mammalian target of rapamycin and ovine conceptus development. He graduated in May 2009.
- Xilong Li – [with Dr. Guoyao Wu] – Regulation of porcine conceptus survival and growth by l-arginine. He graduated in December 2011
- Xiaqiu Wang – [with Dr. Guoyao Wu] – program in progress
- Wei Ying – [with Dr. Beiyan Zhou] – program in progress
- Xu Jing – [with Dr. Guoyao Wu] – program in progress

Master of Science Degrees

- Makiko Suzuki - Thesis entitled "Molecular Cloning of the Complementary DNA and Expression of the Endometrium Oxytocin Receptor During Early Pregnancy in Ewes". She graduated in 1994 with the M.S. in Physiology of Reproduction.
- Chen Chen - Thesis titled "Expression of paracrine growth factors and their receptors in the ovine uterus". He graduated in August 2000.
- Allison Gray [Co-chair with Dr. Thomas E. Spencer] - Thesis titled "The uterine gland knock-out ewe: A model to study the role of endometrial glands in uterine function". She graduated in May 2000
- Kristin Taylor, [Co-chair with Dr. Thomas E. Spencer] - Thesis titled Neonatal ovine uterine morphogenesis: Mechanisms regulating the development of endometrial glands. She graduated in

December 2000

- David Stewart [with Dr. Thomas E. Spencer], Thesis titled "Effects of interferon-tau on activation of the JAK/STAT signal transduction pathway and regulation of ovine endometrial gene expression". He graduated in August 2001.
- Jane Garlow - [with Dr. Robert C. Burghardt]- Thesis titled "Integrin and extracellular matrix interactions at the maternal-conceptus interface in pigs". She graduated in May 2002.
- Hyo-Won Ahn – [with Dr. T.E. Spencer] –Progesterone and interferon tau regulated genes in the endometrium of the ovine uterus and expression of interferon stimulated genes in the corpus luteum during early pregnancy in sheep. She graduated in May 2008
- Rebecca Simmons – [with Dr. T.E. Spencer] – Insulin-like growth factor binding proteins-1 and -3, and hydroxysteroid dehydrogenase 11b1: potential roles in ruminant conceptus development and endometrial function. She graduated in December 2009
- Megan Minten – [with Dr. T.E. Spencer] – Progesterone regulation of endometrial gene expression in the early pregnant ovine uterus. She graduated in August 2011

Undergraduate Student Supervision

- Lindsay Ramey, undergraduate research assistant, Texas A&M, 2013

Honors and Awards

- American Society of Animal Science Physiology and Endocrinology Award (1980)
- University of Florida Gamma Sigma Delta Research and Teaching Awards (1976 and 1982)
- University of Florida Sigma Xi Research Award (1976)
- University of Florida Alpha Zeta "Professor of the Year" (1977-1978)
- Florida Blue Key Distinguished Faculty Award (1985)
- Fellow, American Association for the Advancement of Science (1988-present)
- Goding Lecturer, Australian Society for Reproductive Biology and Fertility Society of Australia (1988)
- Society for the Study of Reproduction Research Award (1990)
- Sir John Hammond Lecturer, Society for the Study of Fertility and Societe Francaise pour le Etude de la Fertilite (1991)
- Biotechnology 94 Award (1994)
- American Society of Animal Science L.E. Casida Award for Graduate Education (1995)
- Gamma Sigma Delta International Distinguished Achievement Award in Agriculture (1996)
- Texas A&M University System Regents Fellow (1998)
- Society for the Study of Reproduction Distinguished Service Award (2000)
- Texas A&M University and the Association of Former Students Distinguished Achievement Award in Research (2000)
- Alexander von Humboldt Research Award in Agriculture (2000)
- Vice Chancellor for Agriculture Award in Excellence for Research (2000)
- C.E. Byrd High School Hall of Fame, Shreveport, Louisiana (2002)
- Wolf Prize in Agriculture (2003)
- Honorary Member, American College of Theriogenologists (2003)

- Doctor of Science, *honoris causa*, University of Guelph (2004)
- Society for the Study of Reproduction Carl Hartman Award (2004)
- Texas A&M University Distinguished Professor (2004)
- Vice Chancellor for Agriculture Award for Team Research in Uterine Biology and Pregnancy (2006)
- Society for Research and Fertility Distinguished Research Award (2007)
- E. T. York Lecturer, University of Florida (2007)
- Society for the Study of Reproduction Trainee Mentoring Award (2009)
- Doctor of Science, *honoris causa*, University of Florida (2009)
- Pioneer Award, International Society for Ruminant Reproduction (2010)
- Distinguished Alumnus Award, North Carolina State University (2010)
- Vice Chancellor's Award for Excellence in Diversity (2011).

Membership and Service

- **Editorial Boards:** *Biology of Reproduction* (1983-1986; 1999-2003), *Journal of Animal Science* (1974-1977;1980-1983;2002-2005), *Domestic Animal Endocrinology* (1983-1986; 2010-), *Theriogenology* (1980-1990); *Endocrine (*1993-2010); *Journal of Reproductive Immunology* (1993-2008); Endocrinology (2001-2005), *Reproduction in Domestic Animals* (2002- present), and *American Journal of Reproductive Immunology* (2003-present)
- Editor in Chief, Biology of Reproduction (1989-1995)
- Deputy Editor, *Reproductive Biology and Endocrinology* (2002 - 2005),
- Associate Editor, Biology of Reproduction (2004-2009)
- Director, Society for the Study of Reproduction (1984-1987)
- Ad Hoc Member of National Institutes of Health Reproductive Biology Study Section (1978-present)
- Member of U.S.D.A. Competitive Grants Program in Animal Science (1985; 1999)
- Member of International Advisory Panel for *Journal of Reproduction, Fertility and Development* (1988-1993)
- Member of Editorial Board of *Oxford Reviews in Reproductive Biology* (1990-1995)
- Member of National Advisory Committee for Kansas Mental Retardation Research Center, University of Kansas (1989-1995)
- Member, Executive Committee, Center for Diabetes, University of Florida (1990-1993); Member, Medical Advisory Committee for Stop! Children's Cancer, Gainesville, FL (1990-1994)
- Member National Food Animal Integrated Research '95 Program Committee (1993-1995)
- President-Elect (1995-1996), President (1996-1997), and Past-President (1997-1998), Society for the Study of Reproduction
- Consultant, Louisiana State University Board of Regents, Gordon Cain Endowed Chair (1999-2001)
- Member, External Advisory Committee, University of Maryland Center for Studies in Reproduction Research Forum (1999-2009)
- Member, Southwest Bio Steering Committee (2000)

- Member, Israel-U.S.A. Binational Agricultural Research and Development Program Technical Advisory Committee for Competitive Grants (1997-2003)
- Member, External Advisory Board, The Kansas Biomedical Research Infrastructure Network (2001- present)
- Member, International Scientific Committee, European Placenta Group (2002-2003)
- Member, National Academy of Sciences Committee on Identifying and Assessing Unintended Effects of Genetically Engineered Foods on Human Health (2002-2003)
- Member, U.S.D.A. Interagency Working Group on Animal Genomics (2002)
- Member, Federation of Animal Science Societies Scientific Advisory Committee on Biotechnology (2003-2006)
- Member, Texas Department of Agriculture-Texas Israel Exchange/Binational Agricultural Research and Development Program Joint Advisory Committee (2004-2006)
- Board of Directors, Texas Society for Biomedical Research (2005-2009)
- Member, USDA-NIH Research Committee (2005-)
- Chair, External Advisory Committee, Reproductive Biology Research Cluster, University College Dublin, Dublin,Ireland (2005-present)
- Associate, NIH Council of Public Representatives (2006-present)
- Member, USDA Advisory Committee on Biotechnology and 21st Century Agriculture (2007-2009)
- Texas A&M University Biotechnology Program Advisory Council (2007-2008)
- USDA Cooperative States Research, Education and Extension Service Panel (2009-)
- Member, Faculty of World Class University Program in Biomodulation, Seoul National University (2009-2013)
- Chair, Scientific Advisory Board, Texas Enterosorbents, Inc. (2008 – 2009)
- Member, Scientific Advisory Board of TauMedix (2010 -2013)
- Member, Scientific Advisory Board of Pregmama (2010-present)
- Associate Editor, Journal of Animal Science and Biotechnology (2009 – present)
- Associate Editor, Molecular Human Reproduction (2012-present).
- Member, External Advisory Board, The Kansas Biomedical Research Infrastructure Network (2001-)
- Member, International Scientific Advisory Committee, European Placenta Group (2002-2003);
- Deputy Editor, *Reproductive Biology and Endocrinology* (2002 – 2004)

Awarded Research Grants (last 5 years)

- USDA-CSREES NRI CGP 2006-00863: Nutrient Sensing Via mTOR Cell Signaling for Conceptus Development and Survival; PI: Fuller W. Bazer; Co-I: Drs. G. Wu and G. Johnson; 09/01/06-08/31/2010; $349,129
- NIH/ZRG1 IMM-A, 1R25 GM075300-01A1Bridges to the Doctorate in Reproductive Biology; PI: Fuller W. Bazer; Co-PI: Drs. Gary Newton, Prairie View A&M University, and Jamie Laurenz, Texas A&M University at Kingsville. 09/01/06-08/31/09; $620,491
- USDA-CSREES NRI CGP 2008-00547; "Arginine nutrition, placental angiogenesis, and fetal growth in pigs. Principal Investigator: Guoyao Wu; Co-I: Drs. F.W. Bazer and G.A. Johnson. 9/1/08-8/31/11; $300,000

- USDA CSREES AFRI 2009-01722; Physiological Roles of Prostaglandins and Interferon Tau in Conceptus Development and Endometrial Function. Principal Investigator: Thomas E. Spencer; Co-I: Fuller W. Bazer & Robert C. Burghardt; 09/01/2009-08/31/2012; $340,000 total.
- USDA CSREES AFRI 2010-03220; Arginine and Secreted Phosphoprotein 1 Mediat4e mTOR Cell Signaling for Conceptus Development and Survival. PI: Fuller W. Bazer; Co-I: Drs. Guoyao Wu and Greg A. Johnson; 12/01/10 – 11/30/14; $500,000 total cost.

Synergistic Activities

- Served as Director, Center for Animal Biotechnology and Genomics, 1992-2001
- Established Interdisciplinary Faculties of Reproductive Biology and associated Reproductive Biology Forum at both the University of Florida and Texas A&M University
- Co-founder of Texas Forum on Reproductive Sciences that meets each April since 1994 in the Texas Medical Center

Refereed Publications (*last 5 years, total citation of over 900 and h-index of 17*)

2013

1. Lim W, Jeong W, Kim J, Yoshimura Y, Bazer FW, Han JY, Song G. Expression and regulation of beta-defensin 11 in the oviduct in response to estrogen and in ovarian tumors of chickens. Mol Cell Endocrinol 2013: Mol Cell Endocrinol 366:1-8.
2. Bazer FW. Contributions of an animal scientist to understanding the biology of the uterus and pregnancy. Reprod Fertil Devel 2013; 25:1–19.
3. Ying W, Cheruku PS, Bazer FW, Safe SH, Zhou B. Investigation of macrophage polarization using bone marrow derived macrophages. J Visualized Exp 2013; (In Press).
4. Lee JY, Jeong W, Kim JH, Kim J, Bazer FW, Han JY, Song G. Distinct expression pattern and post-transcriptional regulation of cell cycle genes in the glandular epithelia of avian ovarian carcinomas. PlusOne 2013; (In Press).
5. Dai Z, Wu Z, Yang Y, Wang J, Satterfield MC, Meininger CJ, Bazer FW, Wu G. Nitric oxide and energy metabolism in mammals. 2013 Biofactors Biofactors. 2013 Mar 29 [Epub ahead of print]
6. Mullen MP, Bazer FW, Wu G, Parr MH, Evans ACO, Crow MA, Diskin MG. Effects of systemic progesterone during the early luteal phase on the availabilities of amino acids and glucose in the bovine uterine lumen. Reprod Fertil Develop published online 4 February 2013
7. Hoffmann AR, Dorniak P, Filant J, Dunlap KA, Bazer FW, de la Concha-Bermejillo A, Welsh CJ, Varner P, Edwards JF. Ovine fetal immune response to cache valley virus infection. J Virol 2012; (Accepted)
8. Kim J, Song G, Wu G, Gao H, Johnson GA, Bazer FW. Arginine, leucine, and glutamine stimulate proliferation of porcine trophectoderm cells through the MTOR-RPS6K-RPS6-EIF4EBP1 signal transduction pathway. Biol Reprod 2013 Mar 13. (Epub ahead of print)
9. Antoniazzi AQ, Webb BT, Romero JJ, Ashley RL, Smirnova NP, Henkes LE, Bott RC, Oliveira JF, Niswender GD, Bazer FW, Hansen TR. Endocrine delivery of interferon tau protects the corpus 1 luteum from prostaglandin F2-alpha-induced luteolysis in ewes. Biol Reprod 2013: (In Press)
10. Lee JY, Jeong W, Lim W, Lim CH, Bae SM, Kim J, Bazer FW, Han JY, Song G. Hypomethylatin and post-transcriptional regulation of dna methylatransferases in the ovarian carcinomas of the laying hen. 2013 PLoS ONE 8(4): e61658.
11. Ying W, Bazer FW, Zhou B. Uteroferrin enhances fetal erythropoiesis at terminal stages. PlosOne (submitted)

12. Tekwe CD, Lei J, Yao K, Rezaei R, Li X, Carroll RJ, Meininger CJ, Bazer FW, Wu G. Oral administration of interferon-τ enhances oxidation of energy substrates and reduces adiposity in Zucker diabetic fatty rats. Biofactors (In Press)
13. Dorniak P, Bazer FW, Spencer TE. PHYSIOLOGY AND ENDOCRINOLOGY SYMPOSIUM: Biological role of interferon tau in endometrial function and conceptus elongation. J Anim Sci. 2013; 91:1627-1638.
14. Lim CH, Jeong W, Lim W, Lee JY, Bae SM, Kim J, Bazer FW, Han JY, Song G. Avian WNT4 in the female reproductive tracts: Potential role of oviduct development and ovarian carcinogenesis. PlosOne (accepted).
15. Forde N, Mehta JP, McGettigan PA, Mamo S, Bazer FW, Spencer TE, Lonergan P. Alterations in expression of endometrial genes coding for proteins secreted into the uterine lumen during conceptus elongation in cattle. Journal: BMC Genomics (accepted)

2012
1. Lim W, Ahn SE, Jeong W, Kim JH, Kim J, Lim CH, Bazer FW, Han JY, Song G. Tissue Specific Expression and Estrogen Regulation of SERPINB3 in the Chicken Oviduct. Gen Comp Endocrinol 2012; 175:65-73.
2. Ahn SE, Jeong W, Kim JH, Lim W, Kim J, Bazer FW, Han JY, Song G. ERBB receptor feedback inhibitor 1: Identification and regulation by estrogen in chickens.
Gen Comp Endocrinol. 2012; 175:194-205.
3. Bazer FW, Song G, Thatcher WW. Roles of conceptus secretory proteins in establishment and maintenance of pregnancy in ruminants. Asian-Aust J Anim Sci 2012;25:1-16.
4. Bazer FW, Song G, Kim J, Erikson DW, Johnson GA, Burghardt RC, Gao H, Satterfield MC, Spencer TE, Wu G. Mechanistic mammalian target of rapamycin (MTOR) cell signaling: Effects of select nutrients and secreted phosphoprotein 1 on development of mammalian conceptuses. Mol Cellular Endocrinol 2012; 354:22–33.
5. Wang J, Wu Z, Li D, Li N, Dindot S, Satterfield MC, Bazer FW, Wu G. Nutrition, Epigenetics, and metabolic syndrome. Antioxidants Redox Signaling 2012; 17:282-301.
6. Kim M, Seo H, Choi Y, Shim J, Bazer FW, Ka H. Swine leukocyte antigen-DQ expression and its regulation by interferon-gamma at the maternal-fetal interface in pigs. Biol Reprod 2012;86: 1-11.
7. Lim W, Kim JH, Ahn SE, Jeong W, Kim J, Bazer FW, Han JY, Song G. Avian SERPINB11 gene: A marker for ovarian endometrioid cancer in chickens. Exp Biol Med (Maywood) 2012; 237:150-159.
8. Dorniak P, Welsh TH, Bazer FW, Spencer TE. Endometrial HSD11B1 and Cortisol Regeneration in the Ovine Uterus: Effects of pregnancy, interferon tau and prostaglandins. Biol Reprod 2012; 86:1-10
9. Padua MB, Lynch VJ, Alvarez NV, Garthwaite MA, Golos TG, Bazer FW, Kalkunte S, Sharma A, Wagner GP, Hansen PJ. ACP5 (Uteroferrin): Phylogeny of an ancient and conserved gene expressed in the endometrium of mammals. Biol Reprod. 2012; 86:1–8.
10. Lee JY, Jeong W, Lim W, Kim J, Bazer FW, Han JY, Song G. Chicken pleiotrophin gene: identification and regulation of tissue specific expression by estrogen in the oviduct and distinct expression pattern in the glandular epithelia of ovarian carcinomas. PLoS ONE 7(4): e34215.
11. Bazer FW, Spencer TE, Thatcher WW. Growth and development of the ovine conceptus. J Anim Sci 2012; 90:159-170.
12. Bazer FW, Kim J, Ka H, Johnson GA, Wu G, Song G. Select nutrients in the uterine lumen of sheep and pigs affect conceptus development. J Reprod Develop 2012; 58:180-188.
13. Dorniak P, Bazer FW, Wu G, Spencer TE. Prostaglandins and interferon tau regulate endometrial function in sheep. Biol Reprod. 2012; 87(1):9
14. Kong X, Tan B, Yin Y, Gao H, Li X, Jaeger LA, Bazer FW, Wu G. L-Arginine stimulates the mTOR signaling pathway and protein synthesis in porcine trophectoderm cells. J Nutr Biochem. 2012; 23:1178-1183.
15. Satterfield MC, Dunlap KA, Keisler DH, Bazer FW, Wu G. Arginine nutrition and fetal brown adipose tissue development in nutrient-restricted sheep. Amino Acids 2012 43:1593-603.

16. Jeong W, Lim W, Kim J, Ahn SE, Lee HC, Jeong JW, Han JY, Song G, Bazer FW. Cell-specific and temporal aspects of gene expression in the chicken oviduct at different stages of the laying cycle. Biol Reprod. 2012; 86(6):172.
17. Kim J, Song G, Wu G, Bazer FW. Functional roles of fructose. Proc Nat Acad Sci USA 2012; 109:E1619-1628.
18. Jeong W, Kim HS, Kim YB, Kim MA, Lim W, Kim J, Jang HJ, Suh DH, Kim K, Chung HH, Bazer FW, Song YS, Han JY, Song G. Paradoxical Expression of AHCYL1 Affecting Ovarian Carcinogenesis between Chickens and Women. J Exp Biol Med 2012; 237:758-767.
19. Lim W, Jeong W, Kim JH, Shin J, Kim J, Bazer FW, Han JY, Song G. Differential expression of secreted phosphoprotein 1 in response to estradiol-17beta and in ovarian tumors in chickens. Biochem Biophys Res Commun 2012:422:494-500.
20. Bazer FW, Song G, Kim J, Dunlap KA, Satterfield MC, Johnson GA, Burghardt RC, Wu G. Uterine biology in pigs and sheep. J Anim Sci Biotechnol. 2012; 16;3(1):23.
21. Dorniak P, Welsh TH Jr, Bazer FW, Spencer TE. Cortisol regulation of endometrial function in the ovine uterus. 2012; Biol Reprod 86(4):124.
22. Wu Z, Satterfield MC, Bazer FW, Wu G. Regulation of brown adipose tissue development and white fat reduction by L-arginine. Curr Opin Clin Nutr Metab Care 2012, 15:529–538.
23. Bazer FW, Kim J, Song G, Ka H, Tekwe CD, Wu G. Select nutrients, progesterone, and interferon tau affect conceptus metabolism and development**.** Ann NY Acad Sci, 2012; 1271:88–96.
24. Dorniak P, Bazer FW, Spencer TE. Biological role of interferon tau in endometrial function and conceptus elongation. J Anim Sci. 2012; Oct 24. [Epub ahead of print]
25. Bazer FW, Song G, Kim J, Dunlap KA, Satterfield MC, Johnson GA, Burghardt RC, Wu G. Uterine biology in pigs and sheep. J Anim Sci Biotechnol. 2012; 16;3(1):23.
26. Lim CH, Jeong W, Lim W, Kim J, Song G, Bazer FW. Differential expression of select members of the SLC family of genes and regulation of expression by micrornas in the chicken oviduct. Biol Reprod 2012; 21;87(6):145.
27. Lim W, Kim HS, Kim YB, Kim MA, Kim J, Ahn SE, Jeong W, Lim CH, Kim MK, Chung HH, Bazer FW, Song YS, Han JY, Song G. SERPINB3 in the chicken model of ovarian cancer: a novel biomarker for predicting platinum resistance and survival in patients with epithelial ovarian cancer. PLoS One. 2012;7(11):e49869.
28. Antoniazzi AQ, Webb BT, Romero JJ, Ashley RL, Smirnova NP, Henkes LE, Bott RC, Oliveira JF, Bazer FW, Hansen T. Endocrine delivery of interferon-tau protects the corpus luteum from prostaglandin F2alpha-induced luteolysis in ewes. Biol Reprod 2012; (In Press)
29. Jeong W, Kim J, Ahn SE, Lim W, Lee SI, Bazer FW, Han JY, Song G. Expression of AHCYL1 is mediated by estrogen-induced ERK1/2 MAPK cell signaling to effect functional aspects of the chicken oviduct. PLoS One. 2012;7(11):e49204.
30. Bazer FW, Kim J, Song G, Satterfield MC, Johnson GA, Burgardt RC, Wu G. Uterine environment and conceptus development in ruminants. Anim Reprod 2012; 9: 97-304.
31. Bazer FW, Satterfield MC, Song G. Modulation of uterine function by endocrine and paracrine factors in ruminants Anim Reprod 2012; 9:305-311.

2011

1. Bazer FW, Spencer TE, Johnson GA, Burghardt RC. Uterine receptivity to implantation of blastocysts in mammals. Frontiers in Bioscience 2011; S3:745-767.
2. Kim J, Burghardt RC, Wu G, Johnson GA, Spencer TE, Bazer FW. Select Nutrients in the ovine uterine lumen: VII. Effects of arginine, leucine, glutamine and glucose on trophectodem cell signaling, proliferation and migration. Biol Reprod 2011; 84 70-78.
3. Kim J, Burghardt RC, Wu G, Johnson GA, Spencer TE, Bazer FW. Select Nutrients in the ovine uterine lumen: VIII. Arginine stimulates proliferation of ovine trophectoderm cells through mTOR-RPS6K-RPS6 signaling cascade and synthesis of nitric oxide and polyamines. Biol Reprod 2011; 84 62-69.

4. Song G, Fleming JGW, Kim J, Spencer TE, Bazer FW. Pregnancy and interferon tau regulate N-myc interactor in the ovine uterus. Dom Anim Endocrinol 2011; 40:87–97.
5. Kim J, Burghardt RC, Wu G, Johnson GA, Spencer TE, Bazer FW. Select Nutrients in the ovine uterine lumen: IX. Differential effects of arginine, leucine, glutamine and glucose on interferon tau, orinithine decarboxylase and nitric oxide synthase in the ovine conceptus. Biol Reprod 2011; 84:1139-1147.
6. Wu G, Bazer FW, Burghardt RC, Johnson GA, Kim SW, Knabe DA, Li P, Li XL, McKnight JR, Satterfield MC, Spencer TE. Proline and hydroxyproline: biochemistry and nutrition in animals. Amino Acids. 2011; 40:1053-1063.
7. Song G, Fleming JGW, Kim J, Spencer TE, Bazer FW. Pregnancy and interferon tau regulate DDX58 and PLSCR1 in the ovine uterus during the peri-implantation period. Reproduction 2011; 141:127-138.
8. Wu G, Bazer FW, Johnson GA, Knabe DA, Burghardt RC, Spencer TE, Li XL,Wang JJ. Important roles for L-glutamine in swine nutrition and production. J Anim Sci. 2011; 89:2017–2030.
9. Lassala A, Bazer FW, Cudd TA, Datta S, Keisler DH, Satterfield MC, Spencer TE, Wu G. Parenteral Administration of L-Arginine Enhances Fetal Survival and Growth in Sheep Carrying Multiple Fetuses. J Nutr 2011;141:849-855.
10. Forde N, Carter F, Spencer TE, Bazer FW, Sandra O, Mansouri-Attia N, Okumu LA, McGettigan PA, Mehta JP, McBride R, O'Gaora P, Roche JF, Lonergan P. Conceptus-Induced Changes in the Endometrial Transcriptome: How Soon Does the Cow Know She Is Pregnant? Biol Reprod. 2011; 85: 144-156.
11. Dorniak P, Bazer FW, Spencer TE. Prostaglandins Regulate Conceptus Elongation and Mediate Effects of Interferon Tau on the Ovine Uterine Endometrium. Biol Reprod 2011; 84, 1119-1127.
12. Wu G, Bazer FW, Burghardt RC, Johnson GA, Kim SW, Knabe DA, Li P, Li X, McKnight JR, Satterfield MC, Spencer TE. Proline and hydroxyproline metabolism: implications for animal and human nutrition Amino Acids 2011; 40:1053–1063.
13. Bazer FW. Contributions of an animal scientist to reproductive biology. Biol Reprod 2011; 85:228-242.
14. Mamo S, Mehta JP, McGettigan P, Fair T, Spencer TE, Bazer FW, Lonergan P.
RNA sequencing reveals novel gene clusters in bovine conceptuses associated with maternal recognition of pregnancy and implantation. Biol Reprod 2011; 85 1143-1151.
15. Bazer FW, Wu G, Johnson GA, Kim J, Song G. Uterine histotroph and conceptus development: Select nutrients and secreted phosphoprotein 1 affect MTOR cell signaling in ewes. Biol Reprod 2011; 85, 1094–1107.
16. Wu G, Bazer FW, Johnson GA, Knabe DA, Burghardt RC, Spencer TE, Li XL, Wang JJ. Triennial Growth Symposium: important roles for L-glutamine in swine nutrition and production. J Anim Sci. 2011;89:2017-2030.
17. Lehmann J, Ellenberger C, Hoffmann C, Bazer FW, Klug J, Allen WR, Sieme H, Schoon HA. Morpho-functional studies regarding the fertility prognosis of mares suffering from equine endometrosis. Theriogenology. 2011; 76:1326-1336.
18. Lim W, Jeong W, Kim JH, Lee JY, Kim J, Bazer FW, Han JY, Song G. Differential expression of alpha 2 macroglobulin in response to dietylstilbesterol and in ovarian carcinomas in chickens. Reprod Biol Endocrinol. 2011; 9:137.
19. Lim W, Kim JH, Ahn SE, Jeong W, Kim J, Bazer FW, Han JY, Song G. Avian SERPINB11 gene: Characteristics, tissue-specific expression, and regulation of expression by estrogen. Biol Reprod 2011; 85:1260-1268.

2010
1. Kim J, Erikson DW, Burghardt RC, Spencer TE, Wu G, Bayless KJ, Johnson GA, Bazer FW. Secreted phosphoprotein 1 binds integrins to initiate multiple cell signaling pathways, including FRAP1/mTOR, to support attachment and force-generated migration of trophectoderm cells. Matrix Biology 2010; 29:369-382
2. Song G, Bailey DW, Burghardt RC, Dunlap KA, Spencer TE, Bazer FW, Johnson GA. Cathepsin B, Cathepsin L and Cystatin C in the porcine uterus and placenta: A model for fluid-phase transport of

proteins secreted by uterine epithelia, across placental areolae and neonatal gut. Biol Reprod 2010;82:854-864.
3. Dunlap KA, Kwak H, Burghardt RC, Bazer FW, Magness RR, Johnson GA, Bayless KJ. Evidence for sphingosine-1-phosphate (S1P) signaling pathway regulation of endometrial and placental angiogenesis during pregnancy in sheep. Biol Reprod 2010;82:876-887.
4. Satterfield MC, Gao H, Li X, Wu G, Johnson GA, Spencer TE, Bazer FW. Select nutrients and their associated transporters are increased in the ovine uterus following early progesterone administration. Biol Reprod 2010;82:224-231.
5. Satterfield MC, Bazer FW, Spencer TE, Wu G. Sildenafil citrate treatment enhances aminoacid availability in the conceptus and fetal growth in an ovine model of intrauterine growth restriction. J Nutr 2010;140:1–8.
6. Simmons RM, Satterfield MC, Welsh TH, Bazer FW, Spencer TE. HSD11B1, HSD11B2, PTGS2 and NR3C1expression in the peri-implantation ovine uterus: effects of pregnancy,progesterone and interferon tau. Biol Reprod Biol Reprod 2010;82:35-43.
7. Bott RC, Ashley RL, Henkes LE, Antoniazzi AQ, Bruemmer JE, Niswender GD, Bazer FW, Spencer TE, Smirnova NP, Anthony RV, Hansen TR. Uterine vein infusion of interferon tau (IFNT) extends luteal lifespan in ewes. Biol Reprod 2010; 82:725-735.
8. Bazer FW, Wu G, Spencer TE, Johnson GA, Burghardt RC, Bayless K. Novel Pathways for Implantation and Establishment and Maintenance of Pregnancy in Mammals. Mol Hum Reprod 2010;16:135-152.
9. Avison DL, DeFaria W, Tryphonopoulos P, Tekin A, Attia G, Takahashi H, Jin Y, Palaios E, Pararas N, Carreno MR, Santiago S, Bazer FW, Ruiz P, Tzakis A. Heterotopic uterus transplantation in a swine model. Transplantation (in press)
10. Pereira FTV, Braga FC, Burioli KC, Kfoury JR, Oliveira LJ, Papa PC, Carvalho AF, Ambrósio CE, Bazer FW, Miglino MA. Transplacental transfer of iron in the water buffalo (*Bubalus bubalis*): Uteroferrin and erythrophagocytosis. Reprod Domest Anim 2010;45:907-914.
11. Forde N, Spencer TE, Bazer FW, Song G, Roche JF, Lonergan P. Effect of pregnancy and progesterone concentration on expression of genes encoding for transporters or secreted proteins in the bovine endometrium. Physiol Genomics. 2010;41:53-62.
12. Wu G, Bazer FW, Burghardt RC, Johnson GA, Kim SW, Li XL, Satterfield MC, Spencer TE. Impacts of amino acid nutrition on pregnancy outcome in pigs: mechanisms and implications for swine production. J Anim Sci 2010; 88:E195-204.
13. Bailey DW, Dunlap KL, Erikson DW, Patel A, Bazer FW, Burghardt RC and Johnson GA. Effects of Long-Term Progesterone Exposure on Porcine Uterine Gene Expression: Progesterone Alone Does Not Induce Secreted Phosphoprotein 1 (Osteopontin) in Glandular Epithelium. Reproduction 2010; 140:595-604.
14. Bailey DW, Dunlap KA, Frank JW, Erikson DW, White BG, Bazer FW, Burghardt RC and Johnson GA. Effects of long-term progesterone on developmental and functional aspects of porcine uterine epithelia: progesterone alone does not support glandular development of pregnancy. Reproduction 2010;140:583-594.

2009
1. Sitzlar MA, Mora MA, Flemming JW, Bazer FW, Bickham HW, Matson CW. Potential effects of environmental contaminants on P450 aromatase activity and DNA damage in swallows from the Rio Grande and Sommerville, Texas. Ecotoxicology. 2009; 18:15-21.
2. Gao H, Wu G, Spencer TE, Johnson GA, Li X, Bazer FW. Select nutrients in the ovine uterine lumen: I. Amino acids, glucose and ions in uterine lumenal fluid of cyclic and pregnant ewes. Biol Reprod 2009 80:86-93.
3. Gao H, Wu G, Spencer TE, Johnson GA, Bazer FW. Select Nutrients In The Ovine Uterine Lumen: II. Glucose Transporters in the Uterus and Peri-Implantation Conceptuses. Biol Reprod 2009 80:94-104
4. Gao H, Wu G, Spencer TE, Johnson GA, Bazer FW. Select nutrients in the ovine uterine lumen: III

Cationic amino acid transporters in the ovine uterus and peri-implantation conceptuses. Biol Reprod. 2009; 80:602-609.
5. Song G, Satterfield MC, Kim J, Bazer FW, Spencer TE. Progesterone and interferon tau regulate leukemia inhibitory factor receptor and interleukin 6 signal transducer in the ovine uterus during early pregnancy. Reproduction 2009;137:553–565.
6. Fleming JGW, Song G, Choi Y, Spencer TE, Bazer FW. Interferon regulatory factor 6 (IRF6) is expressed in the ovine uterus and functions as a transcriptional activator. Mol Cell Endocrinol 2009; 299:252–260
7. Song G, Dunlap KA, Kim J, Bailey DW, Spencer TE, Burghardt RC, Johnson GA, Bazer FW. Progesterone and estrogen limit luminal epithelial expression of stanniocalcin 1 to the implantation period of pregnancy in pigs. Endocrinology 2009; 150:936-945.
8. Bazer FW, Burghardt RC, Johnson GA, Spencer TE, Wu G. Interferons and progesterone for establishment and maintenance of pregnancy: Interactions among novel cell signaling pathways. Reprod Biol 2008; 8:179-211.
9. Wu G, Bazer FW, Davis TA, Kim SW, Li P, Rhoads JM, Satterfield MC, Smith SB, Spencer TE, Yin Y. Arginine metabolism and nutrition in growth, health and disease. Amino Acids 2009; 37:153–168.
10. Lassala A, Bazer FW, Cudd TA, Li X, Satterfield MC, Spencer TE,Wu G. Intravenous administration of citrulline to pregnant ewes is more effective than arginine for increasing arginine availability in the fetus. J Nutr 2009;139:660-665.
11. Bazer FW, Spencer TE, Johnson GA. Interferons and uterine receptivity. Seminars in Reprod Med 2009; 27:90-102.
12. Gao H, Wu G, Spencer TE, Johnson GA, Bazer FW. Select Nutrients in the Ovine Uterine Lumen: IV. Expression of Neutral and Acidic Amino Acid Transporters in Ovine Uteri and Periimplantation Conceptuses. Biol Reprod 2009;80 1196-1208.
13. Gao H, Wu G, Spencer TE, Johnson GA, Bazer FW. Select Nutrients in the Ovine Uterine Lumen: V. Nitric Oxide Synthase, GTP Cyclohydrolase and Ornithine Decarboxylase in Ovine Uteri and Peri-Implantation Conceptuses. Biol Reprod. 2009; 81:67-76.
14. Gao H, Wu G, Spencer TE, Johnson GA, Bazer FW. Select Nutrients in the Ovine Uterine Lumen: VI. Expression of FK506-Binding Protein 12-Rapamycin Complex-Associated Protein 1 (FRAP1) and regulators and effectors of mTORC1 and mTORC2 complexes in ovine uteri and conceptuses Biol Reprod. 2009; 81:87-100.
15. Li X, Bazer FW, Gao H, Jobgen W, Li P, McKnight JR, Satterfield MC, Spencer TE, Wu G. Amino acids and gaseous signaling. Amino Acids 2009; 37:65–78.
16. Bazer FW, Spencer TE, Johnson GA, Burghardt RC, Wu G. Comparative aspects of implantation. Reproduction 2009; 138:195-209.
17. Simmons RM, Erikson DW, Kim J, Burghardt RC, Bazer FW, Johnson GA, Spencer TE. Insulin-like growth factor binding protein-1 in the ruminant uterus: potential endometrial marker and regulator of conceptus elongation. Endocrinology 2009; 150:4295-4305.
18. Forde N, Carter F, Fair T, Crowe MA, Evans ACO, Spencer TE, Bazer FW, McBride R, Boland MP, O'Goara P, Lonergan P, Roche JF. Progesterone-Regulated Changes in Endometrial Gene Expression Contribute to Advanced Conceptus Development in Cattle. Biol Reprod 2009; 81:784-794.
19. Roberts RM, Smith GW, Bazer FW, Cibelli J, Seidel GE Jr, Bauman DE, Reynolds LP, Ireland JJ. Research priorities. Farm animal research in crisis. Science. 2009;324:468-469.
20. Satterfield MC, Song G, Kochan L, Riggs P, Simmons RM, Elsik C, Adelson D, Bazer FW, Zhou H, Spencer TE. Discovery of candidate genes and pathways in the endometrium regulating ovine blastocyst growth and conceptus elongation. Physiol Genomics 2009;39:85-99.
21. Lassala A, Bazer FW, Cudd TA, Datta S, Keisler DH, Satterfield MC, Spencer TE, Wu G. Parenteral Administration of L-Arginine Prevents Fetal Growth Restriction in Undernourished Ewes. J Nutr 2009;139:660-665.
22. Wu G, Bazer FW, Burghardt RC, Johnson GA, Kim SW, Knabe DA, Li X, Satterfield MC, Smith SB, Spencer TE. Functional amino acids in swine nutrition and production. Wageningen Academic Publishers

2009;
28. Ahn HW, Farmer JL, Bazer FW, Spencer TE. Progesterone and interferon tau-regulated genes in the ovine uterine endometrium: identification of periostin as a potential mediator of conceptus elongation. Reproduction 2009; 138 813–825

2008

1. Jäger K, Ellenberger C, Bartmann CP, Rass J, Bazer FW, Klug J, Allen WR, Hoppen HO, Hoffmann C, Schoon HA. Histopathological and immunohistochemical findings during the sexual cycle in female mules and effects of long-term Regumate® administration. Pferdeheilkunde 2008; 24:44-52
2. Wu G, Bazer FW, Datta S, Johnson GA, LI P, Satterfield MC, Spencer TE. Proline metabolism in the conceptus: Implications for fetal growth and development. Amino Acids; 2008; 35:691–702
3. Song G, Kim J, Bazer FW, Spencer TE. Progesterone and Interferon Tau Regulate Hypoxia-inducible factors (HIFs) in the Endometrium of the Ovine Uterus. Endocrinology 2008; 149:1926-1934
4. Kim J, Song J, Gao H, Farmer JL, Satterfield MC, Burghardt RC, Wu G, Johnson GA, Spencer TE, Bazer FW. Insulin-like Growth Factor 2 (IGF2) Activates PI3K-AKT1 and MAPK Cell Signaling Pathways and Stimulates Proliferation and Migration of Ovine Trophectoderm Cells. Endocrinology 2008; 149:3085-3094
5. Wu G, Bazer FW, Datta S, Gao H, Johnson GA, Lassala A, Li P, Satterfield MC, Spencer TE. Intrauterine growth retardation in livestock: Implications, mechanisms and solutions. Arch. Tierz., Dummerstorf 2008; **51:** Special Issue, 4-10
5. Hayashi K, O'Connell AR, Juengel JL, McNatty KP, Davis GH, Bazer FW, Spencer TE. Postnatal uterine development in Inverdale ewe lambs. Reproduction 2008; 135: 357–365
6. Song G, Satterfield MC, Kim J, Bazer FW, Spencer TE. Gastrin-releasing peptide (grp) in the ovine uterus: regulation by interferon tau and progesterone. Biol Reprod. 2008;79 376-386
7. Satterfield MC, Hayashi K, Song G, Black SG, Bazer FW, Spencer TE. Progesterone Regulates FGF10, MET, IGFBP1, and IGFBP3 in the Endometrium of the Ovine Uterus. Biol Reprod 2008; 79:1226-1236.
8. Dunlap KA, Burghardt RC, Erikson DW, Reed KM, White FJ, Farmer JL, Spencer TE, Magness RR, Bazer FW, Bayless KJ and Johnson GA. Progesterone and placentation increase uterine glandular and stromal secreted phosphoprotein 1 (osteopontin) that may function for histotrophic and hematotrophic support of ovine pregnancy. Biol Reprod 2008;79:983–990
9. Ireland JJ, Roberts RM, Palmer GH, Bauman DE, Bazer FW A commentary on domestic animals as dual-purpose models that benefit agricultural and biomedical research. J Anim Sci. 2008 86:2797-2805.
10. Ellenberger C, Wilsher S, Allen WR, Hoffmann C, Kölling M, Bazer FW, Klug J, Schoon D, Schoon A. Immunolocalisation of the uterine secretory proteins uterocalin, uteroferrin and uteroglobin in the mare's uterus and placenta throughout pregnancy. Theriogenology 2008; 70:746-757.
11. Banu SK, Lee J, Satterfield MC, Spencer TE, Bazer FW and Arosh JA. Molecular cloning and characterization of prostaglandin transporter in ovine endometrium: Role for multiple cell signaling pathways in transport of Prostaglandin F2 alpha. Endocrinology 2008 149:219-231.
12. Farmer JL, Burghardt RC, Jousan FD, Hansen PJ, Bazer FW, Spencer TE. Galectin 15 (LGALS15) functions in trophectoderm migration and attachment. FASEB J. 2008 22:548-560.
13. Joyce MM, Burghardt JR, Burghardt RC, Hooper RN, Bazer FW, Johnson GA. Uterine MHC class I molecules and beta2-microglobulin are regulated by progesterone and conceptus interferons during pig pregnancy J Immunol 2008;181:2494-2505.
14. Satterfield MC, Song G, Hayashi K, Bazer FW, Spencer TE. Progesterone regulation of the endometrial WNT system in the ovine uterus. Reprod Fertil Devel, 2008; 20:935–946
15. Bazer FW, Burghardt RC, Johnson GA, Spencer TE, Wu G. Interferons and progesterone for establishment and maintenance of pregnancy: Interactions among novel cell signaling pathways. Reproductive Biology 2008; 8:179-211.
16. Bazer FW, Salamonsen LA. Let's Validate Those Cell Lines. Biol Reprod 2008; 79:585
17. Bazer FW, Slayden O. Progesterone-Induced Gene Expression in Uterine Epithelia: A Myth

Perpetuated by Conventional Wisdom. Biol Reprod 2008; 79:1008–1009

JOHN BEVAN

DEPARTMENT OF CHEMISTRY, TEXAS A&M UNIVERSITY.
3255 TAMU, COLLEGE STATION, TX 77843-3255

Tel.: (979) 845-2372, Fax: (979) 845-4719
bevan@mail.chem.tamu.edu, http://www.chem.tamu.edu/rgroup/bevan/

Research Interests

- Intermolecular structure and dynamics
- Spectroscopic instrumentation
- Atmospheric monitoring and environmental technology
- Fundamental molecular physics

Education

University of Wales,	Chemistry,	B.Sc., 1968
University of Surrey,	Chemical-Physics,	M.Sc., 1970
University College London,	Chemistry,	Ph.D., 1974

Thesis: "Gas Phase Spectroscopic Investigations of Some Small Ring Compounds and Hydrogen Bonded Complexes", Prof. D.J. Millen and Dr. A.C. Legon

Research Experience

Guest Research Worker:	National Bureau of Standards, Gaithersburg, Maryland, 1985-1985, 2000-2001
Royal Society Research Fellow, University of Exeter	1992
Senior National Research Council Fellow and Sabbatical Leave	Jet Propulsion Laboratories, Pasadena, CA, 1987-1987.

Research Associate,	Herzberg Institute of Astrophysics, Ottawa, Canada	1977-1978
Postdoctoral Fellow,	University of Montreal (C. Sandorfy, advisor)	1976-1977
Postdoctoral Fellow,	Rice University (R. F. Curl, advisor)	1975-1976

Teaching Experience(2007-)

2007

Chemistry 322 - Physical Chemistry
Chemistry 326 – Physical Chemistry
Chemistry 322 - Physical Chemistry
Chemistry 690

2008

Chemistry 328

2009

Chemistry 328

2010

Chemistry 689 Seminar
Chemistry 327 - Physical Chemistry Enrolment
Chemistry 327-Physical Chemistry Enrolement
Chemistry 690 –Enrolment 5.

2011

Spring Chemistry 327, 689 Seminar
Fall Chemistry 327

2012

Chem 111-519# students 24, Chem 111-520 # students 24, Chem 111-521# students 20, Chem 112-537 # students 24, Chem 112-538 # students 24, Chem 112-539 # students 23, Chem 112-540 #students 21, Chem 117-519 # students 23, Chem 117-520 # students 24, Chem 117-521 # students 24, Chem 322-500 # students 21 Chem 491-505-# students 1, Chem 691-605 # students Chem 111-501-# students 24, Chem 111-502-# students 23, Chem 111-503-# students 24, Chem 111-504-# students 24, Chem 111-505-# students 24, Chem 111-506-# students 24, Chem 111-507-# students 21, Chem 112-513-# students 24, Chem 112-514-# students 24, Chem 117-522-# students 17, Chem 117-523-# students 17, Chem 322-500-# students 21, Chem 491-505-# students 1, Chem 691-605-# students 2

Graduate Student Advising

27

(2007-) M. Butler, B.A. McElmurry, A. Sizhuk, W.K. Scott, S. Springer, L.A. Rivera

Undergraduate Student Supervision

Greater than 50

(2007-) D. Hitchcock, J. Trevino, E. Townsley, W.K. Scott, S. Springer, S. Moller, S. Zia, G. Brown, M. Williams

Honors and Awards

The Association of Former Students Distinguished Achievement College-Level Awards(2012)
Semiconductor Research Council/Semiconductor Safety Association/ SEMATECH International, Research Excellence Award(1999)
Royal Society Guest Research Fellowship(1992)
National Research Council Senior Fellowship(1987)
Ramsay Memorial Medal(1974)

Membership and Service

- Member of the ACS, AAAS

- Proposal reviewer for NSF, ACS Petroleum Research Fund, EURYI Panel Reviewer CRIF/MRI program NSF, Environmental Protection Agency (EPA), Department of Energy(DOE), Panel Reviwer CRIF/MRI program NSF.

- Reviewer for Environmental Science and Technology, Journal of Physical Chemistry A, J. Chem. Phys. J. of Physical Chemistry, Chem. Phys. Letts. J. Mol. Structure.

Awarded Research Grants

NSF, 1/31/06-7/31/09 Characterization of Non-covalent Interactions, $ 260.000, **J.Bevan** and R.R. Lucchese

Robert A. Welch Foundation, 6/1/06-5/31/09 The Structure and Dynamics Of Prototypical Hydrogen Bonded Interactions, $180,000, **J. Bevan**

Robert A. Welch Foundation, 6/1/2009-5/31/2011, The Structure and Dynamics Of Prototypical Hydrogen Bonded Interactions, $120,000, **J. Bevan**

CRDF, 8/1/2007-7/31/2009, Elaboration of Analytical MethodsIn THz Frequency Range for Atmospheric Investigations, $5870, **J.Bevan**

NSF, 8/1/2004-8/31/2008, Development of Submillimeter/ Terahertz Instrumentation for Spectroscopy and Dynamics $199,000, **J. Bevan et al..**

NSF 9/1/09-7/31/12, Spectroscopic and Computational Characterization of Non-covalent Interactions, $449062**, J.Bevan** and R.R. Lucchese.

Robert A. Welch Foundation, 6/1/2012-5/31/2014, Structure and Dynamics of Prototypical Hydrogen Bonded and Related Interactions, $120,000, **J. Bevan**

Synergistic Activities

Played a fundamental role in the establishment of the Center of Atmospheric Chemistry and the Environment at Texas A&M University. This is an official center of Texas A&M University at College Station and was established under the auspices of the Vice –President for Research and established by the Board of Regents, TAMU following action by the Texas State Legislature.

Co-founder and director of the start-up company, RF Environmental Systems Inc established in 1993 to commercialize plasma abatement technology for global warming emissions.

Technological transfer of surface wave plasma abatement technology for effective reduction (99.998%) of perfluorocompounds (PFCs) in all semiconductor process emissions. This technology, has been successful beta testing with SEMATECH at Motorola ARPDL, Austin, Texas. Texas A&M University was awarded US patent #5,750,823(1998) and was recognized by

an Environmental Research Excellence Award, SRC/SSA/International SEMATECH, (1999).

Established Laboratory of Submillimeter/Terahertz Science and Technology, TAMU.

Invited Seminars

- See below .

Refereed Publications (*total citation of over 1790 and h-index of 24*)

1. S.A.Springer, L.A. Rivera-Rivera, B.A. McElmurry, Z. Wang, I.I Leonov, R.R. Lucchese, A.C. Legon, and **J.W. Bevan**, "A CMM-RS Potential for Characterization of the Properties of the Halogen-bonded OC-Cl2 Complex and a comparison with hydrogen-bonded OC-HCl", J. Phys. Chem. A.,116, 1213-1223 (2012).

2. B.A. McElmurry, L.A. Rivera-Rivera, Z. Wang, I.I. Leonov, R.R. Lucchese and **J.W. Bevan,** "A morphed intermolecular potential of OC-HCCH based on QCL infrared spectroscopy", Chem. Phys. Letts., 522, 17-22 (2012).

3. B.A. McElmurry, L.A. Rivera-Rivera, K.W. Scott, Z. Wang, I.I. Leonov, R.R. Lucchese**, J.W. Bevan,** "Studies of low-frequency intermolecular hydrogen-bonded vibrations using a continuous supersonic slit jet mid-infrared quantum cascade laser spectrometer," Chemical Physics 409, 1–10 (2012).

4. L.A. Rivera-Rivera, Z. Wang, B.A. McElmurry, R.R. Lucchese, and **J.W. Bevan**, "Predictions of properties in the CO-HF isomer using a Six-Dimensional Morphed Potential" J. Molecular Structure, 1023, 43-48 (2012).

5. L.A. Rivera-Rivera, Z. Wang, B.A. McElmurry, R.R. Lucchese, **J.W. Bevan,** and G. Kanschat, "Morphing a Vibrationally-Complete Ground State Potential for the Hydrogen Bond OC-HF," Chem.Phys. 390, 42-50 (2011).

6. Z. Wang, B.A. McElmurry, R.R. Lucchese, **J.W. Bevan** and L.H. Coudert, "Paired Hydrogen Bonds in the Hydrogen Halide Homodimer $(HI)_2$", J. Chem. Phys. 12, 64317-64333 (2011).

7. L.A. Rivera-Rivera, Z. Wang, B.A. McElmurry, F.F. Willaert, R.R. Lucchese, **J.W. Bevan,** R.D. Suenram, F.J. Lovas, "A ground state morphed intermolecular potential for the hydrogen bonded and van der Waals isomers in OC:HI and a prediction of an anomalous deuterium isotope effect", Journal of Chemical Physics, 133,184305-184318 (2010).

8. L.A. Rivera-Rivera, R.R. Lucchese, **J.W. Bevan,** "A four dimensional compound model morphed potential for the OC:HBr complex", Physical Chemistry Chemical Physics, 12, 7258-7265 (2010).

9. L. H. Coudert, S. P. Belov, F. Willaert, B. A. McElmurry, R. R. Lucchese, **J. W. Bevan,** and J. T. Hougen, "Submillimeter Spectrum and Analysis of Vibrational and Hyperfine Coupling Effects in $(HI)_2$", Chem. Phys. Letts 482, 180-188 (2009).

10. F.F. Willaert, B.A. McElmurry, R.R. Lucchese and **J.W. Bevan**, "Probing the Accuracy of the Isomerization Energy of the 3-D Morphed Potential of Ar-HBr", Chemical Physics Letters 460, 325-30 (2008).

11. L. A. Rivera-Rivera, R.R. Lucchese and **J.W. Bevan**, "A Parameterized Compound-Model Chemistry for Morphing The Intermolecular Potential of OC-HCl", Chemical Physics Letters 460, 352-58 (2008).

12. Rivera-rivera, L.A., McElmurry, B.A., Belov, S.P., Lucchese, R.R., **Bevan, J.W.,** A Three Dimensional Morphed Potential of Ne-HCl Including the Ground State Deuterated Sigma Bending Vibration, Chem. Phys. Letts., 444, 9-16(2007).

13. Jabs, W., Willaert, F.F., McElmurry, B.A., Rivera-rivera, L.A., Montuoro, R., Lucchese, R.R., **Bevan, J.W**., and Suenram, R.D..(2007) Microwave-based Structure and Four Dimensional Morphed Intermolecular Potential for HI-CO_2. J. Chem. Phys., A 111, 11976-11985(2007).

Conference Presentations

1. "High Resolution Spectroscopy as a Probe of the Fundamental Nature of Prototypical Non-covalent Interactions," Physics Department, TAMU 10/12/2012 (Oral, invited).

2. "The Badger-Bauer Rule Revisited: Correlation of Blue Frequency Shifts in the OC Hydrogen Acceptor with Morphed Hydrogen Bond Dissociation Energies in OC-HX (X=F, Cl, Br, I, CN, CCH)", SWTCC, Chemistry Department, Texas A&M University, College Station, Texas 10/26-28/2012 (Poster).

3. "Spectroscopic Studies of HB/XB Interactions", TAMU PQE Follow-on Symposium, Physics Department, TAMU, Jan 10-12 (2012)(Oral, invited).

4. Infrared Quantum Cascade Laser Spectroscopy of Low Frequency Vibrations of Intermolecular Complexes, October 3-7, 2011, 36th International Conference IRMMW-THz , October 3-7, 2011, Houston, Texas

5. "Towards sub ppq detection and monitoring capabilities for environmental applications using novel THz technologies", 36th international conference IRMMW-THz, October 3-7, 2011, Houston, Texas

6. "New Perspectives from Morphing potentials for hydrogen bonded interactions", 24th Austin Symposium on molecular Structure and Dynamics , March 6-8, 2010, Austin , Texas.

7. "A four dimensional compound model morphed potential for OC:HBr complex", 24th Austin Symposium on molecular Structure and Dynamics , March 6-8, 2010, Austin , Texas

8. A four-dimensional compound-model morphed potential for the OC:HBr complex 25th Southwest Theoretical Chemistry Conference, Houston, TX; October 16-17, 2009

9. Belov, S.P., Willaert, F., McElmurry, B.A.,.Lucchese, R.R., Bevan J.W., and Coudert, L.H.. (2007) Vibrational and Hyperfine Coupling Effects in $(HI)_2$, FC-11, International Conference on Molecular Structure The Ohio State University, Columbus Ohio, June 22, 2007.

Curriculum Vitae Kenneth P. Bowman

Department of Atmospheric Sciences
Texas A&M University
3150 TAMU
College Station, TX 77843-3150
k-bowman@tamu.edu, http://atmo.tamu.edu/profile/KBowman

Education

Princeton University Geophysical Fluid Dynamics Ph.D. 1984 Princeton University Geophysical Fluid Dynamics M.S. 1981 University of Colorado Environmental Design B.S. 1979

Professional experience

Texas A&M University	Harris Professor of Geosciences	2012–
Texas A&M University	Department Head	2007–2012
Texas A&M University	Professor	1998–2004
National Center for Atmospheric Research	Long-Term Visitor	
Texas A&M University	Associate Professor	1994–1998
Texas A&M University	Associate Research Scientist	1992–1994
University of Illinois	Assistant Professor	1985–1992
NASA Goddard Space Flight Center	NRC Postdoc	1983–1985
Geophysical Fluid Dynamics Laboratory, Princeton University	Research Assistant	1979–1983
Institute for Arctic and Alpine Research, University of Colorado	Research Assistant	1976–1979

Teaching experience (Texas A&M University)

- ATMO 201 – Atmospheric Science
- ATMO 321 – Computer Applications in Atmospheric Science (new course)

- ATMO 324 – Physical and Regional Climatology
- ATMO 336 – Atmospheric Dynamics
- ATMO 435 – Synoptic-Dynamic Meteorology
- ATMO 441 – Satellite Meteorology and Remote Sensing (new course)
- ATMO 485 – Directed Studies
- ATMO 601 – Fundamentals of Atmospheric Dynamics
- ATMO 602 – Principles of Atmospheric Physics and Chemistry
- ATMO 685 – Directed Studies
- ATMO 681 – Seminar
- ATMO 691 – Research

Honors, prizes and awards

- David Bullock Harris Professor of Geosciences, 2012
- Texas A&M University Association of Former Students, College of Geosciences Distinguished Teaching Award, 1998
- National Research Council Resident Research Associateship, NASA Goddard Space Flight Center, 1983–85

Professional memberships and activities

- Member, Board of Trustees, University Corporation for Atmospheric Research, 2011-2016
- Member, UCAR Membership Committee, 2009-2013
- Texas A&M University representative, University Corporation for Atmospheric Research, 2008-2012
- Principal investigator, Stratosphere-Troposphere Analyses of Regional Transport 2008 (START08) Mission
- Member, HIAPER Progressive Science mission team. (NCAR Gulfstream V research aircraft inaugural mission.)
- Member, Program Committee, Joint European Geophysical Society/American Geophysical Union Spring Meeting, 2003
- Member, Publications Committee, American Geophysical Union, 2000–2002
- Secretary, Atmospheric Sciences Section, American Geophysical Union, 1998–2000
- Chair, American Meteorological Society Committee on the Middle Atmosphere, 1998–2001
- Meeting Chair, American Meteorological Society Eleventh Middle Atmosphere Meeting, January 2000, Long Beach, CA
- Member, American Meteorological Society Committee on the Middle Atmosphere, 1995– 1998
- Editor with Dr. S. El-Sayed of special issue of the International Journal of Environmental Studies on Global Impacts of Stratospheric Ozone Depletion, 1997
- Member, American Geophysical Union
- Member, American Meteorological Society

Meetings, workshops, and invited talks (past 5 years)

- UCAR Board of Trustees Meetings, Boulder, CO and Washington, DC, 2010, 2011, 2012
- Texas A&M representative, UCAR Members Meeting, 2007, 2008, 2010, 2011
- *Lagrangian Diagnostics for Transport and Irreversible Stirring*, AGU Chapman Conference on Advances in Lagrangian Modeling of the Atmosphere, Grindelwald, Switzerland, 2011
- *Observations of Tropospheric and Stratospheric Intrusions in the Extratropical Upper Troposphere and Lower Stratosphere*, IUGG/IAMAS Conference on Recent Advances in Middle Atmosphere Science, Melbourne, Australia, 2011
- *Transport by the Asian Monsoon Circulation*, IUGG/IAMAS Conference on Monsoons, Tropical Cyclones, and Tropical Dynamics, Melbourne, Australia, 2011
- *Evaluation of WACCM Simulations of the Upper Troposphere and Lower Stratosphere using data from the Stratosphere-Troposphere Analyses of Regional Transport 2008 experiment (START08)*, American Meteorological Society Middle Atmosphere Meeting, Seattle, WA, 2011
- *Tropospheric Intrusions Observed During START08*, Atmospheric Chemistry Division, National Center for Atmospheric Research, Boulder, CO, 2010
- *Climate Research in the Atmospheric Sciences Department at Texas A&M*, Regional Climate Modeling Center Planning Meeting, Austin, TX, 2010
- *Aircraft Observations of the Atmosphere for Climate Change Research*, Department of Biological

and Agricultural Engineering, Texas A&M University, 2009
- AMS/UCAR Atmospheric Science Department Heads and Chairs Meeting, Boulder, CO, 2008, 2010
- *Transport of Air from the Tropical Upper Troposphere into the Extratropical Lower Stratosphere*, Workshop on Processes in the Upper Troposphere and Lower Stratosphere, Boulder, CO, 2009
- *A Comparison of Oceanic Precipitation Estimates in the Tropics and Subtropics*, NASA Precipitation Measuring Mission (PMM) science team meeting, Salt Lake City, UT, 2009
- *START08 and Pre-HIPPO Mission Overview*, Department of Atmospheric Sciences, Texas A&M University, 2008
- *Origin of Tropospheric Air in the Extratropical Lower Stratosphere*, American Geophysical Union Joint Assembly, Toronto, Canada, 2009
- *Origin of Tropospheric Air in the Extratropical Lower Stratosphere during START08*, Stratosphere Troposphere Analyses of Regional Transport workshop, Boulder, CO, 2009
- Stratospheric Processes and their Role in Climate (SPARC) International Science Meeting, Bologna, Italy, 2008
- Invited lectures at Pusan National University, Pusan, Korea; Yonsei University and Seoul National University, Seoul, Korea, June 2008

Books and CDs

- Yang, Ping, and Kenneth P. Bowman, 2012. *Introduction to Satellite Meteorology and Atmospheric Remote Sensing*, John Wiley and Sons, Inc., in preparation.
- Bowman, Kenneth P., 2006. *An Introduction to Programming with IDL – Interactive Data Language*, Academic Press (Elsevier), 286 pp., ISBN 0-12-088559-X.
- Bowman, K. P., 1994. *Stratospheric Ozone*. CD-ROM, Lenticular Press, College Station, TX.

Papers and reports over last 5 years

(For citation statistics use Web of Science ResearcherID: A-1345-2012)

*indicates student author

77. Bowman, K. P., J. C. Lin, A. Stohl, R. Draxler, P. Konopka, M. Bourqui, A. Andrews, D. Brunner, 2013. Input data requirements for Lagrangian trajectory models, *Bull. Am. Meteor. Soc.*, accepted, doi: 10.1175/BAMS-D-12-00076.
76. Homeyer, C. R.*, and K. P. Bowman, 2013. Rossby wavebreaking and transport between the tropics and extratropics above the subtropical jet, *J. Atmos. Sci.*, 70, 607-626, doi: 10.1175/JAS-D-12-0198.1.

75. Yi, B.*, K. P. Bowman, P. Yang, and X. Liu, 2012. Aerosol-cloud-precipitation relationships from satellite observations and global climate model simulations, *J. Appl. Rem. Sens.*, 6, 063503, doi:10.1117/1.JRS.6.063503.
74. Homeyer, C. R.*, K. P. Bowman, L. L. Pan, M. A. Zondlo, and J. F. Bresch, 2011. Convective injection into stratospheric intrusions, *J. Geophys. Res.*, 116, D23304, doi: 10.1029/2011JD016724.
73. Homeyer, C. R.*, K. P. Bowman, and L. L. Pan, 2011. Dynamical and chemical characteristics of tropospheric intrusions observed during START08, *J. Geophys. Res.*, 116, D06111, doi: 10.1029/2010JD015098.
72. Vogel, B., et al., 2011. Transport pathways and signatures of mixing in the extratropical tropopause region derived from Lagrangian model simulations, *J. Geophys. Res.*, 116,

D05306, doi: 10.1029/2010JD014876.
71. Murthi, A.*, K. P. Bowman, and L. R. Leung, 2010. Simulations of precipitation using NRCM and comparisons with satellite observations and CAM: Annual cycle, *Clim. Dyn.*, 35, 2010, doi: 10.1007/s00382-010-0878-z.
70. Wunch, D., G. C. Toon, P. O. Wennberg, S. C. Wofsy, B. B. Stephens, M. L. Fischer, O. Uchino, J. B. Abshire, P. Bernath, S. C. Biraud, J.-F. L. Blavier, C. Boone, K. P. Bowman, E. V. Browell, T. Campos, B. J. Connor, B. C. Daube, N. M. Deutscher, M. Diao, J. W. Elkins, C. Gerbig, E. Gottlieb, D. W. T. Griffith, D. F. Hurst, R. Jimnez, G. Keppel-Aleks, E. A. Kort, R. Macatangay, T. Machida, H. Matsueda, F. Moore, I. Morino, S. Park, J. Robinson, C. M. Roehl, Y. Sawa, V. Sherlock, C. Sweeney, T. Tanaka, and M. A. Zondlo, 2010. Calibration of the Total Carbon Column Observing Network using aircraft profile data, *Atmos. Meas. Tech.*, 3, 1351-1362, doi: 10.5194/amt-3-1351-2010.
69. Homeyer, C. R.*, K. P. Bowman, and L. L. Pan, 2010. Extratropical tropopause transition layer characteristics from high-resolution sounding data, *J. Geophys. Res.*, 115, D13108, doi: 10.1029/2009JD013664.
68. Pan, L. L., K. P. Bowman, E. L. Atlas, S. C. Wofsy, F. Zhang, J. F. Bresch, B. A. Ridley, J. V. Pittman, C. R. Homeyer*, P. Romashkin, W. A. Cooper, 2010. The Stratosphere-Troposphere Analyses of Regional Transport 2008 (START08) Experiment, *Bull. Amer. Meteor. Soc.*, 91, 327-342, doi: 10.1175/2009BAMS2865.1.
67. Bowman, K. P., C. Homeyer*, and D. Stone*, 2009. A comparison of oceanic precipitation estimates in the tropics and subtropics, *J. Appl. Meteorol. and Climatology*, 48, 1335-1344, 10.1175/2009JAMC2149.1.
66. Shin, D.-B., K. P. Bowman, J.-M. Yoo and L. S. Chiu, 2009. Variability of passive microwave radiometric signatures at different spatial resolutions and its implication for rainfall estimation, *IEEE Trans. on Geoscience and Remote Sensing*, 47, 1575-1584, doi: 10.1109/TGRS.2008.2007740.
65. Li, B., A. Murthi*, K. P. Bowman, G. R. North, Marc G. Genton, and M. Sherman, 2009. Statistical tests of Taylor's hypothesis: An application to precipitation fields, *J. Hydrometeorology*, 10, 254–265, doi: 10.1175/2008JHM1009.1.
64. Jackson, C. S., M. K. Sen, G. Huerta, Y. Deng, and K. P. Bowman, 2008. Error reduction and convergence in climate prediction, *J. Climate*, 21, 6698–6709, doi: 10.1175/2008JCLI2112.1.
63. Wu*, Q., S. Mahajan*, K. P. Bowman, and P. Chang, 2008. Atmospheric response to Atlantic Tropical Instability Waves in Community Atmosphere Model version 3, *J. Geophys. Res.*, 113, D15125, doi: 10.1029/2007JD009474.
62. Erukhimova, T., R. Zhang, and K. P. Bowman, 2008. The climatological mean atmospheric transport under weakened Atlantic thermohaline circulation climate scenario, *Climate Dynamics*, doi: 10.1007/s00382-008-0402-x.

Graduate students (chair or co-chair)

- Leong Siu, Texas A&M University, M.S. in progress.
- David Solomon, Texas A&M University, M.S. in progress.
- Nichole Kinney, Texas A&M University, *Convective-Resolving Regional Climate Simulations for the Amazon Basin: Comparison with TRMM Rainfall Data*, M.S., 2012.
- Cameron Homeyer, Texas A&M University, *Chemical and Dynamical Characteristics of Stratosphere-Troposphere Exchange*, Ph.D., 2012.

- Elizabeth Baugher, Texas A&M University, *Comparison between Model Simulations and Measurements of Hyperspectral Far-Infrared Radiation from FIRST during the RHUBC-II Campaign*, M.S., 2011.
- Cameron Homeyer, Texas A&M University, *Extratropical Tropopause Transition Layer Characteristics from High-Resolution Sounding Data*, M.S., 2010.
- Aditya Murthi, Texas A&M University, Ph.D., *Analysis Of Precipitation Using Global Climate Models and Comparisons with Satellite Observations*, 2009. Lawrence Berkely National Laboratory.
- Matthew Rigney, Texas A&M University, *Ensemble Statistics and Error Covariance in a Rapidly Intensifying Hurricane*, M.S., 2009.
- Qiaoyan Wu, Texas A&M University, Ph.D., *An Observational and Numerical Study of Atlantic Tropical Instability Waves*, 2007. Second Institute of Oceanography and Department of Ocean Science and Engineering, Zhejiang University, Hangzhou, China
- Jeremy DeMoss, Texas A&M University, M.S., *Changes in TRMM Rainfall Due to the Orbit Boost Estimated from Buoy Rain Gauge Data* , 2006.
- Craig Collier, Texas A&M University, Ph.D., *Tropical Precipitation Simulated by the NCAR Community Climate Model (CCM3): An Evaluation Based on TRMM Satellite Measurements*. GL Garrard Hassan, Inc.
- Darielle Dexheimer, Texas A&M University, M.S., *Lagrangian Methods For Climatological Analysis Of Regional Atmospheric Transport With An Emphasis On Texas Ozone Exceedances*, 2004. Anemometry Specialists, Inc.
- Hye-Kyung Cho, Texas A&M University, Ph.D., *Analysis of Rainfall Data from the Tropical Rainfall Measuring Mission (TRMM)*, 2002.
- Capt. Amy Phillips, Texas A&M University, M.S., *Comparing Rain Rate Measurements from TRMM and Next Generation ATLAS Buoys: A Ground Truth Experiment*, 2002.
- Kyong-Hwan Seo, Texas A&M University, Ph.D., *Transport and Mixing in the Atmosphere: Anomalous Diffusion and Stratosphere-Troposphere Mass Exchange*, 2001. Associate Professor and Department Head, Department of Atmospheric Sciences, Pusan University, Pusan, Korea.
- Michele Nordeen, Texas A&M University, M.S., *An Online Climatic Database for Texas*, 2000. Science Systems and Applications, Inc. (SSAI).
- Christopher Rogers, Texas A&M University, M.S., *Transport of Smoke from the Central American Fires of 1998*, 2000. Mactec Engineering and Consulting.
- Capt. Gettys Harris, USAF, Texas A&M University, M.S., *Comparison of NCEP Reanalysis and TRMM Precipitation Radar Estimates of Melting-Layer Altitudes*, 1999.
- Capt. Richard Wagner, USAF, Texas A&M University, M.S., *Wavebreaking and Mixing in the Northern Hemisphere Summer Stratosphere*.
- Capt. Peter J. Cohen, Texas A&M University, M.S., *Interhemispheric Mixing by Seasonal Modulation of the Hadley Circulation*, 1997.
- Yongyun Hu, Texas A&M University, M.S., *GCM Simulation of the Tropical Mixing Barriers in the Lower Stratosphere*, 1996. Head, Department of Atmospheric Sciences, Peking University, Beijing, China.
- Steven Dahlberg, Texas A&M University, Ph.D., *An Observational Study of Mixing in the Arctic Winter Stratosphere*, 1995.
- Jin Huang, University of Illinois, Ph.D., *Climate Sensitivity Study with Energy Balance Models*, 1991. Program Manager, NOAA Climate Prediction Program for the Americas.
- Stacey Hollandsworth, University of Illinois, M.S., *An Observational Study of the Quasi-Biennial Oscillation*, 1990. Scientific Programmer, Science Systems and Applications, Inc. (SSAI).
- Nicholas Mangus, University of Illinois, M.S., *An Investigation of Barotropic Mixing in*

Response to Transient Forcing Near the Antarctic Polar Vortex, 1990. Air Quality System Office, U.S. EPA.

Graduate students (committee member)

- Kim, Yongsun, Oceanography, Texas A&M University, Ph.D., in progress.
- Sun, Ying, Statistics, Texas A&M University, Ph.D., 2011.
- Stryker, Sarah, Oceanography, Texas A&M University, M.S., 2011.
- Lee, Keun-Hee, Texas A&M University, Ph.D., in progress.
- Tomlinson, Jason, Texas A&M University, Ph.D., *The Evolution of the Physicochemical Properties of Aerosols in the Atmosphere*, 2010.
- Gay, Shelton, Oceanography, Texas A&M University, Ph.D., in progress.
- Hering, Mandy, Statistics, Texas A&M University, Ph.D., *Space-Time Forecasting and Evaluation of Wind Speed with Statistical Tests for Comparing Accuracy of Spatial Predictions*, 2009.
- Hernandez, Celina, Texas A&M University, M.S., *The QBO's Influence on Lightning Production and Deep Convection in the Tropics*, 2008.
- Wang, Shuguang, Texas A&M University, Ph.D., *Gravity Waves from Vortex Dipoles and Jets*, 2008.
- Zhang, Zhibo, Texas A&M University, Ph.D., *Satellite-Based Remote Sensing of Cirrus Clouds: Hyperspectral Radiative Transfer Modeling, Analysis of Uncertainties in In-Situ Cloud Extinction Measurements and Intercomparison of Cirrus Retrievals from A-Train Instruments*, 2008.
- Shu, Tingting, University of Alberta, Edmonton, Alberta, Canada, Ph.D., *Analysis of Non-stationary surface air temperature and a drought index*, 2007. ¨

- Ollers, Michael, Eindhoven Technical University, Eindhoven, Netherlands, Ph.D., *Transport and Mixing in the Stratosphere by Inertio-Gravity Waves*, 2003.
- Shin, Dong-Bin, Texas A&M University, Ph.D., *Studies Related to Tropical Rainfall Measuring Mission (TRMM): Sampling a Cyclostationary Field and a Climatology of Reflectivity Profiles*, 1999.
- Baca, William Michael, Texas A&M University, M.S., *A Numerical Study of Circulation and Mixing in a Macrotidal Estuary: Cobscook Bay, Maine*, 1998.
- Li, Xianjin, Texas A&M University, Ph.D., *Equatorially Trapped Waves and Wave-Induced Mixing in the Mid-Depth Atlantic Ocean*, 1996.
- Lefevre, Randy Joseph, Texas A&M University, Ph.D., *Using the Quasigeostrophic Potential Vorticity Height Tendency Equation to Diagnose the Development of Midtropospheric Mobile Troughs*, 1995.
- Tobin, Bridget Frances, Texas A&M University, M.S., *The Seasonal Cycle Dependence of Temperature Fluctuations in the Atmosphere*, 1994.
- Collins, Richard Laurence, University of Illinois, Ph.D., *Middle Atmosphere Structure and Dynamics: Lidar Studies at the South Pole, Syowa, and Urbana*, 1994.
- Chen, Ping, University of Illinois, Ph.D., *Dynamics of Planetary Waves in the Atmosphere*, 1992.
- Kubesh, Rodney Joseph, University of Illinois, Ph.D., *A Laboratory Investigation of Raindrop Oscillations*, 1991.
- Cai, Ming, University of Illinois, Ph.D., *Basic Dynamics of Low-Frequency Variability and the Storm Tracks*, 1990.
- Chuang, Chien-Hua Catherine, University of Illinois, Ph.D., *A Numerical Model for the Axisymmetric Equilibrium Shape of Drops in Uniform Motion: Effects of External Flow, Electric Fields, and Surface Charge*, 1989.

Research grants and contracts

- K. P. Bowman and D. Conlee: *REU Site: Atmospheric Sciences in the Gulf Coast Region*; NSF; 2012-09-01 to 2015-08-31; $297,589.
- K. P. Bowman: *Dynamical and Chemical Diagnosis of Stratosphere-Troposphere Analyses of Regional Transport 2008 (START08) Data*; NSF; 2010-09-01 to 2013-08-31; $477,158.
- Dessler, A., and K. P. Bowman: *Using Aura TES Isotopic Data to Trace Water Transport in the Troposphere to Interpret Global Environmental Change*; NASA; 2008-06-01 to 201105-31, $399,531.
- Richardson, M. J., K. P. Bowman, D. Cairns, and J. Pettibon.: *Geoscience Scholars*; NSF; 2007-09-01 to 2012-08-31; $600,000.
- Bowman, K. P., and F. Zhang: *Collaborative Research: Stratosphere-Troposphere Analyses of Regional Transport (START) Experiment (2008)*; NSF; 2007-09-15 to 2009-08-31; $200,002.
- Bowman, K. P., and G. R. North: *Ground Truth and Model Validation Studies with TRMM, SSM/I, and TMPA Data*; NASA; 2007-09-01 to 2012-08-31; $433,578.
- Genton, M. G., B. K. Mallick, K. P. Bowman, M. Jun, F. Zhang, and R. Saravanan: *Non-Gaussian Statistical Analysis of Large Climate Datasets and Simulations*; NSF; 2006-09-01 to 2009-08-31; $1,030,000.
- Bowman, K. P.: *Flight Planning and Meteorological Analysis in Support of the HIAPER START Progressive Science Mission*; NSF; 2006-01-15 to 2006-12-31; $45,712.
- North, G. R., and K. P. Bowman: *Statistical Studies in Support of Precipitation Missions*; NASA; 2003-12-01 to 2006-11-30; $360,000.
- Bowman, K. P.: *Quantitative Comparison of the Transport Circulation of the Troposphere in Observations and GCM Simulations*; NSF; 2001-06-01 to 2005-05-31; $332,417.
- Bowman, K. P.: *Regional-Scale Atmospheric Transport and Air Quality in Texas*; Texas Air Research Center; 2001-11-01 to 2004-3-31; $63,886.
- North, G. R., and K. P. Bowman: *Statistical Sampling and Estimation Problems Using TRMM Data*; NASA; 2000-03-01 to 2002-10-31; $346,439.
- • K. P. Bowman, D. Z. Sui, J. F. Griffiths, J. P. McGuirk, G. R. North, N. W. Tindale, and T. T. Wilheit: *A Distributed Environmental Data Server*. NASA MTPE. 1997-10-01 to 1998-09
- 30. $295,691.
- North, G. R., and K. P. Bowman: *Statistical Sampling and Estimation Problems Using TRMM Data*; NASA; 1997-03-01 to 2000-02-28; $350,000.
- Bowman, K. P.: *Observational and Modeling Studies of Transport and Mixing in the Stratosphere and Troposphere*; NASA Atmospheric Chemistry Modeling and Analysis Program; 1997-02-01 to 2000-01-31; $225,806.
- Valdes, J., K. P. Bowman, and G. Fipps: *Soil Moisture and Agricultural Water Uses in a Changing Climate: Coupling a Regional Hydrologic Model with GCM Estimates*; DOE NIGEC; 1995-09-01 to 1998-08-31; $243,000.
- Valdes, J., and K. P. Bowman: *Soil Moisture in a Changing Climate: An Interdisciplinary Study of Coupling a Regional Hydrologic Model with GCM Estimates*; Texas A&M Interdisciplinary Research Initiatives Award; 1995-06-01 to 1996-05-31; $19,600.
- Carrie, G.: *Texas Institute of Oceanography Fellowship*; 1995-01-01 to 1995-12-31; $15,000.
- Dahlberg, S. P.: *Graduate Student Researchers Program Training Grant*; NASA; 1993-0901 to 1996-08-31; $66,000.
- Bowman, K. P.: *Observational and Model Studies of Large-Scale Mixing Processes in the Stratosphere*; NASA Upper Atmosphere Research Program; 1993-03-01 to 1997-02-29; $281,000.
- M. K. Ramamurthy and K. P. Bowman: *Online Meteorological Data Analysis System*, NSF,

1990-10-01 to 1991-09-30, $13,075.

- Bowman, K. P., J. E. Walsh, and R. B.. Wilhelmson: *An Interactive Environment for Studying Large Earth Observation and Model Data Sets*, NASA, 1990-07-01 to 1993-06-30, $597,577.
- Bowman, K. P.: *Studies of Dynamical Processes Affecting the Distribution of Stratospheric Ozone*, NASA/Upper Atmosphere Theory and Data Analysis Program, 1990-01-01 to 199212-31, 1992, $179,473.
- Bowman, J. A., J. Shafer, and K. P. Bowman: *Climate Change and the Seasonal and Annual Ground-Water Balance*, Illinois Department of Energy and Natural Resources, 1989-07-15 to 1991-01-15, $11,542.
- Bowman, K. P.: *Research Experiences for Undergraduates*, NSF/Climate Dynamics Program, 1987-09-01 to 1988-03-31, $4,000.
- Bowman, K. P.: *Stochastic Models of Climate Variability*, NSF/Climate Dynamics Program, 1986-10-15 to 1989-03-31, $76,200.
- Bowman, K. P.: *An Observational Study of Recent High-Latitude Ozone Variations, NASA/ Upper Atmosphere Theory and Data Analysis Program*, 1986-11-01 to 1989-12-31, $100,977.

Sarah D. Brooks

Associate Professor
Department of Atmospheric Sciences
Texas A&M University

Tel: 001-979-845-5632
Fax: 001-979-862-4466
Email: sbrooks@tamu.edu

PROFESSIONAL INTERESTS

Aerosol chemical and physical processes. Warm and ice cloud nucleation. Urban and rural air quality. Aircraft, shipboard and ground-based measurements. Instrument development.

EDUCATION AND TRAINING

Massachusetts Institute of Technology	Chemistry	S.B., 1995
University of Colorado	Analytical Chemistry	Ph.D., 2002
Colorado State University	Atmospheric Science	Postdoc., 2002-2004

PROFESSIONAL AND RESEARCH EXPERIENCE

2011-present Associate Professor, Dept. of Atmospheric Sciences, Texas A&M University, TX

2005-2011 Assistant Professor, Dept. of Atmospheric Sciences, Texas A&M University, TX

1995-1997 Senior Research Technician, Dupont Corporate Catalysis Center, Wilmington, DE
Synthesized new metal oxide materials for catalytic oxidation chemistries.

1993 Undergraduate Research, Massachusetts Institute of Technology, Cambridge, MA
Advisor: Dr. Robert Field.

AWARDS

PECASE 2007, Presidential Early Career Award in Science and Engineering
(awarded by the White House, nominated through USDA)
National Science Foundation CAREER Award, 2006
Texas A&M Association of Former Students Outstanding Teacher Award, 2010
Research Mentor for 2 Student Research Week 2011 awardees,: Matthew Mahon: first place poster and Kristen Huang: second place oral presentation
Summer Research Institute Fellow in Interfacial and Condensed Phase Chemical Physics (at PNNL and Lawrence Berkeley National Laboratories, student, Naruki Hiranuma), 2009
Fulbright Scholar Faculty Host, for Rosendo Pichinte, University of El Salvador, 2010
National Atmospheric Deposition Program Student Travel Award (student, Naruki Hiranuma), 2008
AMS Student Travel Award (student, Naruki Hiranuma), 2007
AMS Student Conference Presentation (student, Naruki Hiranuma) 3rd place, 2007
Texas A&M Regents' Fellowship (student, Andrew Glen)
Texas A&M Faculty Travel Award, 2006
Pathways to the Doctorate Fellowship (with student, Naruki Hiranuma)
Texas A&M International Research Travel Award Grant (IRTAG), 2005
ACCESS award (Atmospheric Chemistry Colloquium for Emerging Senior Scientists) Sept. 2003
NASA CRYSTAL-FACE and SOLVE Group Achievement Awards, 2002 and 2001
European Aerosol Conference, Student Travel Award, September 2001
ICNAA Student Travel Award, August 2000

SYNERGISTIC ACTIVITIES

1. Participated in national and international measurement campaigns: DOE-ISDAC, Halo-Cast I, TEXAS-AQ2, NASA SOLVE, CRYSTAL-FACE, IDEAS III, AIRS II, and INSPECT II.
2. Host to Visiting Professor on Sabbatical, Dr. Allison Steiner, University of Michigan, current, and Fulbright Scholar, Professor Rosendo Pichinte, National University of El Salvador, 2010
3. Collaboration with PNNL and Lawrence Berkeley National Laboratories through the Summer Research Institute Program (student, Naruki Hiranuma).
4. Faculty mentor for 2 funded NSF REU programs in Atmospheric Sciences and Environmental Geosciences, 2010-present.
5. Served on review panel for German National Science Foundation, 2011.

SOCIETY MEMBERSHIPS

American Geophysical Union (AGU)
American Association for Aerosol Research (AAAR)
American Meteorological Society (AMS)

CURRENT GRADUATE STUDENTS

Andrew Glen (Ph.D.)
Chunhua Deng (Ph.D.)
John Orcutt (Ph.D.)
Ben Cole (Ph.D., co-chair with Dr. Ping Yang)

FORMER GRADUATE STUDENTS

Naruki Hiranuma (Ph.D., 2010)
Katie Suter (M.S., 2011)
Laura Mason (M.S., 2009)
Adam Fornea (M.S., 2008)
Jianxu Lu (co-chair, M.S., 2009)
Ben Cole (co-chair, M.S., 2012)

UNDERGRADUATE INDEPENDENT RESEACH MENTEES TO DATE

Reese Parker (current)
Kristen Collier (current)
Ben Stuart (current)
Will Hatheway
Kristin Huang
Matthew Mahon
Daniel Billingsley
Francisco Greg Vidaurri
Marissa Gonzales
Cameron Moore
Leah Cheek
Christina Barron
Roberto Farias

Jonathan Gramann
Daniel Pulis
Alicia Dale
Katie Suter (became a M.S. student in my group)
Duncan Axisa (M.S. independent study)

COURSES TAUGHT
ATMO 335 Atmospheric Thermodynamics
ATMO 689/489 - Laboratory Methods in Atmospheric and Environmental Chemistry
(Designed and taught new lecture and laboratory course)
Now an official course TAMU course
ATMO 465 - Air Pollution Meteorology (Writing-intensive course)
ATMO 446 - Physical Meteorology
ATMO 201 - Introduction to Atmospheric Sciences
GEOS 105 - Introduction to Environmental Sciences
GEOS 689/489 International Polar Year (Guest lecturer)

PROFESSIONAL AND SERVICE ACTIVITIES
National
AGU session convener and chair, Annual Meeting Fall 2012
Served on NASA review panel, 2006
Served on NSF Polar Programs review panel, 2007
Served on USDA-CREES Air Quality review panel, 2008
Served on DOE SBIR review panel, 2009
Served on NOAA SBIR review panel (remote) 2009
Participated in International Polar Year Measurement Campaign, ISDAC, Barrow AK, April 2008
Attended the Earth Science Women's Network Career Development Meeting, Dec. 2008.
Attended the ARPA-E Energy Innovation Summit, 2010.
Reviewer for Journal of Geophysical Research, Geophysical Research Letters, Aerosol Science and Technology, Physical Chemistry, Chemical Physics, and Atmospheric Chemistry and Physics, Physical Chemistry Chemical Physics (PCCP), Atmospheric Chemistry and Physics, NOAA SBIR program and the National Environmental Research

International
Invited Workshop Discussion Leader, SOLAS Air-Sea Exchange Workshop, Kiel, Germany 2012
Served on review panel for German National Science Foundation, 2011
Reviewer for Council (NERC), United Kingdom
Fulbright Scholar Host for Dr. Rosendo Pichinte, National University of El Salvador, 2010
REU Research Mentor/Field Project Supervisor, Soltic Center, Costa Rica, Summer 2011&2012

REFEREED PUBLICATIONS
Hiranuma, N.*, S.D. Brooks, R. Moffet, M. Gilles, A. Laskin, A. Zelenyuk, A. Glen*, The role of chemical composition in ice nucleation during the Arctic spring, 2013, *J. Geophys. Res*, accepted.

Glen, A. and S.D. Brooks (2013), A new method for measuring optical scattering properties of atmospherically relevant dusts using the Cloud Aerosol Spectrometer Polarization (CASPOL) Instrument, *Atmos. Chem. Phys.,* 13, 1345-1356, doi:10.5194/acp-13-1345-2013.

Avzianova, A. and S.D. Brooks, Raman spectroscopy of glyoxal oligomers in aqueous solutions *(2013) *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy 101*,40-48.

Glen, A.* and S.D. Brooks, A new method for measuring optical scattering properties of atmospherically relevant dusts using the Cloud Aerosol Spectrometer Polarization (CASPOL) Instrument (2012) Atmos. Chem. Phys. Discuss., 12, 22415-22449, doi:10.5194/acpd-12-22415-2012.

Jackson, R.C., G.M. McFarquhar, A.V. Korolev, J.W. Strapp, M.E. Earle, P. Liu, R.P. Lawson, S.D. Brooks, M. Wolde, M. Freer, The dependence of arctic mixed phase stratus ice cloud microphysics on aerosol concentration using observations acquired during ISDAC and M-PACE (2012) J. Geophys. Res., doi:D1520710.1029/2012jd017668.

Hiranuma, N.* and S.D. Brooks, J. Gramann, and B. Auvermann, High concentrations of coarse particles emitted from a cattle feeding operation (2011), *Atmos. Chem. Phys*. 11, 8809-8823, doi:1-5194/acp-11-8809-2011.

Avramov, A., A.S. Ackerman, A.M. Frinlind, B. Van Diendenhoven, G. Botta, K. Aydin, J. Verlinde, A.V. Korolev, G.M. McFarquhar, R. Jackson, S.D. Brooks, A. Glen*, and M. Wolde, Towards ice formation closure (2011), J. Geophys. Res., 116, D00T08, doi:10.1029/2011JD015910.

Hiranuma, N.*, S.D. Brooks, J. Gramann, and B. Auvermann, The unique properties of agricultural aerosols: Emissions from a cattle feeding operation, *Atmos. Chem. Phys. Discuss*., 11, 14417-14453 (2011), doi:10:519/acpd-11-14417/21011.

McFarquhar, G.M., S. Ghan, J.Verlinde, A. Korolev, J.W. Strapp, B. Schmid, J. Tomlinson, M. Wolde, S.D. Brooks, D. Collins, D. Cziczo, M. Dubey, J. Fan, C. Flynn, I. Gultepe, J. Hubbe, M. Gilles, G. Kok, A. Laskin, P. Lawson, P. Liu, X. Liu, D. Lubin, C. Mazzoleni, A. Macdonald, R. Moffet, H. Morrison, M. Ovtchinnikov, D. Ronfeld, M. Shupe, D. Turner, S. Xie, A. Zelenyuk, and A. Glen*, "Indirect and Semi-Direct Aerosol Campaign (ISDAC): The impact of arctic aerosols on clouds," (2011) Bull. Amer. Meteor. Soc., doi: 10.1175/2010BAMS2935.1.2011.

Hiranuma, N., S.D. Brooks, D.C.O. Thornton, and B.W. Auvermann, "Atmospheric ammonia concentrations at an open-air cattle feeding facility," *J. Air & Waste Manage. Assoc*. 60:210–218, DOI:10.3155/1047-3289.60.2.210, 2010.

Atkinson, D.B., P. Massoli, N. T. O'Neill, P. K. Quinn, S.D. Brooks, and B. Lefer, "Comparison of in situ and columnar aerosol spectral measurements during TexAQS-GoMACCS 2006: Testing parameterizations for estimating aerosol fine mode properties," *Atmos. Chem. Phys*., 10, 51–61, 2010.

Brooks, S.D., M. Gonzales*, and R. Farias*, "Using surface tension measurements to understand how pollution can influence cloud formation, fog, and precipitation," *Journal of Chemical Education,* 86 (7), 838-841, 2009.

Fornea, A.P.*, S.D. Brooks, J. B. Dooley*, and A. Saha, "Heterogeneous freezing of ice on atmospheric aerosols containing ash, soot, and soil," *J. Geophys. Res*., *114*, D13201, doi:10.1029/2009JD011958, 2009.

Wright, M.E., Atkinson, D.B. L. Ziemba, R. Griffin, N. Hiranuma*, S.D. Brooks, B. Lefer, J. Flynn, R. Perna, B. Rappengluck, W. Luke, P. Kelley, "Extensive aerosol optical properties

and aerosol mass related measurements during TRAMP/TexAQS 2006 - Implications for PM compliance and planning, " *Atmospheric Environment*, doi:10.1016/j.atmosenv.2008.12.055, 2009.

DeMott, P. J., K. Sassen, M. R. Poellot, D. Baumgardner, D. C. Rogers, S. D. Brooks, A. J. Prenni, and S. M. Kreidenweis, Correction to "African dust aerosols as atmospheric ice nuclei," *Geophys. Res. Lett.,* 36, L07808, doi:10.1029/2009GL037639, 2009.

Atkinson, D.B., P. Massoli, N. T. O'Neill, P. K. Quinn, S.D. Brooks, and B. Lefer, "Comparison of in situ and columnar aerosol spectral measurements during TexAQS-GoMACCS 2006: Testing parameterizations for estimating aerosol fine mode properties" *Atmos. Chem. Phys. Discuss.,* 9, 17465-17494, 2009.

Hiranuma, N.*, S.D. Brooks, B. Auvermann, and R. Littleton, "Chemical and hygroscopic properties of agricultural aerosols," *Atmospheric Environment*, 42, 1983-1994, 2008.

Prenni, A.J., P.J. DeMott, C. Twohy, M.R. Poellot, S.M. Kreidenweis, D.C. Rogers, S.D. Brooks, M. Richardson, and A.J. Heymsfield, "Examinations of ice formation processes in Florida cumuli using ice nuclei measurements of anvil ice crystal particle residues," *J. Geophys. Res.,* 112, D10221, doi:10.1029/2006JD007549, 2007.

Cziczo, D.J., P.J. DeMott, S.D. Brooks, A.J. Prenni, D.S. Thomson, D. Baumgardner, J.C. Wilson, S.M. Kreidenweis, and D.M. Murphy, "Observations of organic species and atmospheric ice formation," *J. Geophys. Res. Letts.,* 31, L12166, doi: 10.1029/2004GL019822, 2004.

Brooks, S.D., P.J. DeMott, and S.M. Kreidenweis, "Water uptake by particles containing humic materials and mixtures of humic materials with ammonium sulfate," *Atmos. Environ.,* 38(13) 1859-1868, 2004.

Brooks, S.D., O.B. Toon, M.A. Tolbert, D. Baumgardner, B. Gandrud, E. Browell, H. Flentje, J.C. Wilson, "Polar stratospheric clouds during SOLVE/THESEO: Comparison of lidar observations with in-situ measurements," *J. Geophys. Res.,* 109(D2), D02109, doi:10.1029/2003JD003912, 2004.

Brooks, S.D., D. Baumgardner, B. Gandrud, J.E. Dye, M.J. Northway, D.W. Fahey, T.P. Bui, O.B. Toon, M.A. Tolbert, "Measurements of large stratospheric particles in the Arctic polar vortex," *J. Geophys. Res.,* 108 (D20), 4652, 2003.

DeMott, P.J., K. Sassen, M.R. Poellot, D. Baumgardner, D.C. Rogers, S.D. Brooks, A. J. Prenni, and S.M. Kreidenweis, "African dust aerosols as atmospheric ice nuclei," *Geophys. Res. Lett.,* 30 (14): Art. No. 173, 2003.

Wise, M.E., S.D. Brooks, R.M. Garland, D.J. Cziczo, S.T. Martin, and M.A. Tolbert, "Solubility and freezing effects of Fe^{2+} and Mg^{2+} in H_2SO_4 solutions representative of upper tropospheric and lower stratospheric sulfate particles," *J. Geophys. Res.,* 108 (D14), 4434, 2003.

Brooks, S.D., R.M. Garland, M.E. Wise, M. Cushing, E. Hewitt, A. J. Prenni, and M.A. Tolbert, "Deliquescence and efflorescence of mixed maleic acid/ammonium sulfate aerosols," *J. Geophys. Res.,* 108(D15), 4487, 2003.

Brooks, S.D., M.E. Wise, M. Cushing, and M.A. Tolbert, "Deliquescence behavior of organic/ammonium sulfate aerosol," *Geophys. Res. Letts.,* 29 (19), 23- 1-4, 2002.

Prenni, A.J., M.E. Wise, S.D. Brooks, and M.A. Tolbert, "Ice nucleation in sulfuric acid and ammonium sulfate," *J. Geophys. Res.,* 106(D3), 3037-3044, 2001.

Onasch, T.B., R.L. Siefert, S.D. Brooks, A.J. Prenni, B. Murray, M.A. Wilson, and M.A. Tolbert, "Infrared spectroscopic study of the deliquescence and efflorescence of ammonium sulfate aerosol as a function of temperature," *J. Geophys. Res.,* 104(D17), 21,317-21,326, 1999.

UNREFEREED PUBLICATIONS

Hiranuma, N.*, S.D. Brooks, Technical report: The loss rate of Perma Pure PD-Series Dryer for low air flow applications, Sept. 2007.

Hiranuma, N.*, S.D. Brooks, B. Auvermann, R. Littleton, "Size distribution and hygroscopic properties of agricultural aerosols," *Proceedings of the 9th Annual Atmospheric Symposium*, American Meteorological Society, San Antonio, TX, January 2007.

Brooks, S.D. and L.E. Mason*, "Linking aerosol chemistry to water uptake and cloud formation," *Proceeding of the 58th Annual Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy,* Chicago, March 2007.

DeMott, P.J., D. Cziczo, J. Jimenez, S.D. Brooks, M. Richardson, E. Dunlea, K. Koehler, A. Prenni, S. Kreidenweis, R. Borys, and D. Murphy, "Physical and chemical impacts of the ice nucleating properties of atmospheric particles," *Proceedings of the 14th International Conference on Clouds and Precipitation,* Bologna, Italy, July 2004.

Brooks, S.D., A.J. Prenni, M. E. Wise, and M.A. Tolbert, "Phase changes in internally mixed organic/sulfate aerosols," *Nucleation and Atmospheric Aerosols 2000: 15th International Conference,* American Institute of Physics, 728-731.

Prenni, A.J., M.E. Wise, S.D. Brooks, and M.A. Tolbert, "Laboratory studies of ice nucleation in sulfate particles: Implications for cirrus clouds," *Nucleation and Atmospheric Aerosols 2000: 15th International Conference,* American Institute of Physics, 471-474.

Brooks, S.D., "What women scientists still need to SOLVE," *Sojourner, the Women's Forum*, Vol. 6, No. 5, January 2001.

* denotes student of mine.

Total of 383 citations since 1999 (according to webofscience.com).

Funding Record:

Supporting Agency	**Project Title**	**Award Amount**	**Period of Project**
Texas Air Research Center	Component Based Particulate Matter Risk Assessment for Texas PI: Sarah Brooks	$27,000	**6/1/2012-** **7/31/2013**
TAMU Tier One Program (TOP) Interdisciplinary Education	Laboratory in Air: Experiential learning, multi-disciplinary collaboration and green transport technology	$300,000 To Brooks $41,000	6/1/2012- 5/31/2015

Grant	PI: Sharath Girimaji		
National Science Foundation Physical and Dynamical Meteorology	EAGER: Marine Biogenic Aerosols as Cloud Condensation Nuclei over the Pacific Ocean PI: Sarah Brooks	~$140,000 To Brooks, $96,000	03/15/2010-12/30/2012
Norman Hackerman Advanced Research Program	Improved Assessments of Texas Air Quality: Atmospheric Aerosol Composition by Raman Microspectroscopy PI: Sarah Brooks	$150,000	06/01/2010-05/30/2013
National Science Foundation Faculty Early Career Development Program (Atmospheric Chemistry)	**CAREER:** Chemical Processing and Cloud Nucleation Activity of Soot Aerosols PI: Sarah Brooks	$627,645	1/1/2006-12/31/2012

CURRICULUM VITAE

Robert C. Burghardt, Ph.D.

PRESENT POSITION AND ADDRESS:

Title: Professor of Veterinary Integrative Biosciences,
Toxicology, Reproductive Biology, and Biotechnology
Office: B.8E Vet. Med. Admin. Bldg. Phone: 979-862-4083
FAX: 979-847-8981
Email: rburghardt@cvm.tamu.edu

EDUCATION:

Degree/Training	Conferring Institution	Field	Year
B.S.	University of Michigan	Zoology	1969
M.S.	Wayne State University	Biology	1973
Ph.D.	Wayne State University	Biology	1976
Postdoctoral	Harvard Medical School	Reproductive Biology	1976-78

PROFESSIONAL EXPERIENCE AND ACADEMIC APPOINTMENTS:

1991 -	Professor, Department of Veterinary Integrative Biosciences, Texas A&M University (TAMU), previously known as Veterinary Anatomy & Public Health
1987 -	Director, Image Analysis Laboratory, College of Veterinary Medicine, TAMU
1990-	Member, Graduate Faculty, Texas A&M Health Science Center
1991 -	Member, Interdisciplinary Faculty of Toxicology
2005 - 2010	Chair, Interdisciplinary Faculty of Toxicology
2010 -	Vice chair, Interdisciplinary Faculty of Toxicology
1992 -	Faculty, Center for Animal Biotechnology and Genomics
1995 -	Faculty, Center for Food Safety
1998 -	Member, Interdisciplinary Faculty of Reproductive Biology
2010 - 2012	Chair, Interdisciplinary Faculty of Reproductive Biology
2001 -	Member, Interdisciplinary Faculty of Biotechnology
1999 - 2007	Associate Director, Center for Environmental and Rural Health, TAMU
1987 - 1991	Associate Professor, Department of Veterinary Anatomy and Public Health, TAMU
1984 - 1987	Associate Professor, Department of Biology, TAMU
1982 - 1987	Director, Electron Microscopy Center, TAMU
1978 - 1984	Assistant Professor, Department of Biology, TAMU
1977 - 1978	Instructor, Department of Anatomy, Harvard Medical School

AWARDS AND HONORS:

Ford Foundation Postdoctoral Fellowship, Laboratory of Reproduction and Reproductive Biology, Harvard Medical School, 1976-1978

Carrington Veterinary Medical Division Faculty Research Award in Cell Biology and Immunology, College of Veterinary Medicine, 1994

Association of Former Students, College of Veterinary Medicine Distinguished Teaching Award, 1995

Wiley Distinguished Teaching Professorship in Veterinary Medicine, 2000-2003

Vice Chancellor's Award in Excellence for Team Research in Uterine Biology and Pregnancy, 2005, (Fuller W. Bazer, Robert C. Burghardt, Greg A. Johnson, Thomas E. Spencer and Guoyao Wu).

Society for the Study of Reproduction Distinguished Service Award, 2010.

EDITORIAL BOARDS:

Associate Editor, *Biology of Reproduction*, 1992-1995
Editorial Board Member, *Cells, Tissues, Organs*, 2004-present
Editorial Board Member, *Journal of Applied Toxicology*, 2006-present
Referring Editor, *Biology of Reproduction*: Responsible for editorial oversight for appeals to Editor-in-Chief for contested decisions, 2001-2004.

GRANT REVIEW COMMITTEES:

National Science Foundation
- Cell Biology Program, Ad hoc reviewer, March, 1986
- Physiological Processes Program, Ad hoc reviewer, March, 1991
- Signal Transduction and Regulation Program, Ad hoc reviewer, August, 1995.
- Integrative Animal Biology Program, Ad hoc reviewer, September, 2001; October 2002; March 2003

National Institutes of Health
- Program Project Grant Review, Maternal and Child Health Research Committee, National Institute of Child Health and Human Development, 9/26-28, 1990. Re-review of same Program Project Grant, 5/26/91.
- Biochemical Endocrinology Study Section, Child Health and Human Development, Pathophysiology of Endometriosis and Leiomyomata Uteri, Bethesda, MD, September 2-4, 1992.
- National Institute of General Medical Sciences, Special Emphasis Panel, MBRS Supplemental Instrumentation Grant Applications, Gaithersburg MD, April 30, 1996
- Temporary Member, Human Embryology and Development (HED-1) Study Section, October 21-22, 2002.
- Temporary Member, Human Embryology and Development (HED-1) Study Section, February 9-10, 2004.
- Member, NIEHS Environmental Health Sciences Review Committee, site-visit team reviewing NIEHS Center Grant Application, May 2-4, 2004.
- Member, NIH/NIGMS MBRS ES SEP Review Committee, June 17-18, 2004.
- Member, NIH, Special Study Section, Pregnancy & Perinatology, November, 2007
- Ad hoc reviewer, NIH/NIGMS, SCORE proposals, February 25-26, 2008.
- Member, NIH/USDA PAR Study Section, Research Using Agriculturally Important Domestic Species, March 21, 2011; March 27, 2012; March 26, 2013

National Cancer Institute, Role of the Microenvironment in Breast Cancer. February, 1994.

Louisiana Education Quality Support Fund Research and Development Program. Ad hoc reviewer for Board of Regents, January, 1992.

Veterans Health Administration

- Department of Veterans Affairs, Medical Research Service, Ad hoc reviewer, January, 1992.
- Environmental Hazards Research Centers Review Committee, November-December, 1999.

March of Dimes Birth Defects Foundation, Ad hoc reviewer, February, 1996.

United States Department of Agriculture
- Animal Reproductive Efficiency Program, National Research Initiative Competitive Grants Program, Ad hoc reviewer, April, 1994.
- Binational Agricultural Research Development (BARD) Program, Ad hoc reviewer, January, 1998
- Animal Reproductive Efficiency Program, USDA –CSREES National Research Initiative, Ad hoc reviewer, March, 1998, 1999, 2000, 2004
- Animal Reproductive Program, USDA –CSREES National Research Initiative, Ad hoc reviewer, January, 2008

Israel Science Foundation, administered by the Israel Academy of Sciences and Humanities, Ad hoc reviewer, March 1993; April, 1998

Natural Sciences and Engineering Research Council of Canada, September, 2001

March of Dimes Central Texas Chapter, Grants Review Committee, 1999, 2000, 2001, 2002

Wellcome Trust, Joint Infrastructure Fund,UK. November, 1999.

South Plains Foundation, July, 2002

Grant review for Pilot Interdisciplinary Research Projects from The BIO5 Institute, University of Arizona, May, 2006.

TEACHING EXPERIENCE:

Since joining Texas A&M University in 1978, formal teaching responsibilities have been primarily at the graduate level and focused in areas of Cell Biology and evolving technologies associated with analytical electron and optical microscopy. From 1978 to 1987 my academic appointment was in the Department of Biology in the College of Science with an additional appointment from 1982 to 1987, as Director of the Electron Microscopy Center

From 1978-1987 course responsibilities included:

BIOL 602 Transmission Electron Microscopy

BIOL 628 Scanning Electron Microscopy and X-ray Microanalysis

BIOL 430 Biological Imaging

BIOL 617 Cell Biology, Cell Signaling

In 1987, I accepted an appointment as Associate Professor of Veterinary Anatomy and Director of the College of Veterinary Medicine Image Analysis Laboratory (IAL). Development of the IAL as a state-of-the-art optical microscopy laboratory with individualized graduate student instrument and applications training and group training in Optical Microscopy Workshops has been a part of my teaching emphasis. Since 1987, I have also focused formal Cell Biology instruction in the dynamic areas of Cellular Signaling and Signal Transduction and instruction in Optical Microscopy. Regular contributions are made to other team taught courses.

Graduate Teaching responsibilities:

Course Title	Institution	Credit Hr	% of Course	Formal Contact Hr	Dates
VIBS 617 Cell Signaling	TAMU	1 hr	100%	15 1 hr lectures	Every Fall Semester 87-12
ANSC 689 Reproductive Biology II	TAMU	4 hr	6%	4hr	Spring, 2004
BIOT 689	TAMU	1 hr	8%	1.5 hr lecture/lab	Summer, 2002
PHEO/VAPH 605 Chemical Hazards Assessment	TAMU	3 hr	5%	4 hr lecture/lab	Fall, 2000, 2002, 2004, 2006, 2008
VMID 686 Scientific Ethics "Ethics of Scientific Imaging"	TAMU	2 hr	5%	2 hr	Spring, 98-12
VIBS 689 Optical Microscopy: Principles & Practice		3 hr	100%	15 1.5 hr lectures 30 2 hr labs	Fall, 2009 Every Spring Beginning 2010
VAPH 691 Graduate Research					Every semester
Workshops in Optical Microscopy	(all day workshops)				Every semester

Graduate Students*†:

Name	Degree	Institution	Advisor or Committee Member	Dates
Theodore Wing	M.S. candidate		Chair	2010
Huajun He	M.S. candidate (BIOT)		Chair	2009
Dana Dean	Ph.D.		Co-Chair with Dr. Jane Welsh	2009
Lauri Willingham-Rocky	Ph.D.		Chair	2008
Zara Berg	M.S. candidate (TOXI)		Chair	2008
Saeed Al-Ramadan	Ph.D.		Chair	2007
Mindy Wiles	Ph.D.		Co-Chair w TD Phillips	2004
Jane Garlow	M.S.		Co-Chair w FW Bazer	2002
William Day	Ph.D.		Chair	1999
Richard Hutchinson	D.V.M., Ph.D.		Chair	1998
Catharine Schwab	D.V.M., Ph.D. candidate.		Chair	(Deceased, 1996)
Jeff Bowen	Ph.D.		Chair	1996
Jana Echols	M.S.		Chair	1995
Hugh Dookwah	D.V.M., Ph.D.		Chair	1993
Anton Hoffman,	D.V.M., Ph.D.		Chair	1992
Adelaide Brady	Ph.D.		Chair	1992
Michelle Aucoin	D.V.M., Ph.D.		Chair	1992
Lisa Stein	Ph.D.		Chair	1990
Mary L. Treat	M.S.		Chair	1986
Ruth E. Lewis	Ph.D.		Co-Chair	1985
Dana Gaddy Kurten	M.S.		Chair	1985
Philip A. Mitchell	M.S.		Chair	1985

Leslie L. McKenzie-Graham M.S. Chair 1982

†Current service as Committee Member on 2 active M.S. and 20 Ph.D. programs (8 different departments/interdisciplinary degrees):

Name	Department	Degree Sought
Rui Xu	Biochemistry & Biophys.	Ph.D. Candidate
Gregory Johnson	Biochemistry & Biophys.	Ph.D. Candidate
Kristina Najjar	Biochemistry & Biophys.	Ph.D. Candidate
Harini Sreenivasappa	Biomedical Engineering	Ph.D. Condidate
James W. Frank	Biomedical Sciences	Ph.D. Candidate
Yang Gao	Biomedical Sciences	Ph.D. Candidate
JeHoon Lee	Biomedical Sciences	Ph.D. Candidate
Grace Chang	Biomdical Sciences	M.S. Candidate
Kiran Ramchandani	Biotechnology	M.S. Candidate
Amanda H. Vorpahl	Biotechnology	M.S. Candidate
Sarah M. Lane	Chemistry	M.S. Candidate
Amanda David	Chemistry	Ph.D. Candidate
Atashi Mukherjee	Chemistry	Ph.D. Candidate
Li-Jung Chen	Chemistry	Ph.D. Candidate
Olivia Ash	Physiol Reprod	Ph.D. Candidate
Radhakrishna Pulikanti	Physiol Reprod	Ph.D. Candidate
Sandeep Sreevalsan	Toxicology	Ph.D. Candidate
Xi Li	Toxicology	Ph.D. Candidate
Vijay Vansanthakumari	Toxicology	Ph.D. Candidate
Leung Alvin Tang	Toxicology	Ph.D. Candidate
David Morris	Veterinary Microbiology	Ph.D. Candidate
Gabriel Gomez	Veterinary Pathobiology	Ph.D. Candidate

*Additional service over 245 completed Ph.D. and M.S. Degrees since 1979 (see pages 40-45)

Postdoctoral Fellows: Name	Advisor or Committee Member	Dates
Michelle Aucoin	Advisor NRSA	90-92
Tommy Sewall	Advisor	96-98
Richard Hutchinson	Advisor	97-98
Greg Johnson	Co-Advisor	98-00
Igbal Awooda	Advisor	00-02
Frankie White	Co-Advisor	04-05
Jeffrey Catania	Advisor	06-07
David Erikson	Co-Advisor	07-10
Bryan White	Co-Advisor	10-12

TEACHING PROGRAMS

"Principles of Optical Microscopy," workshop developed with support from Wiley Professorship in Veterinary Medicine, 2000-2003.

This Principles of Optical Microscopy workshop was further developed for day-long, local and regional Microscopy and Imaging Workshops with joint funding from the American Association of Anatomists (AAA) and the Center for Environmental and Rural Health.

RESEARCH/SCHOLARLY ACTIVITIES:

Current Research Support

NIH NCI, "MicroRNAs as Targets for Colon Cancer Chemotherapy." S.H. Safe, PI, R.C. Burghardt, Collaborating Investigator, 6/30/09 to 4/30/14, $1,500,000, 5% effort.

NIH NIA, "Age-Dependent Nephrotoxicity Involves Loss of the N-cadherin/α-catenin Complex." A.R. Parrish, PI, R.C. Burghardt, Co-I, 04/15/10 to 03/31/16, $1,427,835, 10% effort.

NIH NCI, "Molecular Mechanisms and Applications of Ah Receptor-MicroRNA Interactions," S.H. Safe, PI, R.C. Burghardt, Co-I, 7/1/10 to 5/31/15, $1,609,735, 5% effort

DOD, (HBCU/MI), Partnership Training Award, Mandip Singh Sachdeva (Florida A&M University) and S.H.Safe, PIs, "The Role of Novel Substituted Diindolylmethane Analogues in the Treatment of Triple-Negative and ErbB2-Positive Breast Cancer" R.C. Burghardt and W.Porter Co-Mentors with Drs. Stephen Safe, 9/1/10 to 8/30/15, $1,400,000.

NIH NICHD, "Molecular Basis of Treating Endometriosis by Prostaglandin E2 Receptor Inhibitors," J. Arosh, PI, R.C. Burghardt, Collaborator, 8/25/2011 to 7/24/2013, $402,875.

NIH NICHD, "Prostaglandin E2 Signaling in Growth and Pains of Endometriosis." J.A. Arosh, PI, R.C. Burghardt, Collabortor, 10/01/11 to 9/30/13, $402,875.

NIH NIEHS "Chromium VI-induced Toxicity on Female Reproductive Function." S.K. Banu, PI, R.C. Burghardt, Collaborator, 8/6/11 to 7/31/13, $402,875.

NIH NICHD "Incorporation of Endothelial Progenitor Cells into Placental Vaculature." G.A. Johnson, PI, R.C. Burghardt, Co-I, 2/1/13 to 1/31/15, $395,018.

Previous Support (last 5 years)

Federal Agencies

9. National Institutes of Health, NIEHS. "Procedures to Assess the Hazards of a Superfund Site." Renewal: S.H. Safe, Director, R.C. Burghardt, Associate Director and Image Analysis Core Leader. 4/01/05 to 3/31/09, $3,400,000 Annual funding for Image Analysis Core, $65,000.

10. NIH, Bridges to the Doctorate in Reproductive Biology (BDRB) R25 GM075300. F.W. Bazer, PI; R.C. Burghardt and others, participating BDRB faculty. 9/01/06 to 8/31/09, $207,832 annual direct costs.

11. USDA, "Biological Functions of Galectin-15 in the Ovine Uterus." T.E. Spencer, PI, R.C. Burghardt, Co-I, 10% effort 7/01/05 to 6/30/09, $340,000.

12. NIH, "N-3 Fatty Acids Alter T-Cell Activation and Signaling." R.S. Chapkin, PI, R.C. Burghardt, Co-I, 09/01/06 to 8/31/11, $1,250,000 direct costs, 5% effort.

13. USDA, "Cellular Transport of Prostaglandins in Ovine Uterus. J. Arosh, PI, R.C. Burghardt, Collaborator, 01/06/2008 to 05/30/2011, $350,000 direct costs, 5% effort.

14. NIH,"Effects of Lactational Exposure to Chromium VI on Ovarian Development," Sakhila Banu, PI, RC Burghardt, Collaborator, 05/01/09 to 4/30/11, 5% effort.

15. NIH, "Endogenous Retroviruses in Conceptus Development and Placental Morphogenesis. T.E. Spencer, PI, R.C. Burghardt, Collaborator, 04/27/07 to 2/29/12, $1,250,000 direct costs, 5% effort

16. USDA, "Physiological Role of Prostaglandins and Interferon Tau in Conceptus Elongation and Endometrial Epithelial Function." T.E. Spencer, PD, F.W. Bazer and R.C. Burghardt, Co-PDs. 10/7/09 to 10/6/12, $350,000, 5% effort.

Equipment Grants

18. Various Institutional Funds totaling $284,000 for a Morgani 268 digital transmission electron microscope cost shared among CVM Departments VIBS $80K, VTPB $80K, CVM Deans Office $68K, VTPP $20K, LACS $10K, SACS $10K, Texas A&M Health Sciences Center, $10K, and the Animal Science Department $6K, and Image Analysis Laboratory, 2008

19. Various Institutional Funds totaling $258,184 for a Zeiss TIRF3 Microscope system, cost shared among VTPB, VIBS, ANSC, Texas AgriLife, IAL, CVM, and multiple individual investigators, 2009.

Teaching Grants

1. Center for Teaching Excellence, Incentive Grant, "Computer Based Self-instructional Aids for Microscopy and the Theory of Image Formation." 4/1/00 to 3/31/01, $1,000.

2. Wiley Distinguished Teaching Professorship in Veterinary Medicine, 2000-2003 Basic Science Teaching Award, 9/1/00 to 8/30/03, $15,000.

3. AAA Outreach grant, Increasing Awareness and Use of Microscopy and Imaging by Veterinary Scientists," American Association of Anatomists. LA Jaeger, PI, RC Burghardt, Co-PI., 2003-2004, $3,000.

Pending Support

USDA, ""The Role of Intraluteal Prostaglandins in Luteolysis and Luteal Protection in Sheep". Joe A. Arosh, PD, R.C. Burghardt and others, Co-PDs, $500,000 12/1/13 to 11/31/17, 5% effort.

USDA "Water and Ion Transport in Porcine Placenta," G. Wu PD, G.A. Johnson, F.W. Bazer, RC. Burghardt, Co-PDs, $489,458, 12/1/13 to 11/31/17, 5% effort

PUBLICATIONS

Refereed Journals (last 5 years):

171. Laffin B, E Wellberg, H-I Kwak, RC Burghardt, RP Metz, T Gustafson, P Schedlin, WW Porter (2008) Loss of Single-minded-2s in the mouse mammary gland induces an epithelial mesenchymal transition associated with upregulation of SLUG and MMP2. Molec Cell Biol 26:1936-1946.

172. Kim J, G Song, H Gao, JL Farmer, MC Satterfield, RC Burghardt, G Wu, GA Johnson, TE Spencer, FW Bazer (2008) Insulin-like growth factor 2 (IGF2) activates PI3K-AKT1 and MAPK cell signaling pathways and stimulates proliferation and migration of ovine trophectoderm cells. Endocrinol 149:3085-3094.
173. Wu F, S Khan, Q Wu, R Barhoumi, R Burghardt, S Safe (2008) Ligand structure-dependent activation of estrogen receptor α / Sp by estrogens and xenoestrogens. J Ster Biochem Mol Biol 110:104-115.
174. Bruce E, R Autenrieth, R Burghardt, KC Donnelly, T McDonald (2008) Using quantitative structure-activity relationships (QSAR) to predict toxic endpoints for polycyclic aromatic hydrocarbons (PAH). J Toxicol Environ Health. A. 71:1073-1084.
175. Bridger PS, S Haupt, R Leiser, GA Johnson, RC Burghardt, H-R Tinneberg, C Pfarrer (2008) Integrin activation in bovine placentomes and in caruncular epithelial cells isolated from pregnant cows. Biol Reprod 79:274-282.
176. Banu SK, JB Samuel, JA Arosh, RC Burghardt, MM Aruldhas (2008) Lactational exposure to hexavalent chromium delays puberty by impairing ovarian development, steroidogenesis and pituitary hormone synthesis in developing Wistar rats. Toxicol Appl Pharmacol, 232:180-189.
177. Joyce MM, JR Burghardt, RC Burghardt, RN Hooper, FW Bazer, GA Johnson (2008) Uterine major histocompatibility Class I molecules and Beta 2 Microglobulin are regulated by progesterone and conceptus interferons during pig pregnancy. J Immunol, 181:2494–2505.
178. Dunlap KA, DW Erikson, RC Burghardt, FJ White, KM Reed, JL Farmer, TE Spencer, RR Magness, FW. Bazer, KJ Bayless, GA Johnson (2008) Progesterone and placentation increase secreted phosphoprotein one (SPP1 or osteopontin) in uterine glands and stroma for histotrophic and hematotrophic support of ovine pregnancy. Biol Reprod, 79:983-990.
179. Loudet A, J Han, R Barhoumi, J-P Pellois, RC Burghardt, K Burgess (2008) Non-covalent delivery of proteins into mammalian cells. Org Biomol Chem 6(24):4516-4522.
180. Song G, KA Dunlap, J Kim, DW Bailey, TE Spencer, RC Burghardt, GA Johnson, FW Bazer (2009) Stanniocalcin 1 is a luminal epithelial marker for implantation in pigs regulated by progesterone and estrogen. Endocrinology 150:936-950.
181. Bazer FW, RC Burghardt, GA Johnson, TE Spencer, G Wu (2008) Interferons and progesterone for establishment and maintenance of pregnancy: interactions among novel cell signaling pathways. Reprod Biol, 8:179-211. Review.
182. Burghardt RC, JR Burghardt, JD Taylor II, AT Reeder, BT Nguen, GA Johnson (2009) Enhanced focal adhesion assembly reflects increased mechanosensation and mechanotransduction at the maternal/conceptus interface and uterine wall during pregnancy in sheep. Reproduction, 137:567-582.
183. Han J, A Loudet, RB Mouneimne, RC Burghardt, K Burgess (2009) A ratiometric pH reporter for observing protein-dye conjugates in living cells. J Am Chem Soc 131:1642-1643.
184. Barhoumi R, JM Catania, AR Parrish, I Awooda, E Tiffany-Castiglioni, S Safe, RC Burghardt (2009) Multiphoton spectral analysis of benzo[a]pyrene uptake and metabolism in breast epithelial cell lines. J Tox Sci 34:13-25.
185. Bruce E, R Autenrieth, R Burghardt, KC Donnelly, T McDonald (2009) Modeling toxic endpoints for improving human health risk assessment of polycyclic aromatic hydrocarbons (PAH) - parent compounds and simple mixtures. Toxicol Environ Chem.91:137-156.
186. Parrish AR, G Chen, RC Burghardt, T Watanabe, C Morisseau, BD Hammock (2009) Attenuation of cisplatin nephrotoxicity by an inhibitor of soluble epoxide hydrolase. Cell Biol Toxicol, 25:217-225.
187. Banu, SK, A Starzinski-Powitz, VO Speights, RC Burghardt, JA Arosh (2009) Induction of peritoneal endometriosis in nude mice using human immortalized endometriosis epithelial and stromal cells: A potential experimental tool to study molecular pathogenesis of endometriosis in human. Fertil Steril 91(5 Suppl):2199-2209.

188. Liu J, M Westhusin, G Johnson, T Raudsepp, B Chowdhary, R Burghardt, C Long, D Kraemer (2009) Evaluation of culture systems for attachment and proliferation of epithelial cells cultured from ovine semen. Animal Reprod Sci 115:49-57.
189. Banerjee A, R Rose, GA Johnson, RC Burghardt, SK Ramaiah (2009) The influence of estrogen on hepatobiliary osteopontin expression in a female rodent model of alcoholic steatohepatitis. J Toxicol Pathol 37:492-501.
190. Wu L, A Loudet, R Barhoumi, R Burghardt, K Burgess (2009) Fluorescent cassettes for monitoring three-component interactions in vitro and ex vivo. J Am Chem Soc 131: 9156-9157.
191. Papineni S, S Chintharlapalli, M Abdelrahim, SO Lee, R Burghardt Abudayyeh A, Baker C, Herrera L, Safe S (2009) Tolfenamic acid inhibits esophageal cancer through repression of specificity proteins and c-met. Carcinogenesis 30: 1193-1201.
192. Figueriredo J, R Barhoumi, M Raffatellu, SD Lawhon, B Rousseau, RC Burghardt, RM Tsolis, AJ Bäumler, LG Adams (2009) Salmonella enterica serovar Typhimurium-induced internalization and IL-8 expression in HeLa cells does not have a direct relationship with intracellular Ca^{2+} levels. Microbes Infect 11: 850-858.
193. Simmons RM, D Erikson, J Kim, RC Burghardt, FW. Bazer, GA Johnson, TE Spencer (2009) IGFBP1 is a universal endometrial marker of conceptus elongation in the ruminant uterus and stimulates trophectoderm migration and attachment. Endocrinology 150: 4295-4305.
194. Bazer F, T Spencer, G Johnson, R Burghardt, G Wu (2009). Comparative aspects of implantation. Reproduction 138:195-209. Review.
195. Barhoumi R, Y Qian, RC Burghardt, E Tiffany-Castiglioni (2010) Image analysis of Ca^{2+} signals as a basis for neurotoxicity assays: Promises and challenges. Neurotoxicol Teratol 32:16-24. Review.
196. Erikson DW, RC. Burghardt, KJ Bayless, GA Johnson. (2009) Secreted phosphoprotein I (SPP1, osteopontin) binds to integrin alphavbeta6 on trophectoderm cells and integrin alphavbeta3 on uterine epithelial cells and promotes trophectoderm cell adhesion and migration. Biol Reprod 81:814-825.
197. Johnson GA, FW Bazer, RC Burghardt, TE Spencer, G Wu, KJ Bayless (2009) Conceptus-uterus interactions in pigs: endometrial gene expression in response to conceptus estrogen and interferons from conceptuses. Soc Reprod Fertil Suppl 66:321-332.
198. Bazer FW, H Gao, GA Johnson, G Wu, DW Bailey, RC Burghardt (2009) Select nutrients and glucose transporters in pig uteri and conceptuses. Soc Reprod Fertil Suppl 66:335-336.
199. Martinez JG, J Huang, RC Burghardt, R Barhoumi, RJ Carroll (2010) Use of multiple singular value decompositions to analyze complex intracellular calcium ion signals. Annal Appl Stat 3:1467-1492
200. Bazer FW, G Wu, TE Spencer, GA Johnson, RC Burghardt, K Bayless (2010) Novel pathways for implantation and establishment and maintenance of pregnancy in mammals. Mol Human Reprod 16:135-152. Review.
201. Massuto DA, EC Kneese, GA Johnson, RC Burghardt, RN Hooper, NH Ing, LA Jaeger. (2010) Transforming growth factor beta (TGFB) signaling is activated during porcine implantation: Proposed role for latency associated peptide withn integrins at the conceptus-maternal interface. Reproduction 139:465-478.
202. Wu G, FW Bazer, RC Burghardt, GA Johnson, SW Kim, X L Li, MC Satterfield, TE Spencer (2010) Impacts of amino acid nutrition on pregnancy outcome in pigs: mechanisms and implications for swine production. J An Sci 88(E.Suppl.) E195-204.
203. Dunlap KA, H-I Kwak, RC Burghardt, FW Bazer, RR Magness, GA Johnson, KJ Bayless (2010) The sphingosine-1-phosphate (S1P) signaling pathway is regulated during pregnancy in sheep. Biol Reprod 82:876-887.
204. Song G, DW Bailey, K Dunlap, RC Burghardt, TE Spencer, FW Bazer, GA Johnson (2010) Cathepsin B, cathepsin L and cystatin C in the porcine uterus and placenta: potential roles in endometrial/placental remodeling and in fluid-phase transport of proteins secreted by uterine epithelia, across placental areolae and neonatal gut. Biol Reprod 82:854-864.

205. Nunes J, SD Lawhon, CA Rossetti, S Khare, JF Figueiredo, T Gull, RC Burghardt, AJ Bäumler, RM Tsolis, HL Andrews-Polymenis, LG Adams (2010) Morphologic and cytokine profile characterization of *Salmonella typhimurium* infection in calves with bovine leukocyte adhesion deficiency. Vet Pathol 47:322-333.
206. Jose J, A Loudet, Y Ueno, R Barhoumi, RC Burghardt, K Burgess (2010) Intracellular imaging of organelles with new water-soluble benzophenoxazine dyes. Org Biomol Chem 8:2052-2059.
207. Li X, FW Bazer, GA Johnson, RC Burghardt, DW Erikson, JW Frank, TE Spencer, I Shinzato, G Wu (2010) Dietary supplementation with 0.8% L-arginine between days 0 and 25 of gestation reduces litter size in gilts.J Nutr 140:1111-1116.
208. Kim J, DW Erikson, RC Burghardt, TE Spencer, G Wu, KJ Bayless, GA Johnson, FW Bazer (2010) Secreted phosphoprotein 1 binds integrins to initiate multiple cell signaling pathways, including FRAP1/mTOR, to support attachment and force-generated migration of trophectoderm cells. Matrix Biol 29:369-382.
209. Chadalapaka G, I Jutooru, R Burghardt, S Safe (2010) Drugs that target specificity proteins downregulate epidermal growth factor receptor in bladder cancer cells. Mol Cancer Res 8:739-750.
210. Jutooru I, G Ghadalapaka, S Sreevslsan, P Lei, R Barhoumi, R Burghardt, S Safe (2010) Arsenic trioxide downregulation of specificity protein (Sp) transcription factors and inhibits bladder cancer cell and tumor growth. Exp Cell Res 316:2174-2188.
211. Black S, F Arnaud, RC Burghardt, MC Satterfield, JGW Fleming, C Long, C Hanna, L Murphy, R Biek, M Palmarini, TE Spencer (2010) Viral particles of endogenous betaretroviruses (enJSRVs) are released in the sheep uterus and potentially infect the conceptus trophectoderm in a trans-species embryo transfer model. J Virol 84;9078-9085.
212. Liu J, M Westhusin, C Long, G Johnson, R Burghardt, D Kraemer (2010) Embryo production and possible species preservation by nucleus transfer of somatic cells isolated from bovine semen. Theriogeniology 74:1629-1635.
213. Bailey DW, KA Dunlap, DW Erikson, A Patel, FW Bazer, RC Burghardt, GA Johnson (2010) Effects of long-term progesterone on developmental and functional aspects of porcine uterine epithelia and vasculature: progesterone alone does not support development of uterine glands comparable to that of pregnancy. Reproduction, 140:583-594.
214. Bailey DW, KA Dunlap, DW Erikson, A Patel, FW Bazer, RC Burghardt, GA Johnson (2010) Effects of long-term progesterone exposure on uterine gene expression: progesterone alone does not induce secretion of secreted phosphoprotein 1 (SPP1) in pig glandular epithelium. Reproduction, 140:595-604.
215. Wu G, FW Bazer, RC Burghardt, GA Johnson, SW Kim, DA Knabe, P Li, XL Li, JR McKnight, MC Satterfield, TE Spencer (2011) Proline and hydroxyproline metabolism: implications for animal and human nutrition. Amino Acids 40:1053-1063.
216. Kim J, RC Burghardt, G Wu, GA Johnson, TE Spencer, FW Bazer (2011) Select nutrients in the ovine uterine lumen: VII. Effects of arginine, leucine, glutamine and glucose on cell signaling, proliferation and migration. Biol Reprod 84:62-69.
217. Kim J, RC Burghardt, G Wu, GA Johnson, TE Spencer, FW Bazer (2011) Select nutrients in the ovine uterine lumen: VIII. Arginine stimulates proliferation of ovine trophectoderm cells through mTOR-RPS6K-RPS6 signaling cascade and synthesis of nitric oxide and polyamines. Biol Reprod 84:70-78.
218. Vanderlaag K, Y Su, AE Frankel, RC Burghardt, R Barhoumi, G Chadalapaka, I Jutooru, S Safe (2010) 1,1-Bis(3'-indolyl)-1-(p-substituted phenyl)methanes induce autophagic cell death in estrogen receptor negative breast cancer. BMC Cancer 2010, 10:669.
219. Bazer FW, TE Spencer, GA Johnson, RC Burghardt (2011) Uterine receptivity to implantation of blastocysts in mammals. Frontiers in Bioscience, S3:745-767, January 1, 2011.
220. Wu G, FW Bazer, GA Johnson, DA Knabe, RC Burghardt, TE Spencer, XL Li, JJ Wang (2011) Triennial Growth Symposium: Important roles for L-glutamine in swine nutrition and production. J An Sci 89:2017-2030. Review.

221. Kim K, RC Burghardt, R. Barhoumi, S-O Lee, X Liu, S Safe (2011) Mdm2 regulates estrogen receptor alpha and estrogen-responsiveness in breast cancer cells. J Molec Endo 46:67-79.
222. Banu SK, JA Stanley, J Lee, SD Stephen, JA Arosh, PB Hoyer, RC Burghardt (2011) Hexavalent chromium-induced apoptosis of granulosa cells involves selective sub-cellular translocation of Bcl-2 members, ERK and p53. Toxicol Appl Pharmacol 251:253-266.
223. Kim J, RC Burghardt, G Wu, GA Johnson, TE Spencer, FW Bazer (2011) Select nutrients in the ovine uterine lumen: IX. Differential effects of arginine, leucine, glutamine, and glucose on interferon tau, ornithine decarboxylase and nitric oxide synthase in the ovine conceptus. Biol Reprod 84:1139-1147.
224. Loudet A, Y Ueno, L Wu, R Barhoumi, R Burghardt, K Burgess (2011) Organelle-selective energy transfer: as an indicator of intracellular environment. Bioorg Med Chem 21:1859-1851.
225. Barhoumi R, Y Mouneimne, E Ramos, C Morisseau, BD Hammock, S Safe, AR Parrish, RC Burghardt (2011) Multiphoton spectral analysis of benzo[a]pyrene uptake and metabolism in living cells. Toxicol Appl Pharmacol 253:45-56.
226. Jose J, A Loudet, Y Ueno, L Wu, H-Y Chen, DH Son R Barhoumi, R Burghardt, K Burgess (2011) Energy transfer cassettes in silica nanoparticles target intracellular organelles. Org Biomol Chem 9 3871-3877.
227. Stanley J, J Lee, TK Nithy, JA Arosh, RC Burghardt, SK Banu (2011) Chromium-VI arrests cell cycle and decreases granulosa cell proliferation by down-regulating cyclin-dependent kinases (CDK) and cyclins and up-regulating CDK-Inhibitors. Reprod Toxicol 32:112-123.
228. Kamkaew A, R Barhoumi, RC Burghardt, K Burgess (2011) Cationic polyfluorenes for intracellular delivery of proteins. Org Biomol Chem 9:6513-6518.
229. Bazer FW, G Song, J Kim, D Erikson, GA Johnson, RC Burghardt, H Gao, MC Satterfirld, TE Spencer, G Wu (2011) Mechanistic Mammalian Target of Rapamycin (MTOR) cell signaling: Effects of select nutrients and secreted phosphoprotein 1 on development of mammalian conceptuses. Molec Cell Endocrinol 354:22-33.
230. Gardiner L, A Akintola, G Chen, J Catania, J Bonventre, V Vaidya, RC Burghardt, J Tezeciakowski, A Parrish (2012) Structural equation modeling (SEM) highlights kidney injury molecule (KIM-1) as a biomarker for chronic kidney disease. Am J Nephrol 35:152-163.
231. Kim K, I Jutooru, G Chadalapaka, G Johnson, J Frank, R Burghardt, S Safe (2012) HOTAIR is a negative prognostic factor and exhibits pro-oncogenic activity in pancreatic cancer. Oncogene. 2012 May 21. doi: 10.1038/onc.2012.193. [Epub ahead of print]
232. Bazer FW, G Song, J Kim, KA Dunlap, MC Satterfield, GA Johnson, RC Burghardt, G Wu (2012) Uterine biology and pregnancy in pigs and sheep. J Anim Sci Biotech, 3:23 doi:10.1186/2049-1891-2-23.
233. Lee J, SK Banu, RC Burghardt, A Starzinski-Powitz, JA Arosh (2012) Selective inhibition of prostaglandin E2 receptors EP2 and EP4 inhibits adhesion of human endometriotic epithelial and stromal cells through suppression of integrin-mediated mechanisms. Biol Reprod, 2012 Dec 12. [Epub ahead of print].
234. Stanley JA, KK Sivakumar, TK Nithy, JA Arosh, PB Hoyer, RC Burghardt, SK Banu (2013) Postnatal exposure to chromium through mother's milk accelerates follicular atresia in F1 offspring through increased oxidative stress and depletion of antioxidant enzymes. Free Radic Biol Med. 2013 Mar 5. doi:pii: S0891-5849(13)00059-2. 10.1016/j.freeradbiomed.2013.02.006. [Epub ahead of print]

Book Chapters:

Burghardt RC, WH Fletcher (1990) Physiologic roles of gap junctional communication in reproduction. In: UTERINE FUNCTION: Molecular and Cellular Aspects (M. Carsden and R. Miller eds.), Plenum Publ., New York. pp. 277-313.

Burghardt RC, R Barhoumi, D Doolitte, TD Phillips (1994) Application of Cellular Fluorescence Imaging for In Vitro Toxicology Testing. In: Principles and Methods of Toxicology, 3rd Edition, AW Hayes, Ed. Raven Press, New York. pp 1231-1259.

Tiffany-Castiglioni E, ME Legare, LA Schneider, ED Harris, R Barhoumi, J Zmudzki, Y Qian, RC Burghardt (1996) Heavy Metal Effects in Glia. In: Paradigms of Neural Injury (J R Perez-Polo, Ed. Methods in Neurosciences, Volume 30, Academic Press, San Diego. pp 135-166.

Burghardt RC, J Bowen, FW Bazer (1998) Endocrine Control of Trophoblast-Uterine Epithelial Cell Interactions. In: Contemporary Endocrinology: Endocrinology of Pregnancy. FW Bazer, ed., Humana Press pp. 199-228.

Burghardt RC, R Droleskey (2006) Transmission Electron Microscopy. In: Current Protocols in Microbiology, John Wiley and Sons, Inc., 2.0.1-2.0.2. 39 pp.

Spencer TE, FW Bazer, GA Johnson, M Palmarini, RC Burghardt (2007) Fetal-maternal interactions during the establishment of pregnancy in ruminants. In: Reproduction in Domestic Ruminants VI. pp 379-396. Edited by JI Juengel, JF Murray and MF Smith. Nottingham University Press, Nottingham, UK.

Wu G, FW Bazer, RC Burghardt GA Johnson, SW Kim, DA Knabe, Lilong Li, MC Satterfield, SB Smith, TE Spencer (2010) Functional amino acids in swine nutrition and production. In: Dynamics in Animal Nutrition, (J. Doppenberg and P. van der Aar, eds.) Wageningemn Academic Publishers, pp 69-98.

Refereed Proceedings/Monographs/Technical Reports:

Fitz TA, RC Burghardt, MM Marr, TL Walden, CA Winkel (1989) Intercellular communication among SV40-transformed rat granulosa cells may be an index of differentiation. In: Eicosanoids and Other Bioactive Lipids in Cancer and Radiation Injury. (KV Honn, LJ Marnett, S Nigam, TL Walden, Jr, eds,), Kluwer Publ., Boston. pp. 363-367.

Burghardt RC, JM Ehrman, TC Stephens, and MF Hibbs (1990) Measurement of microscopic displacements in graphite/epoxy composite materials using a SEM-generated surface map. Proceedings of the XIIth International Congress for Electron Microscopy. Vol. IV, pp. 430-431.

Tuttle KL, JW Evans, DW Forrest, RC Burghardt (1991) Immunohistochemical localization of luteinizing hormone receptors in equine ovarian follicles. J. Reprod. Fert. Proceedings of the 5th International Symposium on Equine Reproduction. p. 635-636.

Pruitt JA, DW Forrest, RC Burghardt, JW Evans, DC Kraemer (1991) Viability and ultrastructure of equine embryos following culture in a static or dynamic system. J. Reprod. Fert. Proceedings of the 5th International Symposium on Equine Reproduction. pp 405-410.

Santos ECFD, DD Varner, RC Burghardt, DW Forrest, TL Blanchard (1995) Electrophoretic analysis of glycosaminoglycans from ovarian follicular fluid of mares. Biol Reprod Monograph 1:507-514.

Brady HA, TL Blanchard, JW Evans, DD Varner, W Day, CA Schwab, B Risek, NB Gilula, RC Burghardt (1995) Gap junction expression in equine endometrium. Biol Reprod Mono 1:393-402.

Burghardt RC, R Barhoumi Mouneimne, MA Walker, GR Newton (1996) Development of laser cytometric approaches to analyze cellular toxicity mechanisms induced by ionizing radiation. Radiation Studies Conference Proceedings, RADSCON'96, pp 82-86.

Burghardt RC, R Barhoumi (1997) Analysis of mechanisms of cellular injury on the micrometer scale. Microscopy and Microanalysis, Vol 3, Suppl 2, Proceedings: Microscopy and Microanalysis '97, pp 37-38.

Barhoumi R, RC Burghardt, DL Busbee, HR McDaniel (1997) Enhancement of glutathione levels and protection from chemically initiated glutathione depletion in rat liver cells by glyconutritionals. Proceedings of the Fisher Institute for Medical Research, Vol 1, No 1, November 1997. 5 pp.

Wilson CL, R Barhoumi, R Burghardt, A Miladi, A Jung (2000) Effects of JP-8 jet fuel on homeostasis of Clone 9 rat liver clls. JANNAF 18th Safety and Environmental Protection Subcommittee Meeting, 123-129. NASA Technical Reports Server.

Al-Ramadan S, SP Brinsko, LA Jaeger, SL Rigby, RC Burghardt (2002) Analysis of MUC-1 and integrin subunit expression in equine uterine epithelium and trophectoderm. Theriogenology, 58(2-4):829-832. Equine Reproduction VIII - Proceedings of the Eighth International Symposium on Equine Reproduction, Fort Collins, USA, July 2002

Bazer FW, GA Johnson, RC Burghardt (2004) "Implantation" In: Encyclopedia of Animal Science, Marcel Dekker, Inc., Print Published: 11/10/2004; Online Published: 10/29/2004, pages: 555 - 558 DOI: 10.1081/E-EAS-120019690.

PATENTS AND RELATED DISCOVERY ACTIVITIES

Patents:

U.S. Patent #6521402, Cryopreservation of Tissues for Use in Nuclear Transfer, Issue date 2/18/2003, RC Burghardt, ME Westhusin, D Dean.

Discovery Activities:

Invention disclosure #3549 TAMUS Office of Technology Commercialization, 2011, Spontaneously Immortalized Granulosa Cell Line Derived from the Rat Ovary. G Stoica and RC Burghardt.

Invention disclosure #1158 TAMU System Technology Licensing Office, 1997, Micro Electroporation Electrodes Y. Mouneimne, R. Barhoumi Mouneimne, R.C. Burghardt.

Invention disclosure #1220 TAMU System Technology Licensing Office, 1997, Signal Analysis Microscopy. R. Barhoumi Mouneimne, Y. Mouneimne, R.C. Burghardt.

Invention disclosure TAMU System Technology Licensing Office, 1997, Disposable Cell Culture Electroporation Chamber and Chamber Holder Y. Mouneimne, R. Barhoumi Mouneimne, R.C. Burghardt.

Invention disclosure: Universal binding system for diagnosis and therapy. Y Mouneimne, R Mouneimne, RC Burghardt, Submitted June 13, 2000.

Invention disclosure: #3237 TAMU System Office of Technology Commercialization, 2010, Multiphoton microscopy spectral analysis for identification and quantification of fluorescent environmental toxicants and their genotoxic and nongenotixic metabolites in living cells. R. Barhoumi Mounrimne and R.C Burghardt, September 24, 2010.

Invention disclosure #3459. TAMU System Office of Technology Commercialization, Spontaneously immortalized granulosa cell line derived from rat. G.Stoica and RC. Burghardt, June 29, 2011.

SERVICE ACTIVITIES:

Professional Organizations and Service:

Professional Organizations:
American Society for Cell Biology, Member, 1979-1998
American Association for Cancer Research, Member, 1992-1998
American Association for the Advancement of Science, Member, 1991-
Society for the Study of Reproduction, Member, 1984-
Society of Toxicology, Member, 1999-

Professional Service:
Editorial Board Member, *Cells Tissues Organs*, 2004-present
Editorial Board Member, *Journal of Applied Toxicology*, 2006-present

Service to the Society for the Study of Reproduction (SSR):

Associate Editor, *Biology of Reproduction*, 1992-1995.
Referring Editor, *Biology of Reproduction*. Responsible for editorial oversight for appeals to Editor-in-Chief for contested decisions, 2001-2004.

Member, Local Arrangements Committee, 1998 *SSR*, 31st Annual Meeting, College Station, TX.

Chair, Publications Committee, *SSR*, 1996-2000. Co-Chair 2005-2008. Responsible for developing proposal and selecting HighWire Press for production of *Biology of Reproduction* on the World Wide Web beginning July, 1998. Responsible for selection of Editor-in-Chief and Associate Editors for the term, 1999-2004 and for selection of Editors-in-Chief for the term beginning July, 2009 though 2013.

Director (Elected), Board of Directors, *SSR*, 2000-2003

Secretary (Elected), Member Executive Committee and Board of Directors, *SSR*, 2010-2013

Member, Awards Committee, *SSR*, 2003-2004.

Chair, Awards Committee, *SSR*, 2004-2005. Responsible for oversight of selection of individuals for major awards of the society including the Carl G. Hartman Award, The SSR Research Award, The SSR Distinguished Service Award, The New Investigator Award, Trainee Research Competition Awards (3 platform and 3 poster), and Trainee Travel Awards (about 40). Also developed with counterpart from the American Association for Reproductive Medicine (ASRM), a Speaker Exchange program recognizing the SSR Research Award and corresponding research award winner from ASRM at each others annual meeting.

Chair, Ad hoc Committee appointed by *SSR* President to develop recommendations for upgrading SSR website, 2005-2006.

Member, *SSR* Strategic Planning Committee, 2003-2004.
Chair, Strategic Planning Subcommittee for the Society's journal, *Biology of Reproduction*, 2003-2004.

Chair, SSR Strategic Planning Committee, *SSR*, 2008-2009.

Member, Strategic Planning Implementation Committee, *SSR*, 2010-2014

Service to Other Organizations

Coordinator, Texas Women's Reproductive Health Consortium, 2000-2004.
Member, Steering Committee, Texas Forum for Reproductive Sciences, 2000-2008; 2010-present

Member, Gulf Coast Society of Toxicology, 1997 Program Committee.

External reviewer for promotion decision (Professor), Department of Health Management and Policy, University of Michigan, July, 1992; July 2000.

External reviewer for tenure and promotion decision (Associate Professor with tenure), Department of Animal Science and Food Technology, Texas Tech University, September, 2000; September, 2001.

External reviewer for promotion decision (Professor), Department of Anatomy & Cell Biology, School of Medicine, East Carolina University, August, 2001.

External reviewer for promotion decision (Professor), Department of Environmental Health, University of Washington, January, 2002.

External reviewer for promotion decision (Associate Professor), Department of Environmental and Radiological Health Sciences, Colorado State University, August, 2004

External reviewer for renewal of Chaired Professorship, Department of Obstetrics & Gynecology, Texas A&M University System Health Science Center, Temple, TX, September, 2004.

External reviewer for promotion decision (Associate Professor), Department of Environmental and Radiological Health Sciences, Colorado State University, August, 2006.

External reviewer for the External Adademic Program Review Physiological Sciences Graduate Interdisciplinary Program, University of Arizona, Tucson, Arizona, April 13-14, 2010.

External reviewer for promotion decision (Professor Emeritus), Department of Physiology, University of Maryland School of Medicine, October, 2011.

External reviewer for promotion decision (Professor), Department of Biomedical Science, Oregon State University, November, 2011.

Guest Editor, *Domestic Animal Endocrinology*, Responsible for oversight of peer review of manuscripts submitted by members of *Domestic Animal Endocrinology* Editorial Office, 2001.

Manuscript Review for Journals: Review of between 25-35 manuscripts per year

Ad hoc reviewer for 48 different journals:

Acta Anatomica
American Journal of Obstetrics and Gynecology
American Journal of Physiology: Cell Physiology
American Journal of Physiology: Heart and Circulatory Physiology
American Journal of Physiology: Endocrinology and Metabolism
American Journal of Physiology: Regulatory, Integrative and Comparative Physiology
American Journal of Veterinary Research
Animal Reproduction Science
Birth Defects Research Part A: Clinical and Molecular Teratology
Biochemical Pharmacology
Biology of Reproduction
Bioorganic & Medicinal Chemistry Letters
BioTechniques
Cancer Chemotherapy and Pharmacology
Cancer Letters
Cancer Prevention Research
Cell and Tissue Research
Cells Tissues Organs
Cereal Chemistry
Comparative Biochemistry and Physiology

Differentiation
Domestic Animal Endocrinology
Endocrinology
European Journal of Obstetrics & Gynecology and Reproductive Biology
Experimental Cell Research
Food Additives and Contaminants
Human Reproduction
In Vitro Cellular and Developmental Biology
Journal of the American Aging Association
Journal of Animal Science
Journal of Animal Science and Biotechnology
Journal of Applied Toxicology
Journal of Cardiovascular Pharmacology
Journal of Endocrinology
Journal of Pharmacology and Experimental Therapeutics
Journal of Reproduction and Fertility
Life Sciences
Molecular and Cellular Biochemistry
Molecular Human Reproduction
Molecular Reproduction and Development
Neurotoxicology
Placenta
Reproduction
Reproductive Biology and Endocrinology
Society for Experimental Biology and Medicine
Theriogenology
Trends in Endocrinology & Metabolism
Toxicology Letters
Toxicological Sciences

Ad hoc reviewer for professional publishers:
Elsevier Science Ltd.

Major Committee Assignments:

Departmental:
Member, Search Committee, Developmental Biologist, 1990.
Member, Search Committee, Cell Biology/Histology Position, 1993
Member, Search Committee, Microscopic Anatomy, Fall 1993
Chair, Promotion and Tenure Committee, 1993-2005
Member, Promotion and Tenure Committee, 2005-present
Member, Department of Veterinary Anatomy & Public Health Executive Committee, 2000-present
Member, Search Committee, Microscopic Anatomy, 2000-2001
Chair, Search Committee, Gross Anatomy, Reproductive Biology, 2003
Member, Search Committee, Reproductive Biology, 2009-2010
Member, VIBS Strategic Planning Committee 2009-2010

College:
Director, Image Analysis Laboratory, 1987-present, College of Veterinary Medicine. Coordinated the development of a centralized analytical microscopy research laboratory for the College via consolidation of departmental resources and acquisition of new technologies. Responsible for purchase and subsequent upgrade of an ACAS 570 Interactive Laser

Cytometer (upgraded to a Meridian Ultima Confocal System), a JEOL JSM 25-SII scanning electron microscope, a Balzers Freeze Fracture Device, a Zeiss PM III photomicroscope, a Scanalytics fluorescence deconvolution workstation, PTI ratiometric fluorescence workstation, a Meridin InSIGHT Point video rate scanning laser confocal microscope, an image analysis workstation (Axiophot, 3 chip color camera, power Mac, digital printer, scanner), a Hacker Cryostat, a Bio-Tek Fluorescence/Absorbance Reader, Eppendorf micromanipulator/ microinjection system, Quantix, Orca DMX-1200, and Axiocam digital cameras, Bio-Rad MP 2000 Multi-photon microscope, Applied Spectral Imaging system, Stallion Dual Detection System, Olympus live cell imaging workstation, Zeiss 510 Meta NLO multiphoton confocal microscope, Veritas Laser Capture Dissection system, FEI Company Morgani TEM, Zeiss TIRF3 microscope, and others. Responsible for acquisition of support equipment including computers, film recorder, microtomes, cell culture facilities, photographic and gold sputtering equipment. Developed renovation plan and managed $300K laboratory renovation, 1998-1999. Developed laboratory policies and procedures and equipment instructional materials.

Media Resources Committee, 1988-1991. College of Veterinary Medicine.
Member, Building and Remodeling Committee, 1994-1995
Member, Imaging Symposium Committee, 1989.
Member, CVM Promotion and Tenure Committee, 1993-2005
Chair, CVM Promotion and Tenure Committee, 1997-1998
Member, Department Head Search Advisory Committee, 1998-1999
Member, CVM - Graduate Student Association, Travel Awards Committee, 1998-2000
Member, Search Committee, Chair in Stallion Reproduction, 2000-2001
Member, Signature Program Searches in Reproductive Biology, 2004-2005
Member, Cell Biologist Search Committee, Veterinary Pathobiology, 2007-2008
Member, Toxicologist Search Committee, Veterinary Physiology & Pharmacology, 2008-2009.
Advisor, CVM Postdoctoral Association, 2009-present
Member, Graduate Recruitment Task Force, 2010-2011
Member, CVM Strategic Planning Committee, 2010-2012

University:

Graduate Council Representative on Ph.D. examining committees, 1978-2003.
Member, Institutional Self-Study preparing for Southern Association of Colleges and Schools review. Section IX. Special Activities 1982-1983.
Member, Selection Committee, Faculty Distinguished Achievement Awards, 1987.
Member (ex officio), Electron Microscopy Advisory Committee, 1982-1987.
Member, Electron Microscopy Users Committee, 1987-1988.
Director, Texas A&M University Electron Microscopy Center, 1982-1987. Supervision of research operations for the campus electron microscope, electron microprobe research facility; coordinate teaching activities (3 graduate and 2 undergraduate courses); coordinate equipment proposals; responsible for acquisition of 3 electron microscopes (Philips 400T-NSF equipment grant, Zeiss 10C and JEOL JSM 35 through proposals for President's research incentive funds); obtained funding for Zeiss Photomicroscope III, an EDAX Energy-dispersive x-ray microanalyzer and a Zeiss SEM-IPS image memory/image processor-image analysis unit; verify equipment competence of new equipment users; provide consulting to University life- and physical sciences personnel.
Member, Search Committee for molecular biology/genetics/biochemistry position, Department of Animal Science, 1991-1992.
Member, Planning Committee, 1994 TAES Science Conference, 1993.
Member, National Science Board and Government University Industry Research Round table study, Individual Scholar Task Force Committee, 1994.

Member, Center for Food Safety Program and Scheduling Committee, 1995.
Chair, Research Assistantship Selection Committee, Faculty of Reproductive Biology, 1995-present
Member, Imaging and Visualization Resources Committee, 1996-1997
Member, Executive Committee, Center for Environmental and Rural Health, 1999-present
Member, Search Committee, E.M. Center Director, 1998-2000
Member, Search Committee, Physiological Genomics position, Department of Animal Science, 2001
Member, Search Committee, Reproductive Biology Signature Program Searches, 2004-2005 (two positions filled in 2004).
Member, Search Committee, Molecular Endocrinology position, Department of Animal Science, 2005
Member, Interdisciplinary Life Sciences Building Committee, 2005
Member, Research Roadmap Committee, 2009
Member, Working Group on Interdisciplinary Research Groups (IRGs) and Interdisciplinar Research Programs (IRPs), 2010-2011

University (Interdisciplinary Faculty Programs, Interdisciplinary Research Groups):
Member, Executive Committee, Faculty of Toxicology, 1998-present
Member, Faculty of Toxicology External Review Steering Committee, 1998-1999
Member, Executive Committee, Faculty of Reproductive Biology, 1999-2004; 2006-present
Member, Faculty of Reproductive Biology, Graduate Programs Committee, 2003-2005
Chair, Faculty of Toxicology, 2005-2010

Duties include: a) oversight of administrative activities of faculty (i.e., IFT administrative office (telephone, computer and software, supplies and small equipment) and staff salaries. Staff include a Program Assistant (100% effort), a Business Coordinator (15% effort) and a student worker); b) administrative oversight of applications/admissions of graduate students to Toxicology Program; c) administrative oversight of funding for Toxicology Seminar Series, Travel Awards (including 18 students to Society of Toxicology, Society of Environmental Toxicology and Chemistry, American Association for Cancer Research, Endocrine Society and Teritology Society, Keystone Conferences as well as attendance of 12 students to the Gulf Coast Chapter-Society of Toxicology); d) preparation of Annual Report of IFT to the Dean of Graduate Studies and Council of Participating Deans; e) Toxicology Seminar Series; g) Organization and scheduling of Annual Toxicology Graduate Student Forum (Dr. Weston Porter and Kim Daniel coordinate scheduling of venue and graduate student presentations;

Additonal one-time duties:

a) Preparation of 394 page Self-Study for External Review of the Toxicology Program in 2007; b) Organization and scheduling of Academic Program Review scheduled for May 6-9, 2007; c) Development of Outcomes Assessment Instrument and Core Competencies for the Interdisciplinary Faculty of Toxicology; d) Provide formal response to findings Academic Program Review to Office of Graduate Studies; e) Meet with Executive Vice President and Provost, Executive Associate Vice President for Research, Dean of Undergraduate Programs, Participating Deans, Assistant Dean of Graduate Studies and Dean, Office of Graduate Studies to review Academic Program Review; f) Obtained 2 new graduate student stipends through the Office of the Executive Vice President and Provost for IFT beginning Fall, 2007.

Vice-Chair, Faculty of Toxicology, 2010-present

Chair, Interdisciplinary Faculty of Reproductive Biology, 2010-present

Duties include: a) Oversight of administrative activities of faculty and IFRB Standing and ac hoc Committees; b) Administrative oversight of funding for Reproductive Biology

Seminar Series, Travel Awards to national and international meetings, and other trainee-focused enrichment activities; c) Preparation of Annual Report of IFRB to the Dean of Graduate Studies and Council of Participating Deans; d) Organization and scheduling of Annual Reproductive Biology Retreat, Retreat venue and catering; e) Assist with organization and scheduling of annual Dr. Raymond O. Berry Memorial Lecture; f) Collect information and prepare Spring and Fall IFRB Newsletters; f) Search for IFRB funding

Member, Faculty of Reproductive Biology, Seminar Committee, 2010-present

OTHER SCHOLARLY ACTIVITY:

Conferences, Symposia: Organized/Chaired (examples)

Coordinator, Texas Women's Health Consortium, 2000-2005, responsible for sponsoring 2 day annual meeting of the Texas Forum on Reproductive Biology at the Institute of Biosciences & Technology in Houston.

Invited Presentations, Symposia, Colloquia and Named Lectures (Past 5 years only).

"Integrating Advances in Optical Microscopy to Study Mechanisms of Cellular Injury and Mechanobiology of Pregnancy." Department of Environmental and Radiological Health Sciences, Colorado State University, March 10, 2008.

"Integration of Cellular Responses to Mechanical Forces of Pregnancy," Gordon Research Conference on Reproductive Tract Biology, Andover, NH, August 3-8, 2008.

"Mechanobiology of Pregnancy," Department of Physiology and Biomedical Engineering, Mayo Clinic College of Medicine, September 26, 2008.

"Integration of Cellular Responses to Mechanical Forces of Pregnancy," Toxicology Seminar Series, TAMU Interdisciplinary Faculty of Toxciology, September 14, 2009.

"Mechanical Force-induced Cell Signaling in the Uterus," Reproductive Biology Seminar Series, TAMU Interdisciplinary Faculty of Reproductive Biology, February 5, 2010.

"Mechanobiology of Pregnancy," Keynote speaker for the Center for Reproductive Biology and Health Annual Retreat, Penn State University, May 24-25, 2010.

"Mechanical Signals Impact the Function and Effectiveness of Hormones, Growth Factors & Nutrition in the Pregnant Uterus," Exercise Physiology Seminar Series, TAMU, February 28, 2011.

"Mechanical Signals Impact the Function and Effectiveness of Hormones, Growth Factors & Nutrition in the Pregnant Uterus," The 4th Special Biomodulation Symposium, Seoul National University, Seoul, Korea, May 16, 2011.

"Integrin Signaling in Pregnancy," International Symposium on Maternal Nutrition and Fetal Development, China Acricultural University, Beijing, China, May 21, 2011.

"Integrating Advances in Optical Microscopy to Study Mechanisms of Cellular Injury and Mechanobiology of Pregnancy/Parturition, Wuhan Polytechnic University, Wuhan, China, May 24, 2011

"Mechanisms of Cellular Injury: a Cellulomics Approach," Guangdong Insitute of Animal Science, Changsha, China, May 26, 2011

"Integrating Advances in Optical Microscopy to Study Mechanisms of Cellular Injury and Mechanobiology of Pregnancy/Parturition, South China Agricultural University & Guangdong Academy of Agricultural Sciences, Ghangzhou, China, May 27, 2011.

"Integrating Advances in Optical Microscopy for Interdisciplinary Research and Education," University Lecture Series, North Dakota State University, April 26, 2012.

"Eavesdropping on Animal Cells and Tissues at the Micrometer to Nanometer Scale," Department of Animal Science, Center for Nutrition and Pregnancy and the Advanced Imaging and Microscopy Laboratory, North Dakota State University, April 27, 2012.

"Microscopy and Photonics in Cancer," College of Pharmacy and Pharmaceutical Sciences, Florida A&M University, January 10, 2013.

DON R. COLLINS

Texas A&M University
(979) 845-6324
dcollins@tamu.edu
http://collinsgroup.tamu.edu

Last updated: May 1, 2013

GENERAL INFORMATION

EDUCATION

2000	**Ph.D.**, California Institute of Technology, Pasadena, CA Environmental Engineering Science *Advisors:* Drs. John H. Seinfeld and Richard C. Flagan
1994	**B.S.**, Virginia Tech, Blacksburg, VA Civil Engineering

PROFESSIONAL EXPERIENCE

2010 –	Director of Environmental Programs in Geosciences, Texas A&M University
2010 –	Professor of Atmospheric Sciences, Texas A&M University
2005 – 2010	Associate Professor of Atmospheric Sciences, Texas A&M University
1999 – 2005	Assistant Professor of Atmospheric Sciences, Texas A&M University

EDITORSHIPS

2007 – 2010	Associate Editor of the Journal of Geophysical Research - Atmospheres

PROFESSIONAL MEMBERSHIPS

- American Association for Aerosol Research
- American Chemical Society
- American Geophysical Union

HONORS AND AWARDS

- Texas A&M Dean's Distinguished Achievement Award for Faculty Research, 2007
- Texas A&M Association of Former Students College-Level Faculty Distinguished Award in Teaching, 2003
- Texas A&M Center for Teaching Excellence Montague Scholar Award, 2003

- National Science Foundation CAREER Award in Physical Meteorology and Atmospheric Chemistry, 2001
- National Aeronautics and Space Administration New Investigator Program (NIP) Award in Earth Science, 2001

CURRENT RESEARCH GROUP

Graduate students:

- Nathan Taylor (Ph.D)
- Manasi Mahish (Ph.D.)
- Gabriel Antonietti (M.S.)
- Jillianne Matus (M.S.)

Undergraduate students:

- Mark Benoit

Research Associates:

- Chance Spencer

FORMER GRADUATE STUDENTS

- Crystal Glen
  - Ph.D., 2010, *Observations of Secondary Organic Aerosol Production and Soot Aging Under Atmospheric Conditions using a Novel Environmental Aerosol Chamber*
  - Currently Senior Member of Research Staff at Sandia National Laboratory, Albuquerque, NM
- Jason Tomlinson
  - Ph.D., 2010, *The Evolution of the Physicochemical Properties of Aerosols in the Atmosphere*
  - Currently Scientist at Pacific Northwest National Laboratory, Richland, WA
- Roberto Gasparini
  - Ph.D., 2005, *Developing Models of Aerosol Representation to Investigate Composition, Evolution, Optical Properties, and CCN Spectra using Measurements of Size-resolved Hygroscopicity*
  - Currently Client Manager, Spirit Environmental, Houston, TX
- Joshua Santarpia
  - Ph.D., 2005, *The Application of Size-Resolved Hygroscopicity Measurements to Understanding the Physical and Chemical Properties of Ambient Aerosol*
  - Currently a Principal Member of Technical Staff, Fire and Aerosol Sciences, Sandia National Laboratories, Albuquerque, NM
- Yong Seob Lee

- Ph.D., 2004, *Investigation of the Optical and Cloud Forming Properties of Pollution, Biomass Burning, and Mineral Dust Aerosols*
  - Currently an Officer of the Korean Meteorological Administration, Seoul, Korea

- Duncan Axisa
  - M.S., 2009, *Aircraft Observations of Sub-cloud Aerosol and Convective Cloud Physical Properties*
  - Currently Associate Scientist III at NCAR, Boulder, CO

- Robert Osborn
  - M.S., 2006, *Isolation of Ambient Aerosols of Known Critical Supersaturation: The Differential critical Supersaturation Separator (DS_cS)*
  - Currently Air Quality Consultant, Spirit Environmental, Houston, TX

- Timothy Thomas
  - M.S., 2005, *Assessment of the Mixing State and Cloud Nucleating Efficiency of Asian Aerosols using Aircraft-based Measurements of Hygroscopicity*
  - Currently an Earth Science teacher at the North Rose-Wolcott High School, Wolcott, NY

- Christopher Allen
  - M.S., 2005, *The Seasonality of Optical Properties in Big Bend National Park*
  - Currently Staff Scientist, Zephyr Environmental, Houston, TX

RESEARCH SUMMARY

PUBLICATIONS

Submitted:

Levy, M., Zhang, R., Khalizov, A. F., Zheng, J., **Collins, D. R.**, Reed, C. C*., Yu, X-Y, Luke, W., Jayne, J. T., Olaguer, E.. "Measurements of submicron aerosols in Houston, Texas during the 2009 SHARP field campaign," submitted to *Journal of Geophysical Research – Atmospheres*.

Published (last 5 years):

52. Hallar, A. G.,Lowenthal, D. H., Clegg, S. L., Samburova, V, Taylor, N. F.*, Mazzoleni, L. R., Zielinska, B. K., Kristensen, T. B., Chirokova1, G., McCubbin, I. B., Dodson, C., **Collins, D. R.**, 2013. "Chemical and hygroscopic properties of aerosol organics at Storm Peak Laboratory," *Journal of Geophysical Research – Atmospheres*, doi-10.1002/jgrd.50373.

51. Khalizov, A., Lin, Y., Qiu, C., Guo, S., **Collins, D. R.**, and Zhang, R., 2013. "The role of OH-initiated oxidation of isoprene in aging of combustion soot," *Environmental Science and Technology,* 47, pp 2254-2263.

50. Vogelmann, A. M., McFarquhar, G. M., Ogren, J. A., Turner, D. D., Comstock, J. M., Feingold, G., Long, C. N., Jonsson, H. H., Bucholtz, A., **Collins, D. R.**, Diskin, G. S., Gerber, H., Lawson, R. P., Woods, R. K., Andrews, E., Yang, H. J., Chiu, J. C., Hartsock, D., Hubbe, J. M., Lo, C. M., Marshak, A., Monroe, J. W., McFarlane, S. A., Schmid, B., Tomlinson, J. M.*, Toto, T., 2012. "RACORO Extended-Term, Aircraft Observations of Boundary-Layer Clouds," *Bulletin of the American Meteorological Society,* 93, pp 861 - 878.

49. Tessendorf, S. A., Bruintjes, R. T., Weeks, C., Wilson, J. W., Knight, C. A., Roberts, R. D., Peter, J. R., Collis, S., Buseck, P. R., Freney, E., Dixon, M., Pocernich, M., Ikeda, K., Axisa, D.*, Nelson, E., May, P. T., Richter, H., Piketh, S., Burger, R. P., Wilson, L., Siems, S. T., Manton, M., Stone, R. C., Pepler, A., **Collins, D. R.**, Bringi, V. N., Thurai, M., Turner, L., McRae, D., 2012. "The Queensland Cloud Seeding Research Program," *Bulletin of the American Meteorological Society*, 93, pp 75 - 90.

48. Taylor, N. F.*, **Collins, D. R.**, Spencer, C. W., Lowenthal, D. W., Zielinska, B., Samburova, V., and Kumar, N., 2011. "Measurement of Ambient Aerosol Hydration State at Great Smoky Mountains National Park in the Southeastern United States," *Atmospheric Chemistry and Physics*, 11, pp 12085-12107.

47. Santarpia, J. L.*, **Collins, D. R.**, Hegg, D. A., Kaku, K. C., Covert, D. S., Jonsson, H. H., and Buzorius, G., 2011. "Estimates of aqueous-phase sulfate production from tandem differential mobility analysis," *Atmospheric Environment*, 45, pp 5484 – 5492.

46. Duplissy, J., DeCarlo, P. F., Dommem, J., Alfarra, M. R., Metzger, A., Barmpadimos, I., Prevot, A. S. H., Weingartner, E., Tritscher, T., Gysel, M., Aiken, A. C., Jimenez, J. L., Canagaratna, M. R., Worsnop, D. R., **Collins, D. R.**, Tomlinson, J.*, and Baltensperger, U., 2011. "Relating hygroscopicity and composition of organic aerosol particulate matter," *Atmospheric Chemistry and Physics*, 11, pp 1155-1165.

45. Wang, J., Cubison, M. J., Aiken, A. C., Jimenez, J. L., and **Collins, D. R.**, 2010. "The importance of aerosol mixing state and size-resolved composition on CCN concentration and the variation of the importance with atmospheric aging of aerosols," *Atmospheric Chemistry and Physics*, 10, pp 7267-7283.

44. Roberts, G. C., Day, D. A., Russell, L. M., Dunlea, E. J., Jimenez, J. L., Tomlinson, J. M.*, **Collins, D. R.**, Shinozuka, Y., and Clarke, A. D., 2010. "Characterization of particle cloud droplet activity and composition in the free troposphere and the boundary layer during INTEX-B," *Atmospheric Chemistry and Physics*, 10, pp 6627-6644.

43. Smith, J. N., Barsanti, K. C., Friedli, H. R., Ehn, M., Kulmala, M., **Collins, D. R.**, Scheckman, J. H., Williams, B. J., and McMurry, P. H., 2010. "Observations of aminium salts in atmospheric nanoparticles and possible climatic implications," *PNAS*, doi: 10.1073.

42. Jimenez, J. L., 26 co-authors, Tomlinson, J. M.*, **Collins, D. R.**, 33 co-authors., 2009. "Evolution of organic aerosols in the atmosphere," *Science*, 326, pp 1525-1529, doi: 10.1126.

41. Clements, A., Jia, Y., Fraser, M. P., Zhu, Y., Pudota, J., DenBleyker, A., Michel, E., **Collins, D. R.**, McDonal-Buller, E. C., and Allen, D. T., 2009. "Air pollutant concentrations near three Texas roadways, Part II: Chemical characterization and transformation of pollutants," *Atmospheric Environment*, 43, pp 4523-4534.

40. Zhu, Y., Pudota, J., **Collins, D. R.**, Allen, D. T., Clements, A., Denbleyker, A., Fraser, M. P., Jia, Y., McDonald-Buller, E. C., and Michel, E., 2009. "Air pollutant concentrations near three Texas roadways, Part I: Ultrafine particles," *Atmospheric Environment*, 43, pp 4513-4522.

39. Lowenthal, D. H., Zielinska, B., Mason, B., Samy, S., Samburova, V., **Collins, D. R.**, Spencer, C.W., Taylor, N. F.*, Allen, J. O., and Kumar, N., 2009. "Aerosol characterization studies at Great Smoky Mountains National Park, Summer, 2006," *Journal of Geophysical Research – Atmospheres,* doi:10.1029/2008JD011274.

38. Dunlea, E. J., DeCarlo, P. F., Aiken, A. C., Kimmel, J. R., Peltier, R. E., Weber, R. J., Tomlinson, J. M.*, **Collins, D. R**., Shinozuka, Y., McNaughton, C. S., Howell, S. G., Clarke, A. D., Emmons, L. K., Apel, E. C., Pfister, G. G., Donkelaar, A., Martin, R. V., Millet, D. B., Heald, C. L., and Jimenez, J. L., 2009. "Evolution of Asian aerosols during transpacific transport in INTEX-B," *Atmospheric Chemistry and Physics*, 9, pp 2757-7287.

37. Shinozuka, Y., Clarke, A. D., DeCarlo, P. F., Jimenez, J. L., Dunlea, E. J., Roberts, G. C., Tomlinson, J. M.*, **Collins, D. R.**, Howell, S. G., Kapustin, V. N., McNaughton, C. S., and Zhou, J., 2009. "Aerosol optical properties relevant to regional remote sensing of CCN activity and links to their organic mass fraction: Airborne observations over Central Mexico and the US West Coast during MILAGRO/INTEX-B," *Atmospheric Chemistry and Physics*, 9, pp 6727-6742.

36. O'Halloran, T. L., Fuentes, J. D., **Collins, D. R.**, Cleveland, M. J., and Keene, W. C., 2009. "Influence of air mass source region on nanoparticle events and hygroscopicity in central Virginia, U.S.," *Atmospheric Environment*, 43, pp 3586-3595.

35. Martin, S. T., Rosenoern, T., Chen, Q. and **Collins, D. R.**, 2008. "Phase Changes of ambient particles in the Southern Great Plains of Oklahoma, USA," *Geophysical Research Letters,* 35, L22801.

34. Osborn, R. J.*, Taylor N. F.*, Spencer, C., and **Collins, D. R.**, 2008. "Isolation of ambient particles of known critical supersaturation: The Differential Activation Separator (DAS)," *Aerosol Science and Technology*, 42, pp 759-772.

33. DeCarlo, P. F., Dunlea, E. J., Kimmel, J. R., Aiken, A. C., Sueper, D., Crounse, J., Wennberg, P. O., Emmons, L., Shinozuka, Y., Clarke, A., Zhou, Z., Tomlinson, J. M.*, **Collins, D. R.**, Knapp, D., Weinheimer, A. J., Montzka, D. D., Campos, T., and Jimenez, J. L., 2008. "Fast airborne aerosol size and chemistry measurements above Mexico City and Central Mexico during the MILAGRO campaign," *Atmospheric Chemistry and Physics*, 8, pp 4027-4048.

32. Wood, R., Comstock, K. K., Bretherton, C. S., Cornish, C., Tomlinson, J. M.*, **Collins, D. R.**, and Fairall, C, 2008. "Open cellular structure in marine stratocumulus sheets," *Journal of Geophysical Research – Atmospheres*, 113. Art. No. D12207.

* A graduate student I advise(d)

INVITED SEMINARS (while at Texas A&M)

2012	University of California - Riverside
2008	Istanbul Technical University
2007	University of Southern California
2005	Harvard University
2005	NOAA ESRL
2002	University of California, Santa Cruz
2002	Colorado State University
2002	American Association for Aerosol Research (tutorial)
2000	University of Texas
1999	Rice University

CURRENT FUNDED RESEARCH PROJECTS

End date	Project title	Sponsor	Duration (months)
2016 (Jan)	Collaborative Research: Sensitivity of gas and aqueous phase production of secondary organic aerosol to chemical and environmental perturbations (selected for funding)	NSF	36
2014 (May)	Improving Emission Inventories using Direct Flux Measurements and Modeling (P.I. Schade)	EPA	36
2013 (Oct)	Mentorship of the ARM Southern Great Plains site DMA / TDMA	DOE	84

SERVICE SUMMARY

TEXAS A&M UNIVERSITY

Department of Atmospheric Sciences:

2000 –	Undergraduate advisor
2008 – 2010	Recruiting Committee, Chair
2000 – 2010	Graduate Committee, Chair 2004 - 2007
2008	Weather and Forecasting Search Committee, Chair
2004 – 2007	Budget Committee
2005	Remote Sensing Faculty Search Committee
2004	Department Head Search Committee
2004	Atmospheric Chemistry Search Committees (2)

College of Geosciences:

2010 –	Scholarship Committee
2010 –	Undergraduate Curriculum Committee
2010 –	Assessment Committee
2005 –	Undergraduate Advisor for Environmental Geosciences
2012	Assistant to the Dean Search Committee
2010	Assistant Dean for Diversity and Graduate Student Recruitment and Development Search Committee, Chair
2006 – 2010	Environmental Programs Advisory Committee
2006 – 2009	Geosciences Faculty Advisory Council (GFAC)
2004 – 2006	Academic Council
2005	Surficial Processes Search Committee in Geography
2004	Dean Search Committee

Texas A&M University:

2007 –	Center for Atmospheric Chemistry and the Environment Executive Committee
2010	Graduate Diversity Fellowship reviewer
2008 – 2010	Faculty Advisory Committee to the Vice President for Student Affairs
2006	Beckman Young Investigators Internal Selection Committee
2005	Core Curriculum Review Committee

EXTERNAL AND SCIENTIFIC

Participation in review panels:

2012	EPA Organic Aerosols
2010	NASA New Investigator Program
2007	NSF Climate & Large-Scale Dynamics Program
2005	NOAA Atmospheric Composition and Climate Program

Reviewer of grant applications for the following agencies:

- NSF
- NASA

- DOE
- NOAA

Reviewer of articles in the following journals:

- Aerosol Science and Technology
- Atmospheric Environment
- Atmospheric Research
- Environmental Science and Technology
- Industrial and Engineering Chemistry Research
- Journal of the Air & Waste Management Association
- Journal of Atmospheric and Oceanic Technology
- Journal of Geophysical Research
- Reviews of Geophysics

TEACHING SUMMARY

COURSES TAUGHT

Undergraduate:

- ATMO 201 – Atmospheric Science
- ATMO 335 – Atmospheric Thermodynamics
- ATMO 363 – Introduction to Atmospheric Chemistry and Air Pollution
- ATMO 446 – Physical Meteorology
- ATMO 463 – Air Pollution Meteorology
- ATMO 489 – *Special Topics in* Field Measurements in the Atmospheric Sciences

- GEOS 105 – Introduction to Environmental Geosciences
- GEOS 405 – Environmental Geosciences
- GEOS 481 – Environmental Programs Seminar

Graduate:

- ATMO 602 – Atmospheric Physics and Chemistry
- ATMO 613 – Advanced Atmospheric Chemistry (team taught with 2 others)
- ATMO 645 – Cloud and Precipitation Physics (team taught with 1 other)
- ATMO 681 – Seminar in Atmospheric Sciences
- ATMO 685 – Seminar Course in Atmospheric Chemistry (team taught with 2 others)

SUPPORTED UNDERGRADUATE RESEARCH ASSISTANTS *(PT = part time, FT = full time)*

2012 – Mark Benoit (Atmospheric Sciences) – PT academic year
2010 – 2013 Erik Nielsen (Atmospheric Sciences) – PT academic year, PT summer
2011 – 2012 Hannah Kight (Atmospheric Sciences) – PT academic year
2011 – 2012 Samantha Wills (Atmospheric Sciences) – PT academic year, FT summer
2010 – 2011 Melinda Nicewonger (Atmospheric Sciences) – PT academic year, PT summer
2010 – 2011 Hannah Upton (Atmospheric Sciences) – PT academic year, PT summer
2009 – 2011 Aaron Piña (Atmospheric Sciences) – PT academic year
2009 – 2011 Crystal McClure (Atmospheric Sciences) – PT academic year, FT summer
2009 – 2010 Katelyn Johnson (Atmospheric Sciences) – PT academic year, PT summer
2008 Brad Nolen (Chemistry) – PT academic year, FT summer
2005 – 2007 Nathan Taylor (Atmospheric Sciences) – PT academic years, FT summers
2005 Adam Fornea (Atmospheric Sciences) – PT academic year, FT summer
2005 Marshall Hoepfner (Geology) – PT
2002 – 2003 Laura Sample (Atmospheric Sciences) – PT
2002 – 2003 Chance Spencer (Atmospheric Sciences) – PT
2003 Kwadwo Agyepong (Electrical Engineering) – FT summer
2001 – 2002 Brandon Martin (Electrical Engineering) – PT academic years, FT summer
2001 – 2002 Brandon Watson (Electrical Engineering) – FT summers
2000 – 2001 Julie Sandefur (Bioenvironmental Sciences) – PT

Andrew E. Dessler

Address
Dept. of Atmospheric Sciences
Texas A&M University
TAMU 3150
College Station, TX 77845

Telephone: 979-862-1427
Fax: 979-862-4466
E-mail: adessler@tamu.edu

Research Areas: Climate change, climate feedbacks, remote sensing, climate change policy

Education:

1994 - Ph.D. - Chemistry, Harvard University
1990 - A.M. - Chemistry, Harvard University
1986 - B.A. - Physics, Rice University

Employment

2007-present	Professor, Dept. of Atmospheric Sciences, Texas A&M University
2005-2007	Associate Professor, Dept. of Atmospheric Sciences, Texas A&M University
2000	Senior Policy Analyst, White House Office of Science and Technology Policy, Environment Division, Washington, DC
1998-2005	Associate Research Scientist, Earth System Science Interdisciplinary Center (ESSIC), Univ. of Maryland, College Park, MD
1996-1998	Assistant Research Scientist, ESSIC and the Dept. of Meteorology
1994-1996	National Research Council Research Associateship in the Atmospheric Chemistry and Dynamics Branch of NASA Goddard Space Flight Center, Greenbelt, MD.

Awards

2012	AGU Atmospheric Sciences Ascent Award
2011	Google Science Communication Fellow
2011	Texas A&M College of Geosciences Distinguished Achievement Award for Faculty Research
2011	Texas A&M Sigma Xi Outstanding Communicator Award
2006	Aldo Leopold Leadership Program Fellowship

1999	NASA Goddard Laboratory for Atmospheres Best Senior Author Publication Award for "A reexamination of the 'stratospheric fountain' hypothesis" [*Geophys. Res. Lett.*, 1998].
1999	NASA New Investigator Award recipient
1994-1996	National Research Council Research Associateship
1993	AGU Atmospheric Sciences Section Outstanding Student Paper Award
1991-1994	NASA Graduate Student Fellowship in Global Change Research

Notable invited presentations

2012 Woods Hole, H. Burr Steinbech at-large scholar
2012 NCAR ASP Thompson Lecturer

Leadership positions

2012-2014 Chair of AAAS Section W (atmospheric and hydrospheric sciences)

Teaching:

- GEOS 444: *The science and politics of global climate change: A guide to the debate.* Developed this course, which will be taught as part of the Enviromental Sciences curriculum.
- ATMO 685, *Climate modeling* (Fall 06)
- ATMO 201, *Atmospheric Science* (Fall 07)
- GEOS 210: *Climate change.* Developed this course with Prof. R. Saravanan. This course satisfies the University's tier 2 natural science requirement.

Graduate students:

Hyun Cheol Kim – Ph.D. (Univ. of Maryland), 2005
Joonsuk Lee – Ph.D, 2007, co-chair (with P. Yang)
Allison Cardona – M.A. 2008
Jeremy Solbrig – M.A. 2009
Sean Casey — Ph.D. 2009
A. Verma — M.A. 2011
Tao Wang — M.A. 2011
chaired 2 masters recipients while at the Univ. of Maryland (1998 and 1999)

Tao Wang — Ph.D. current
A. Christenberry — M.A. current
C. Zhou — M.A. current

J. Kummer — M.A. current

Postdoctoral Associates:

Christian Alcala (2001-2002), Sun Wong (2003-2005), Likun Wang (2004-2005), Wei Wu (2005-2006)

Research Scientist:

Sun Wong (2005-2009)

Books

A. E. Dessler, *The chemistry and physics of stratospheric ozone*, Academic Press, San Diego, 2000.

A. E. Dessler and E. A. Parson, *The science and politics of global climate change: A guide to the debate*, Cambridge Univ. Press, first edition 2006, second edition 2010.

A. E. Dessler, *Modern climate change*, Cambridge Univ. Press, 2011.

Refereed Publications (last 5 years)

('*' indicates a graduate student or postdoc first author)

*Wang, T. and A.E. Dessler, Analysis of cirrus in the tropical tropopause layer from CALIPSO and MLS data – A water perspective, *J. Geophys. Res*., 117, D04211, DOI: 10.1029/2011JD016442, 2012.

Schoeberl, M. R., and A. E. Dessler, Dehydration of the stratosphere, Atmos. Chem. Phys., 11, doi: 10.5194/acp-11-8433-2011, 8433-8446, 2011.

Dessler, A.E., Cloud variations and the Earth's energy budget, Geophys. Res. Lett., 38, L19701, DOI: 10.1029/2011GL049236, 2011.

Dessler, A. E., A determination of the cloud feedback from climate variations over the past decade, Science, 330, doi:10.1126/science.1192546, 1523-1527, 2010.

Dessler, A. E., and S. M. Davis, Trends in tropospheric humidity from reanalysis systems, J. Geophys. Res., 115, D19127, doi:10.1029/2010jd014192, 2010.

Yang, P., G. Hong, A.E. Dessler, S.S.C. Ou, K.-N. Liou, P. Minnis, Harshvardan, Contrails and induced cirrus: Optics and radiation, Bull. Am. Met. Soc., 91, DOI: 10.1175/2009BAMS2837.1, 2010.

*Lee, J., P. Yang, A.E. Dessler, B.-C. Gao, S. Platnick, Distribution and radiative forcing of tropical thin cirrus clouds, J. Atmos. Sci., 66, DOI: 10.1175/2009JAS3183.1, 3721-3731, 2009.

Dessler, A.E., Energy for air capture, Nature Geosci., 2, DOI: 10.1038/ngeo691, 811, 2009.

Dessler, A.E., Clouds and water vapor in the northern hemisphere summertime stratosphere, J. Geophys. Res., 114, D00H09, DOI: 10.1029/2009JD012075, 2009.

Dessler, A.E., and S. Wong, Estimates of the water vapor feedback during the El Nino Southern Oscillation, J. Climate, 22, 6404-6412, DOI: 10.1175/2009JCLI3052.1, 2009.

*Wong, S., A.E. Dessler, N.M. Mahowald, P. Yang, and Q. Feng, Maintenance of lower tropospheric temperature inversion in the Saharan Air Layer by dust and dry anomaly, J. Climate, 22, 5149-5162, DOI: 10.1175/2009JCLI2847.1, 2009.

*Casey, S.P.F., A.E. Dessler, and C. Schumacher, Five-year climatology of midtroposphere dry air layers in warm tropical ocean regions as viewed by AIRS/Aqua, J. Appl. Met. Clim., 48, DOI: 10.1175/2009JAMC2099.1, 1831-1842, 2009.

Dessler, A.E., and S.C. Sherwood, A matter of humidity, Science, 323, 1020-1021, DOI: 10.1126/science.1171264, 2009.

Fueglistaler, S., A.E. Dessler, T. J. Dunkerton, I. Folkins, Q. Fu, and P.W. Mote, The tropical tropopause layer, Rev. Geophys., 47, RG1004, DOI: 10.1029/2008RG000267, 2009.

Dessler, A.E., Z. Zhang, and P. Yang, The water-vapor climate feedback inferred from climate fluctuations, 2003-2008, Geophys. Res. Lett., 35, L20704, DOI: 10.1029/2008GL035333, 2008.

Dessler, A.E., P. Yang, J. Lee, J. Solbrig, Z. Zhang, and K. Minschwaner, An analysis of the dependence of clear-sky top-of-atmosphere outgoing longwave radiation on atmospheric temperature and water vapor, J. Geophys. Res., 113, D17102, DOI: 10.1029/2008JD010137, 2008.

*Wong, S. A. E. Dessler, N. Mahowald, P. R. Colarco, A. da Silva, Long-term variability in Saharan dust transport and its link to the North Atlantic sea surface temperature, Geophys. Res. Lett., 35, L07812, DOI:10.1029/2007GL032297, 2008.

Daikwon Han, Ph.D.

Department of Epidemiology & Biostatistics
School of Rural Public Health, Texas A&M Health Science Center
Voice: 979-458-0068, Fax: 979-458-1877, Email: dhan@srph.tamhsc.edu

---

EDUCATION

Ph.D. GIS and Spatial Epidemiology. University at Buffalo, 2003
M.A. Geography, Seoul National University, 1995
B.A. Geography, Seoul National University, 1993

Research Interest

Spatial Epidemiology, GIS & Spatial Analysis Methods, Environmental Health/Exposure Science, Environmental Justice & Health Disparities, Healthcare Access, Population Studies/Spatial Demography.

Teaching

Spatial Epidemiology, GIS and Public Health, Fundamentals of Epidemiology, Research Methods

EXPERIENCE

Assistant Professor, Department of Epidemiology & Biostatistics, Texas A&M School of Public Health, 2008- present.

Graduate Faculty, Texas A&M University, 2009-present.

Affiliated Faculty, Southwest Rural Health Research Center, 2012-present; Affiliated Faculty, Department of Social and Preventive Medicine, School of Public Health, University at Buffalo. 2005- present; Affiliated Faculty, University of Kentucky Prevention Research Center, 2007-present.

Assistant Professor of GIS, Institute for Regional Analysis and Public Policy (IRAPP), Morehead State University, 2005-2008

Research Assistant Professor, Department of Social and Preventive Medicine, University at Buffalo; Postdoctoral Research Fellow, DOD-US Army Congressionally Directed Medical Research Programs (CDMRP)-Breast Cancer Research Program (BCRP), 2003-2005

Research Associate, National Center for Geographic Information and Analysis (NCGIA), SUNY- Buffalo, 2000-2002; Research Associate/GIS Specialist, Department of Social and Preventive Medicine, University at Buffalo. 2001-2002.

PUBLICATIONS

Refereed Journal Papers (last 5 years)

Han, D. Bonner, MR. Nie, J. Freudenheim, JL. Assessing Bias Associated with Geocoding of Historical Residence in Epidemiology Research. *Geospatial Health* 2013, 7:355-360.

Han, D. and Gorman, D. Evaluating the Effects of the Introduction of Off-Sale Alcohol Outlets on Violent Crime. *Alcohol and Alcoholism* 2013, 48:370-374.

Han, D. Lee, K. Kim, J. Bennett, D. Cassady , D. Hertz-Picciotto, I. Development of Time-Location Weighted Spatial Measures using Global Positioning System (GPS) Data. *Environmental Health and Toxicology* 2013, 28:e2013005.

Han, D. Shipp. E. Gorman, D. Evaluating the Effects of the Introduction of Off-Sale Alcohol Outlets on Motor Vehicle Crashes**:** A Time Series Analysis. In Review.

Han, D. Gorman, D. Exploring Spatial Associations between On-Sale Alcohol Availability, Neighborhood Population Characteristics and Violence Crime in a Geographically Isolated City. In Review.

Park, E. Hopke, P. Oh, M. Symanski, E. **Han, D**. Spiegelman, C. Assessment of source specific health effects associated with an unknown number of major sources of multiple air pollutants: A unified Bayesian approach. *Biostatistics,* In Press.

Han, D. and Gorman, D. Alcohol Availability and Violence. *Oxford Bibliographies Online: Public Health* 2012. doi: 10.1093/obo/9780199756797-0013.

Han, D. Nie, J. Bonner, MR. Marian, C. Shields, P. Ambrosone, C. Trevisan, M. Edge, S. Freudenheim, JL. Clustering of Place of Birth for Women with Breast Cancer: Differences by Tumor Subtype. *Cancer Causes and Control* 2013, 24:587-594.

Park, S. and **Han, D.** Reviews in Medical Geography: Spatial Epidemiology of Vector-Borne Diseases. *Journal of the Korean Geographical Society* 2012, 47: 677-699.

Han, D. Hwang S. On the Use of Spatially Referenced Health and Environment Data. *Journal of Environmental Health Sciences* 2011, 37: 1-11.

Han, D. Bonner, MR. Nie, J. Rudra, C. Freudenheim, JL. Using Birth Certificate Data to Reconstruct and Validate Self-reported Birth Address in a Study of Breast Cancer and the Environment. *Annals of Epidemiology* 2011, 21: 710-713.

Jaworowicz Jr DJ. Nie, J. Bonner, MR. **Han, D.** Vito, D. Hutson A, Potischman N, Trevisan, M. Muti, P. Freudenheim, JL. Agreement between self-reported birth weight and birth certificate weights. *Journal of Developmental Origins of Health and Disease* 2010, 1: 106-113

Huang, B. **Han, D.** Dignan, M. Johnson O. Does Distance Matter? Distance to mammography facilities and stage at diagnosis of breast cancer in Rural and Appalachian Kentucky. *Journal of Rural Health 2009, 25: 366-371*.

Sharkey JR. Horel, S, **Han, D.** Huber, JC. Association between Neighborhood Need and Spatial Access to Food Stores and Fast Food Restaurants in Neighborhoods of Colonias. *International Journal of Health Geographics* 2009, 8:9.

Book chapter & other publications

Han, D. and Rogerson, PA. Application of a GIS-Based Statistical Method to Assess Spatio- Temporal Changes in Breast Cancer Clustering in the Northeastern United States. In *Geographic Information Systems*

and Health Applications. Khan, OA (ed), 2003 Hershey, PA: Idea Group Publishing, 114-138.

Han, D. GIS and Environmental Health. Korea Ministry of Environment WebZine: Aug. 2011.

Published Abstracts (last 5 years, Peer-Reviewed)

Han, D. and Gorman, D. Evaluating the Effects of the Introduction of Off-Sale Alcohol Outlets on Violent Crime. *American Journal of Epidemiology* 2013.

Han, D. Gorman, D. Spatial clustering of alcohol outlets after the policy change. *Proc. of the GIS and Public Health Conference 2013*.

Gorman, D. **Han, D.** Socio-Spatial Patterning of Alcohol Outlets after the Introduction of Off-Sale Premises in Lubbock, Texas. *Proc. of the Alcohol Policy Conference 2013*

Gorman, D. **Han, D.** Zheng, Q. Gruenewald, P. An Agent-Based Model of Alcohol Availability and Violence. *Proc. of the American Academy of Health Behavior Conference 2013*.

Han, D. Bonner, MR. Nie, J. Freudenheim, JL. Assessing Bias Associated with Geocoding of Historical Residence in Epidemiology Research. *American Journal of Epidemiology* 2012.

B Huang; TJ Gal; **D Han**; H Wallace; B Shelton; T Tucker; M Dignan. Travel Distance and Pattern of Care for Laryngeal Cancer in Kentucky. *Proc. the American Association for Cancer Research*. Anaheim, CA. 2011.

Han, D. Sharkey J. Horel, S "Spatial Disparities in Potential Access to Food Environments in Rural Texas" *Epidemiology* 2010.

Park E, Symanski E, **Han, D.** Spiegelman C. "Development of Enhanced Statistical Models for Assessing Health Effects Associated with an Unknown Number of Major Sources of Multiple Air Pollutants" *Proc. of the Health Effects Institute Conference*, 2010.

Han, D. J. Kim, K Lee, D. Bennett, B. Ritz , D Cassady , I Hertz-Picciotto "Spatial Analysis of Human Time Location Data: Development of Exposure Weighted Standard Deviational Ellipsis (EW- SDE)" *Epidemiology* 2008, 19(6):S123.

GRANTS & CONTRACTS

"Integrating GIS into Breast Cancer Epidemiologic Research" Department of Defense-US Army Fellowship Grant. 2003-2005. PI

"Spatial Analysis of Breast Cancer and Access to Health Care Services in Kentucky" KAS Research Grant. 2007. PI

"Behavioral and Environmental Influence on Obesity: Rural Context & Race/Ethnicity" NIH, 2008-2010.

"Development of Enhanced Statistical Methods for Assessment of Health Effects Associated with an Unknown Number of Major Sources of Multiple Air Pollutants" HEI, 2010-2012.

"Novel H1N1 Pandemic Influenza Physician/Healthcare Professional Assessment" Texas DSHS, 2010-2011.

"Rural Town Walkability: Measuring the Effects of the Built Environment" NIH, 2011.

"Development and Validation of Agent-Based Models of Alcohol-Related Violence" NIH, 2011-2013.

"H-RAMP: Hazed Risk Assessment and Mitigation Plans" Texas DSHS. 2012-2013.

"Making Healthy Places: Developing Guidelines for Building Healthier Cities" NRC, 2013-2016.

Workshops Organized & Presented

"GIS and cancer surveillance" short course. Division of Cancer Registration and Surveillance National Cancer Control, National Cancer Center of Korea, 2011.

"Spatial Epidemiology for Public Health Research and Practices" Mini-Symposium. Hosted by Korea University College of Medicine and School of Public Health. 2011.

"GIS in Public Health" two-day short course. Texas A&M School of Rural Public Health, College Station, TX. 2009.

"GIS for Public Health Research and Practices" one-day workshop. SNU School of Public Health, 2010.

"GIS Workshop: Fundamental concepts and applications" MSU, 2006.

Guest Lectures (recent 3 years)

VIBS432 Public Health Practices (Fall 2008-2010); FRSC102 Spatial Sciences (Fall 2008); PHEB626 Occupational & Environmental Epidemiology (Spring, 2009, 2011); PHEB689 GIS for Public Health (Spring 2009); VIBS432 Public Health Practices (Spring 2009); PHEB624 Social Epidemiology (Fall 2009, Spring, 2011); PHEB622 Reproduction and Perinatal Epidemiology (Spring 2010); LAND689 Design for Active Living (Spring 2010, 2011); PHPM631 Health Information Management Systems (Spring 2010)

PORFESSIONAL ACTIVITIES

Associate Editor, Exposure Assessment Section, *Environmental Health and Toxicology*.

Editorial Board, *The Scientific World Journal: Epidemiology*, 2011-; Editorial Board, *Journal of Environmental Health Sciences*. 2008-

Scientific Program Committee, 2013 International Society of Environmental Epidemiology (ISEE) & International Society of Exposure Science (ISES) Joint Conference; 2010 International Society of Environmental Epidemiology (ISEE) & International Society of Exposure Science (ISES) Joint Conference.

Scientific Program Committee, 2013 GIS in Public Health Conference, Urban and Regional

Information Science Association (URISA); 2011 GIS in Public Health Conference, URISA.

Program Committee, Health GIS - International Workshop on the Use of GIS in Public Health, 2012.

Chair, "Spatial Epidemiology" session at International Environmental Epidemiology conference 2010; "Health service" session at GIS and Public Health conference 2013; "Disease surveillance" session at GIS and Public Health conference 201; "Women's Health" session at AAG 2007.

Diploma, NCI summer curriculum in cancer prevention: "Principles and Practice of Cancer Prevention and Control." National Cancer Institute, National Institutes of Health, Rockville, MD. July 7-August 1, 2003.

Certificate of completion, Agent-based modeling track, NIH-sponsored Systems Science and Health workshop, Columbia University, NY. June, 2011.

Review/Commentary

Manuscript Reviewer, since 2002-; *International Journal of Health Geographies, Social Science and Medicine, Women's Health, International Journal of Cancer, GeoJournal, Asian Nursing Journal, Journal of Environmental Health Science, Spatio and Spatio-Temporal Epidemiology; International Journal of Healthcare Technology and Management, Environmental Health and Toxicology, Alcohol and Alcoholism*.

Book Reviewer, *GIS for the Urban Environment*. ESRI Press. 2009
Manuscript reviewer for International Geospatial Geocoding Conference, 2011.

Abstract Reviewer, 2006 *Congress of Epidemiology; 2007 CDC Cancer Conference; 2008-2010 Society for Epidemiologic Research Meeting; 2010 International Society of Environmental Epidemiology (ISEE) & International Society of Exposure Science (ISES) Joint Conference; 2011 Congress of Epidemiology –Spatial epidemiology session; 2012 CDC National Cancer Conference*.

Grant Reviewer, National Science Foundation, Geography and Spatial Sciences (GSS) Program, 2012; External Reviewer and Judge, St. Luke's Episcopal Health Charities Community Health Research Award, 2012.

Han, D. Expert Commentary, "Breast cancer and weight control" Family Circle 2007.
Han, D. Expert Commentary, "Adult weight gain and breast cancer risk" MAMM Magazine: women, cancer and community, 2006.
Han, D. Expert Commentary, "Association of Gain and Loss of Weight before and after Menopause with Risk of Postmenopausal Breast Cancer in the Iowa Women's Health Study." Cancer Epidemiology, Biomarkers & Prevention, March 2005; 14:656-661. Breastlink 2006.

Committee/Consulting Works

PhD Dissertation Committee "Modeling climate-induced health dynamics in tropical Africa" Texas A&M Department of Geography. 2009-2012.

PhD Dissertation Committee "Produce food safety and epidemiology" Texas A&M Department of Veterinary Medicine.

PhD Dissertation Committee "Medical geography and ecology of neglected tropical diseases" Texas A&M Department of Geography.

PhD Dissertation Committee "Adulthood and young adult cancer incidence and mortality in Texas" Texas A&M Department of Community Health.

MS Thesis Committee (Chair) "Traffic emissions and pregnancy outcomes" Texas A&M Epidemiology and Biostatistics, 2013.

MS Thesis Committee "Environmental epidemiology of birth defect" Texas A&M Department of Epidemiology and Biostatistics, 2012.

MS Thesis Committee "Measurement errors in a case-control study" Texas A&M Department of Statistics, 2009.

Outside Reader, PhD Dissertation - Risk-Based Characterization of Contaminated Industrial Sites using a Multivariate Statistical and GIS-based Approach in Anniston, Alabama. UB Department of Geography, 2011.

Committee Member, Texas A&M SRPH Distance Education 2008-2010, Student Affairs Committee 2010-2012; Texas A&M SRPH Epidemiology Search Committee, 2009-2010, 2012-2013; MSU Technology Resource 2007-2008, and IRAPP Undergraduate Curriculum, FEP, Homeland Security Committee Member 2005-2008.

Consultant, "Understanding and Improving Asthma Disparities in Kentucky" UK College of Medicine. 2007; "A Case Control Study of Chronic Exposure and Disease Risks among Korean Elderly" Seoul National University College of Medicine. 2007-2008; "Development of planning guideline for creating health places" Korea Research Institute for Human Settlements, 2012.

GIS Advisory Group Member, Texas A&M University

Board Member, Korean-American Geospatial and Environmental Society

Professional Membership

International Society for Environmental Epidemiology (ISEE) Associations of American Geographers (AAG)
Society for Epidemiologic Research (SER)

Urban and Regional Information Science Association (URISA)

HONORS/AWARDS

International Travel Award, 2nd ISSE-EAC regional conference, 2008. Teaching & Learning Grant, MSU Center for Teaching and Learning 2006.

Scholarship, 2006 SPACE GIS Teaching Method Workshop, 2005 Harvard School of Public Health Workshop, 2003 CSISS Research Method Workshop

AAG Nystrom Dissertation Competition Finalist, 2004

Outstanding Research Award, UCGIS 2001 Summer Assembly. TerraSeer Research Contest Winner, 2001.

Press Release

"Alcohol and violence: a new study aims to find the link using simulation models" SRPH Newsletter, 2011

"Timing of weight gain affects breast cancer risk" Reuters Health, 2006

"Breast Cancer Risk Linked to Exposure to Traffic Emissions at Menarche, First Birth" UB Reporter, 2005.

"Women Who Gain Significant Weight in Adulthood Increase Risk of Postmenopausal Breast Cancer, UB Study Finds" UB Reporter, 2004

"GIS Technology Helps Link Premenopausal Breast Cancer with Place of Birth, Residence at Time of Menarche: Information may help identify early environmental exposures that increase risk" UB Reporter, 2003

"Importance of Early Environmental Exposure Pinpointed in Study of Breast Cancer Development: UB study finds clustering related to site of residence at time of menarche" UB Reporter, 2002.

CURRICULUM VITAE
Gregory A. Johnson, Ph.D. **May, 2013**

PRESENT POSITION AND ADDRESS:

Title: Associate Professor
Department: Veterinary Integrative Biosciences
Office: 173 New Addition of Vet. Res. Bldg.
Phone: 979-845-7249
FAX: 979-847-8981
Email: gjohnson@cvm.tamu.edu

EDUCATION:

Degree/Training	Conferring Institution	Field	Year
B.S.	University of Wyoming	Zoology	1984
M.S.	University of Wyoming	Microbiology	1988
Ph.D.	University of Wyoming	Reproductive Biology	1997
Postdoctoral	Texas A&M University	Reproductive Biology	1997-2000

DIVISION OF TIME IN APPOINTMENT:

RESEARCH – 70%

TEACHING – 25%

SERVICE – 5%

PROFESSIONAL EXPERIENCE AND ACADEMIC APPOINTMENTS:

2008 – present	Associate Professor, Department of Veterinary Integrative Biosciences, Texas A&M University (TAMU)
2002 - 2008	Assistant Professor, Department of Veterinary Integrative Biosciences, Texas A&M University (TAMU)
2000 - 2002	Assistant Professor, Department of Animal and Veterinary Science, University of Idaho, Moscow, Idaho
1997 - 2001	Assistant Research Scientist, Texas Agricultural Experiment Station, College Station, TX
1988 - 1995	Research Associate II, Department of Animal Science, College of Agriculture, University of Wyoming

AWARDS AND HONORS:

Phi Beta Kappa Honor Society

Gamma Sigma Delta Honor Society

Sigma Xi Honor Society

Finalist, New Investigator Award, *Society for the Study of Reproduction*, 1997

National Research Service Award, National Institutes of Health (DHHS/NIH #1-F32-HDO 8501 OlAl), "*Osteopontin Affects the Periimplantation Uterus and Conceptus,"* 5/01/99 to 4/30/02.

Vice Chancellor's Award in Excellence for Team Research in Uterine Biology and Pregnancy, 2005.

Vice Chancellor's Award in Excellence for Diversity for the Bridges to the Doctorate in Reproductive Biology Leadership Team 2011.

Gamma Sigma Delta Award of Merit Teaching, 2012

EDITORIAL BOARDS:

Editorial Board Member, *Biology of Reproduction*, 2004

Board of Reviewing Editors, *Biology of Reproduction*, 2007-2009

Board of Reviewing Editors, *Biology of Reproduction*, 2009-2011

Board of Reviewing Editors, *Biology of Reproduction*, 2011-present

TEACHING EXPERIENCE:

Undergraduate:

Course Title	Institution	Credit Hrs	% Course Taught	Contact Hrs	Semesters Taught
VIBS 343 Honors Histology	TAMU	4 Hrs	100 %	3 Hrs Lecture 3 Hrs Laboratory	Fall 2005, 2006, 2007
VIBS 343 Histology	TAMU	4 Hrs	100 %	3 Hrs Lecture/Week 3 Hrs Laboratory/Week	Fall 2008, 2009, 2010, 2011, 2012
AVS 451 Endocrine Physiology	U of Idaho	4 Hrs	100%	4 Hrs Lecture/Week	Fall 2001
VIBS 489 Anatomy of Reproductive Systems	TAMU	3 Hrs	30%	8 Hrs Total Lecture 8 Hrs Total Laboratory	Spring 2013
VIBS 489 Biomedical Neuroendocrine & Endocrine Disorders	TAMU	3 Hrs	10%	6 Hrs Total Lecture	Fall 2007, 2008
VIBS 485 Directed Studies	TAMU	1-4 hrs (Variable)	100 %	NA	All Semesters 2003-2013

Graduate:

Course Title	Institution	Credit Hrs	% Course Taught	Contact Hrs	Semesters Taught
VIBS 602 Histology	TAMU	4 Hrs	100 %	3 Hrs Lecture 3 Hrs Laboratory	Fall 2005, 2005, 2007, 2008, 2009 2010, 2011, 2012
ANSC 631 Advance Reproductive Biology II	TAMU	4 Hrs	33 %	12 Hrs Total Lecture	Spring 2004, 2006, 2008, 2010, 2012
VTMI 662 Advanced Immunological Concepts, Reproductive Immunology	TAMU	1 Hr	100%	15 Hrs Total Lecture	Fall 2003, 2005, 2007, 2009, 2011
Frontiers in Reproduction "Placentation"	Marine Biological Laboratory, Woods Hole, MA	NA	50 %	3 Hrs Total Lecture 3 Hrs Total Laboratory	Summer 2010, 2011, 2012, 2013
AVS 551 Endocrine Physiology	U of Idaho	4 Hrs	100%	4 Hrs Lecture/Week	Fall 2001
VIBS 489 Anatomy of Reproductive Systems	TAMU	3 Hrs	30%	8 Hrs Total Lecture 8 Hrs Total Laboratory	Spring 2013
ANSC/VTPP 654 Molecular Endocrinology	TAMU	3 Hrs	20 %	9 Hrs Total Lecture	Spring 2005, 2007
VIBS 489 Biomedical Neuroendocrine & Endocrine Disorders	TAMU	3 Hrs	10%	6 Hrs Total Lecture	Fall 2007, 2008
VTPP 653 Endocrinology	TAMU	3 Hrs	8%	4 Hrs Total Lecture	Fall 2008, 2010
VIBS 691 Graduate Research	TAMU	Variable	100 %	NA	All Semesters Fall 2002 to 2013
VIBS 685 Directed Studies	TAMU	3 Hrs/ Student	100 %	NA	All Semesters Summer 2011 to 2013

Professional:

NONE

Graduate Students:

Name	Degree	Institution	Major Advisor or Committee Member	Date of Completion
Stephanie Yankee	M.S.	U of Idaho, Animal Science	Committee Member	2001
Stacey Sinor	M.S.	U of Idaho, Animal Science	Committee Member	2002
Kiran Kodali	M.S.	U of Idaho, Animal Science	Committee Member	2002
Allison Grey	Ph.D.	TAMU, Animal Science	Committee Member	2005
Seokwoon Kim	M.S.	TAMU, Animal Science	Committee Member	2005
Katherin Dunlap	Ph.D.	TAMU, Animal Science	Committee Member	2006
Stephanie Schoel	Non-Thesis M.S.	TAMU, BIMS	Major Advisor	2007
Gwonhwa Song	Ph.D.	TAMU, Animal Science	Committee Member	2007
Saeed Al-Ramadan	Ph.D.	TAMU, VIBS	Committee Member	2007
Hyo Won Ahn	M.S.	TAMU, Animal Science	Committee Member	2007
Robert Ramos	Non-Thesis M.S.	TAMU, BIMS	Committee Member	2007
Atrayee Banerjee	Ph.D.	TAMU, VTPP	Committee Member	2007
M. Carey Satterfield	Ph.D.	TAMU, Animal Science	Committee Member	2008
Jennifer Farmer	Ph.D.	TAMU, Animal Science	Committee Member	2008
Margaret Joyce	Ph.D.	TAMU, VIBS	Major Advisor	2008
Haijun Gao	Ph.D.	TAMU, Animal Science	Committee Member	2009
Shae Lewis	Ph.D.	TAMU, Animal Science	Committee Member	2009
Dana Massuto	Ph.D.	TAMU, VIBS	Committee Member	2009
Rebecca Simmons	M.S.	TAMU, Animal Science	Committee Member	2009
Jin Young Kim	Ph.D.	TAMU, Animal Science	Committee Member	2010
Sarah Black	Ph.D.	TAMU, Animal Science	Committee	2010

			Member	
Shih Chi Su	Ph.D.	TAMHSC, Molecular and Cellular Medicine	Committee Member	2011
Xilong Li	Ph.D.	TAMU, Animal Science	Committee Member	2011
Tyler Andrews	M.S.	TAMU, Animal Science	Committee Member	Program Ended
Jehoon Lee	Ph.D.	TAMU, VIBS	Committee Member	2013
Andrew Naeger	Non-Thesis M.S.	TAMU, BIMS	Major Advisor	2013
Jonathan Hicks	Non-Thesis M.S.	TAMU, BIMS	Committee Member	2013
James W. Frank	Ph.D.	TAMU, VIBS	Major Advisor	Current
Rodolfo Cardoso	Ph.D.	TAMU, Animal Science	Committee Member	Current
Theodore Wing	M.S.	TAMU, VIBS	Major Advisor	Current
Xiaoqiu Wang	Ph.D.	TAMU, Animal Science	Committee Member	Current
Leslea Corolla	Non-Thesis M.S.	TAMU, BIMS	Committee Member	Current
Grace Chang	Non-Thesis M.S.	TAMU, BIMS	Major Advisor	Current
Yang Gao	Ph.D.	TAMU, VIBS	Committee Member	Current
Austin Wheeler	Non-Thesis M.S.	TAMU, VIBS	Major Advisor	Current
Chelsie Burroughs	Ph.D.	TAMU, VIBS	Major Advisor	Current
Resa Rezaei	Ph.D.	TAMU, Animal Science	Committee Member	Current
Annisia Williams	Non-Thesis M.S.	TAMU, BIMS	Major Advisor	Academic Probation
Jing Xu	Ph.D.	TAMU, Animal Science	Committee Member	Current

Visiting Graduate Students:

Fang Chen, Peoples Republic of China, 2010-2011

Awards – Graduate Students:

Margaret Joyce

- 2003, George Bush Presidential Library Foundation Grant , Texas A&M University
- 2003, First Place Oral Presentation College of Veterinary Medicine Graduate Student Presentation

- 2004, First Place Oral Presentation, Life Sciences Session Texas A&M University Student Research Week, Texas A&M University

James W. (Will) Frank

- 2011, SSR Trainee Research Award Finalist – Poster Presentations, The Society for the Study of
- 2012, 1st place Platform Presentation, 18th Annual Texas Forum for Reproductive Sciences, Houston, Texas
- 2012, NIFA Fellowship Grant, United States Department of Agriculture
- 2013, Travel Fellowship and Plenary Presentation, 9th International Conference on Pig Reproduction, Olsztyn, Poland
- 2013, High Impact Achievement Recognition Award: Large Grant Recipient, College of Veterinary Medicine, Texas A&M University
- 2013, 2nd place Platform Presentation, 19th Annual Texas Forum for Reproductive Sciences, Houston, Texas

Theodore Wing

- 2012, CVM Graduate Research Mini-Grant Award, College of Veterinary Medicine, Texas A&M University
- 2013, SSR Trainee Research Award Finalist – Platform Presentations, The Society for the Study of
- 2013, SSR Animal Reproduction in Agriculture Fellowship, United States Department of Agriculture

Postdoctoral Trainees and Their Awards:

Dr. Bryan G. White 2010-2012

- 2010, CVM postdoctoral Research Mini-Grant Award, College of Veterinary Medicine, Texas A&M University
- 2011, NIH Travel Award for Early Career Researchers, International Federation of Placenta Associations Meeting, National Institutes of Health
- 2012, SSR Animal Reproduction in Agriculture Research Fellowship, United States Department of Agriculture

Dr. David W. Erikson 2006-2010

- 2008, USDA CSREES NRI Merit Award, United States Department of Agriculture, The Society for the Study of Reproduction Annual Meeting
- 2008, SSR Trainee Research Award Finalist – Platform Presentations, The Society for the Study of Reproduction Annual Meeting
- 2008, 1st place Platform Presentation, 14th Annual Texas Forum for Reproductive Sciences, Houston, Texas

Dr. Kathrin A. Dunlap 2006-2009

- 2007, USDA CSREES NRI Trainee Grant, United States Department of Agriculture
- 2008, USDA CSREES NRI Merit Award, United States Department of Agriculture, The Society for the Study of Reproduction Annual Meeting
- 2009, USDA CSREES NRI Merit Award, United States Department of Agriculture, The Society for the Study of Reproduction Annual Meeting

- 2009, 1st Place, Trainee Research Award, Poster Presentations, The Society for the Study of Reproduction Annual Meeting

Dr. Frank J. White 2004-2005

- 2005, USDA CSREES NRI Merit Award, United States Department of Agriculture, The Society for the Study of Reproduction Annual Meeting

Undergraduate and Veterinary Student Trainees:

Erin Black, presently a VIBS student at Texas A&M University
Daniel Bailey, presently in Medical School, Bethesda Maryland
Cedrick Bates, presently faculty a Prairie View A&M University
James Burghardt, presently graduated, Texas A&M University
Grace Chang, presently a BIMs Non-Thesis M.S. student at Texas A&M University
Jorge DeLeone, presently a BIMS student at Texas A&M University
James Frank, presently Ph.D. Student, VIBS, Texas A&M University
Jose Gonzalez, presently Private Dental Practice, Dallas TX
Schyler Greggs, presently Graduate Student, School of Rural and Public health, Texas A&M Health Science Center
Morgan Halverson, presently in Physician's Assistants School, Houston, TX
Karina Handoyo, presently Medical Student, UT Southwestern Medical School, Dallas, TX
Amy Jeffries, present position unknown
Alice McDonald, presently Undergraduate Student, Texas A&M University
Ryan McLain, presently in the Peace Corps, Sudan, Africa
Jason Muesse, presently Medical Student, Texas A&M Health Science Center
Jesus Muniz, presently RN, Surgery Unit St. Josephs Hospital, College Station, TX
Andrew Naeger, presently accepted to Dental School
Bar Ngyen, presently Dental Student, University of Texas Health Science Center, San Antonio, TX
Jeannie Nguyen, presently Undergraduate Student, Texas A&M University
Atish K. Patel, presently in Dental School, Texas
Kristey Reed, present position unknown
John Graham Reed, present position unknown
Adele Reeder, moved on to be a Medical Student, Baylor College of Medicine, Houston, TX
Justin Roark, present position unknown
Maxwell Su, presently a BIMS student at Texas A&M University
J. Dale Taylor III, present position unknown
Austin Wheeler, presently a VIBS student at Texas A&M University

Awards – Undergraduate Students:

Daniel W. Bailey

- 2008, USDA CSREES NRI Merit Award, United States Department of Agriculture, The Society for the Study of Reproduction Annual Meeting

RESEARCH/SCHOLARLY ACTIVITIES:

Current Research Support:

1. USDA-NRI 2009, *Sphingosine 1-Phosphate Mediates Uterine Angiogenesis*, K. Bayless, PI, G.A. Johnson, Co-PI, 9/01/09–8/31/13, $350,000 direct costs

2. USDA NRI 2010, *Arginine and Secreted Phosphoprotein 1 Mediate mTOR Cell Signaling for Conceptus Development and Survival,* F.W. Bazer, PI, G.A. Johnson, Co-PI, 12/1/10-11/30/14, $500,000 direct costs

3. NIFA Fellowship Grant 2012, *Integrins αvβ3 and α5β1 receptors are necessary for proper implantation of the conceptus in sheep*. J.W. Frank, PI, G.A. Johnson, Mentor, 8/1/12-7/31/14, $75,000 direct costs.

4. NIH-R21 2012, *Incorporation of Endothelial Progenitor Cells into the Placental Vasculature*, G.A. Johnson, PI, K.J. Bayless, PI, R.C. Burghardt, Co-I, 9/1/2012-8/31/14, $275,000 direct costs.

5. Tier One Program (TOP) Grant: Integration of Multidisciplinary and Creative Activities into the Learning Experience, *Enhancing Teaching and Research in Health Impacts of Air Pollution,* G.A. Johnson, R.C Burghardt, F.W. Bazer, M.C. Satterfield, R Zhang, A. Khalizov, Co-I's, 5/1/13-4/30/16, $300,000 direct costs, $300,000 matched by individual Departments (Veterinary Integrative Biosciences, Animal Science, Atmospheric Sciences).

Pending Support:

1. USDA NRI 2013, *Paracrine and Autocrine Signaling Between the Conceptus and Uterus in Pigs*. G.A. Johnson, PI, F.W. Bazer, Co-PI, 9/1/13-8/31/17, $500,000 direct costs.

2. USDA NRI 2013, *Role of Fructose in the Physiology of the Swine Conceptus*. Vallet J.R., PI, G.A. Johnson, Co-PI, F.W. Bazer, Co-PI, G. Wu, Co-PI, 9/1/13-8/31/17, $500,000 direct costs.

3. USDA NRI 2013, *Regulation of water and ion transport by arginine in porcine conceptuses*. G. Wu, PI, G.A. Johnson, Co-PI, F.W. Bazer, Co-PI, R.C. Burghardt, Co-PI, 9/1/13-8/31/17, $500,000 direct costs.

Previous Support:

1. Lalor Foundation, *Osteopontin Affects Conceptus Elongation and Implantation,* 4/1/99-4/1/00, $20,000 direct costs, Awarded/Not Accepted.

2. NRSA Grant (DHHS/NIH #1-F32-HDO 8501-OlAl), *Osteopontin Affects the Periimplantation Uterus and Conceptus,* 5/01/99-4/30/02, $83,160 direct costs

3. University of Idaho Research Council, *Stromal decidualization in the Pregnant Ovine Uterus,* 7/2/01-6/30/02**,** $10,000 direct costs

4. Collaborative Research Agreement Between USDA ARS, APHIS and the University of Idaho No: 58-5348-2-679, *Characterization of Ovine Placental Cell Lines Supporting PrP-Sc Propagation,* 6/1/02-6/1/03, $50,000 direct costs5. NIH-CERH at Texas A&M Pilot Project, *Effects of Osteopontin on Conceptus Development and Implantation,* 6/01/04-5/30/05, $25,000 direct costs

6. Department of Veterinary Anatomy and Public Health Pre-R01 Research Grant, *Osteopontin Functions in the Mouse Uterus and Placenta*, 8/01/04-7/31/05, $25,000 direct costs

7. Department of Veterinary Integrative Biosciences Pre-R01 Research Grant, *Secreted Phosphoprotein-1 (Osteopontin) Mediates Conceptus Attachment for Implantation*, G.A. Johnson, PI, 5/15/07 - 5/14/08. $20,000 direct costs

8. Department of Veterinary Integrative Biosciences Pre-R01 Research Grant 2008, *Involvement of Sphingosine-1-Phosphate in Regulating Uterine Angiogenesis*, G.A. Johnson and K.J. Bayless, Co-PIs, 3/01/08 - 2/29/09. $20,000 direct costs

9. USDA NRI 2008 (Dr Katie Dunlap, trainee recipient), *Mechanistic Analysis of Ovine Endometrial Angiogenesis During Pregnancy*, G.A. Johnson and K.J. Bayless, Co-PDs, 3/01/08-2/28/10, $125,000 direct costs

10. USDA NRI 2006, *Biological Function of Uterine Osteopontin in Porcine Implantation*, G.A. Johnson, PI, K.J. Bayless, Co-PI, 08/01/06-07/31/10, $284,314 direct costs

11. USDA NRI 2006, *Nutrient and Osteopontin Sensing Via MTOR Cell Signaling for Ovine Conceptus Development and Survival*, F.W. Bazer, PI, G.A. Johnson, Co-PI, 08/01/06-07/31/10, $360,000 direct costs

12. USDA-NRI 2008, *Arginine Nutrition, Placental Angiogenesis, and Fetal Growth in Pigs*, G. Wu, PI, G.A. Johnson, Co-PI, 9/01/08–8/31/11, $350,000 direct costs

13. CVM postdoctoral Research Mini-Grant Award 2010, *Role of Sphingosine-1Phosphate in Placentome Endothelial Cell Invasion*, B.G White, PI, G.A. Johnson and R.C. Burghardt Supervisors, 3/1/11-9/1/11, $10,000 direct costs

14. CVM Doctoral Research Mini-Grant Award 2012, *Elucidation of Intercellular Signals That Allow Endothelial Progenitor Cells (EPCs) to Incorporate Into Established Vasculature*, T. Wing, PI, G.A. Johnson and R.C. Burghardt, Supervisors, 3/1/12-9/1/12, $5,000 direct costs.

Invited Presentations, Symposia, Colloquia and Named Lectures

- 2012, Speaker, Osteopontin, a key player in placentation, 6th Annual Reproductive Biology Retreat and 18th Annual Dr. Raymond O. Berry Memorial, College Station, Texas

- 2012, Speaker, *Sphingosine-1-Phosphate Mediates Uterine Angiogenesis,* Agriculture and Food Research Initiative & National Research Initiative, Animal Reproduction Project Director Meeting, The Pennsylvania State University, State College, PA

- 2011, Invited Speaker, *Roles of osteopontin and integrins during pig pregnancy*, Guangdong Institute of Animal Sciences, Guangzhou, China

- 2011, Invited Speaker, *Roles of osteopontin and integrins during pig pregnancy*, Institute of Subtropical Agriculture Chinese Academy of Sciences, Changsha, China

- 2011, Invited Speaker, *Roles of osteopontin and integrins during pig pregnancy*, Hubei Key Laboratory of Animal Nutrition and Feed Science, Wuhan Polytechnic University, Wuhan, China

- 2011, Invited Speaker, *Uterine secretions: molecular regulation of nutrient transport and physiological significance,* International Symposium on Maternal Nutrition and Fetal Development, Beijing, China

- 2011, Invited Speaker, *Interactions between the extracellular matrix (osteopontin) and integrins: strategies for implantation and placentation in pigs, sheep and beyond,* 4th Special Biomodulation Symposium, Seoul, Korea

- 2011, Invited Speaker, *Interactions between the extracellular matrix (osteopontin) and integrin receptors: strategies for implantation and placentation in pigs, sheep and beyond*. Animal Science Departmental Seminar, University of Wyoming

- 2010, Invited Speaker, W*orkshop, What Can We Learn From Epitheliochorial Placentae: Current Advances Based on In Vivo and In Vitro Studies: International Federation of Placenta Associations meeting,* Santiago, Chile

- 2010, Invited Speaker, *Sigma Xi Spring Symposium*, Texas A&M University, College Station, TX

- 2009, Invited Speaker, *Workshop on Comparative Placentation: International Federation of Placenta Associations meeting,* Adelaide, Australia

- 2009, Speaker, *NRI Animal Reproduction Annual Investigator Meeting*, Pittsburgh, Pennsylvania

- 2009, Invited Speaker, *4th International Symposium on Animal Nutrition, Health and Feed Additives, Chinese Academy of Sciences, Changsha, China*

- 2009, Invited Speaker, *Breakout Session: Conceptus-Uterus Interactions*, Eighth International Conference on Pig Reproduction, Banff, Alberta Canada

- 2008, Invited Speaker, *Workshop on Comparative Placentation: Different Species With Different Placental Solutions for Fetal Development and Survival", International Federation of Placenta Associations meeting, and 12th Conference of the European Placenta Group,* Seggau Castle, Austria

- 2008, Invited Speaker, *Gordon Conference on Reproductive Tract Biology, Session V1 Implantation Biology,* Andover, New Hampshire

- 2008, Speaker, *NRI Animal Reproduction Annual Investigator Meeting*, Indianapolis, Indiana

- 2007, Invited Speaker, *Symposium: The Fetomaternal Dialogue in Domestic Animals: From Conceptus to Placental Release*, Marburg, Germany

- 2005, Invited Speaker, *Gordon Conference on Small Integrin-Binding Proteins*, *Shared Functions of SIBLINGS session*, Big Sky, Montana

- 2004, Invited Speaker, *4th Meeting of the DFG Graduate Seminar Giessen-Marburg "Cell-Cell Interaction in Reproduction"*, Giessen, Germany

- 2003, Invited Speaker, *Workshop on Comparative Placentation: Uterine Histotroph and Placental Development, Ninth International Federation of Placenta Associations, 10th Conference of the European Placenta Group*, Mainz, Germany

- 2002, Invited Speaker, *Gordon Conference on Reproductive Tract Biology, New Investigators Forum,* New London, Connecticut

- 2001, Invited Speaker, *Third International Conference on Osteopontin*, San Antonio, TX

- 2001, Invited Speaker, *Northwest Reproductive Sciences Symposium*, Corvallis, OR

- 2001, Invited Speaker, Role of Osteopontin in Conceptus Elongation and Implantation, Giessen, Germany

Professional Organizations and Service:

Professional Organizations:

Society for the Study of Reproduction, Member, 1998 to present
The Endocrine Society, Member, 2001 to 2010
International Federation of Placenta Associations, 2003-2004, 2008-2012

Professional Service:

Board of Reviewing Editors, *Biology of Reproduction*, 2007 to present

Editorial Board Member, *Biology of Reproduction*, 2004

Chair, Interdisciplinary Faculty of Reproductive Biology, 2006 – 2010

Texas Forum on Reproductive Sciences, Houston, TX
Meeting Organizer/Coordinator, 2008
Steering Committee, 2007-present

Member, Society for the Study of Reproduction Publications Committee, 2007-2011.

Member, Membership Committee, Society for the Study of Reproduction, 2003-2006.

Member, Program Committee Abstract Reviewer, Society for the Study of Reproduction, 2006, 2007, 2008

Manuscript Review for Journals:

Review of between 25-30 manuscripts for professional journals per year

Ad hoc reviewer for:

American Journal of Physiology: Regulatory, Integrative and Comparative Physiology
American Journal of Reproductive Immunology
Animal Reproduction
Animal Reproduction Science
Biology of Reproduction
BMC Genomics
Cell and Tissue Research
Cells Tissues and Organs
Domestic Animal Endocrinology
European Journal of Obstetrics & Gynecology & Reproductive Biology
Genome Biology and Evolution
Gynecologic Oncology Case Reports
Histology and Histopathology
Human Reproduction
Innate Immunity
International Journal of Molecular Sciences
In Vitro Cellular and Developmental Biology
Journal of Animal Science
Journal of Endocrinology
Journal of Molecular Histology
Journal of Morphology
Journal of Obstetrics and Gynaecology Research
Journal of Physiology and Pharmacology
Journal of Reproductive Immunology
Journal of Zhejiang University-SCIENCE B
Molecular Biology Reports
Molecular Human Reproduction
Molecular Reproduction and Development
Neurotoxicology
Pediatric Research
Placenta
PNAS
The Quarterly Review of Biology
Regulatory Peptides
Reproduction
Reproductive Biology and Endocrinology
Reproduction in Domestic Animals
Reproduction, Fertility and Development
Theriogenology
The Veterinary Journal

Committee Assignments:

Departmental:

Member, New CVM facilities space committee for VIBS, 2012
Faculty Mentor for Dr. Qinglei Li, 2011- present
Chair, Internal Review Committee for Dr. Louise Abbott's teaching, 2011
Chair, Search Committee, Reproductive Biologist in Pregnancy, 2009-2010
Chair, Internal Review Committee for Dr. Joe Arosh's service, 2010
Chair, Internal Review Committee for Dr. Joe Arosh's research, 2010
Chair, Search Committee, Lecturer in Histology and Anatomy, 2008
Member, Teaching Committee, 2007-present
Member, Strategic Planning Committee, 2009-present
Member, Search Committee, Reproductive Biology/Anatomy, 2003-2004
Member, Teaching Subcommittee, 2006-present
Member, Graduate Programs Committee, 2006-present

College:

Diversity Nomination Review Committee, 2012
VIBS Facilities Planning Committee for Veterinary Medical Academic Building, 2012
Medical Sciences Library Council, 2004-2006
Judge, College of Veterinary Medicine Graduate Research Symposium, 2003, 2004, 2005
Judge, *TAMU 6th Annual Student Research Week,* 2003

University:

Committee Member, Who's Who Among Students in American Universities and Colleges, 2011
Chair, Interdisciplinary Faculty of Reproductive Biology, 2006 – 2010
Member, Executive Committee, Interdisciplinary Faculty of Reproductive Biology, 2006 – present
Chair, Graduate Programs Committee, Interdisciplinary Faculty of Reproductive Biology, 2005 - 2006
Member, Seminar Committee, Interdisciplinary Faculty of Reproductive Biology, 2004 – 2006; Chair 2004-2005

BIBLIOGRAPHY

Publications in Refereed Journals: (last 5 years, *students italicized*)

131. Vallet JL, Leymaster KA, **Johnson GA** and Bazer FW. Limitations in uterine and conceptus physiology that lead to fetal losses. J Animal Sci 2013; accepted.

130. Kim K, Jutooru I, Chadalapaka G, **Johnson G**, Frank J, Burghardt RC and Safe S. HOTAIR is a negative prognostic factor and exhibits pro-oncogenic activity in pancreatic cancer. Cancer Res 2011, In Review.

129. Bazer FW, Song G, Kim J, Dunlap K, Satterfield C, **Johnson GA**, Burghradt RC and Wu G. Uterine Biology and pregnancy in pigs and sheep. J Animal Sci Biotech 2012; 3:23-37.

128. Bazer FW, **Johnson GA**, Song G and Wu G. Pregnancy recognition signaling, fetal-placental development and prenatal fetal programming. In Animal Reproduction in Livestock, [Eds. Susana Astiz Blanco and Antonio Bonzalez Buines], in Encycopedia of Life Support Systems (EPLSS), Developed under the Auspices of the UNESC), Eolss Publishers, Oxford, UK. 2012.

127. Bazer FW, Kim J, Ka H, **Johnson GA**, Wu G and Song G. Select nutrients in the uterine lumen of sheep and pigs affect conceptus development. J Reprod Develo 2012; 58:180-188.

126. Bazer FW, Song G, Kim J, *Erikson DW*, **Johnson GA**, Burghardt RC, Gao H, Satterfield MC, Spencer TE and Gao W. Mechanistic mammalian target of rapamycin (MTOR) cell signaling: effects of select nutrients and secreted phosphoprotein 1 on development of mammalian conceptuses. Mol Cell Endocrinol 2012; 354:22-33.

125. Bazer FW, Wu G, **Johnson GA**, Kim J and Song G. Uterine histotroph and conceptus development: select nutrients and secreted phosphoprotein 1 affect MTOR cell signaling in ewes. Biol Reprod 2011; 85:1094-1107.

124. Wu G, Bazer FW, Burghardt RC, **Johnson GA**, Kim SW, Knabe DA, Li P, Li X, McKnight JR, Satterfield MC and Spencer TE. Proline and hydroxyproline metabolism: implications for animal and human nutrition. Amino Acids 2011; 40:1053-1063.

123. Bayless KJ and **Johnson GA.** Role of cytokines in formation and maintenance of angiogenic sprouts. J Vasc Res 2011; 48:369-385.

122. Wu G, Bazer FW, **Johnson GA**, Knabe DA, Burghardt RC, Spencer TE, Li XL and Wang JJ. Triennial growth symposium: Important roles for L-glutamine in swine nutrition and production. J Anim Sci 2011; 89:2017-2030.

121. Kim J, Burghardt RC, Wu G, **Johnson GA**, Spencer TE and Bazer FW. Select nutrients in the ovine uterine lumen: IX. Differential effects of arginine, leucine, glutamine and glucose on interferon tau, ornithine decarboxylase and nitric oxide synthase in the ovine conceptus. Biol Reprod, 2011; 84:1139-1147.

120. Kim J, Burghardt RC, Wu G, **Johnson GA**, Spencer TE and Bazer FW. Select nutrients in the ovine uterine lumen: VIII. Arginine stimulates proliferation of ovine trophectoderm cells through mTOR-RPS6K-RPS6 signaling cascade and synthesis of nitric oxide and polyamines. Biol Reprod 2011; 84:70-78.

119. Kim J, Burghardt RC, Wu G, **Johnson GA**, Spencer TE and Bazer FW. Select nutrients in the ovine uterine lumen: VII. Effects of arginine, leucine, glutamine and glucose on trophectoderm cell signaling, proliferation and migration. Biol Reprod 2011;84:62-69.

118. Bazer FW, Spencer TE, **Johnson GA** and Burghardt RC. Uterine receptivity to implantation of blastocysts in mammals. Frontiers in Bioscience 2011; S3:745-767.

117. Liu J, Westhusin M, Long C, **Johnson G**, Burghardt R and Kraemer D. Embryo production and possible species preservation by nucleus transfer of bovine semen somatic cells. Theriogenology 2010; 74:1629-1635.

116. *Bailey DW, Dunlap KL, Erikson DW*, *Patel A*, Bazer FW, Burghardt RC and **Johnson GA**. Effects of Long-Term Progesterone Exposure on Porcine Uterine Gene Expression: Progesterone Alone Does Not Induce Secreted Phosphoprotein 1 (Osteopontin) in Glandular Epithelium. Reproduction 2010; 140:595-604.

115. *Bailey DW*, *Dunlap KA*, *Frank JW, Erikson DW, White BG*, Bazer FW, Burghardt RC and **Johnson GA**. Effects of long-term progesterone on developmental and functional aspects of porcine uterine epithelia: progesterone alone does not support glandular development of pregnancy. Reproduction 2010; 140:583-594.

114. Kim J[‡], *Erikson DW*[‡], Burghardt RC, Spencer TE, Wu G, Bayless KJ, **Johnson GA**[¤] and Bazer FW[¤]. Secreted phosphoprotein 1 binds integrins to initiate multiple cell signaling pathways, including FRAP1/mTOR, to support attachment and force-generated migration of trophectoderm cells. Matrix Biol 2010; 29:369-382.

[‡] equal contribution by both authors; [¤]Co-Corresponding Authors

113. Li X, Bazer FW, **Johnson GA**, Burghardt RC, *Erikson DW, Frank JW*, Spencer TE, Shinzato I, and Wu G. Dietary supplementation with 0.8% L-arginine between daya 0 and 25 of gestation reduces litter size in gilts. J Nutri 2010; 140:1111-1116.

112. *Dunlap KA*, Kwak H-I, Burghardt RC, Bazer FW, **Johnson GA**[¤] and Bayless KJ[¤]. Potential involvement of the Sphingosine-1-Phosphate (S1P) Signaling Pathway in Regulating Endometrial and Placental Angiogenesis During Sheep Pregnancy. Biol Reprod 2010; 82:876-887.

[¤]Co-Corresponding Authors

111. Song G, *Bailey DW*, *Dunlap KA*, Burghardt RC, Spencer TE, Bazer FW[t] and **Johnson GA**[t]. Cathepsin B, Cathepsin L and Cystatin C in the Porcine Uterus and Placenta: Potential Roles in Endometrial/Placental Remodeling and in Fluid-Phase Transport of Proteins Secreted by Uterine Epithelia Across Placental Areolae and Neonatal Gut. Biol Reprod 2010; 82:854-864.

[¤]Co-Corresponding Authors

110. Wu G, Bazer FW, Burghardt RC, **Johnson GA**, Kim SW, Li X, Satterfield MC and Spencer TE. Impacts of amino acid nutrition on pregnancy outcome in pigs: mechanisms and implications for swine reproduction. J Anim Sci 2010; 88:E195-E204.

109. Bazer FW, Wu G, Spencer TE, **Johnson GA**, Burghardt RV and Bayless KJ. Novel pathways for implantation and establishment of pregnancy: common mechanisms among mammals. Mol Human Reprod 2010; 16:135-152.

108. Satterfield MC, Gao H, Li X, Wu G, **Johnson GA**, Spencer TE and Bazer FW. Select nutrients and their associated transporters are increased in the ovine uterus following early progesterone administration. Biol Reprod 2010; 82:224-231.

107. Liu J, Westhusin M, **Johnson G**, Raudsepp T, Chowdhary B, Burghardt R, Long C and Kraemer D. Evaluation of culture systems for attachment and proliferation of the epithelial cells cultured from ovine semen. Animal Reprod Sci 2009; 115:49-57.

106. Massuto DA, Kneese EC, **Johnson GA**, Hooper NH, Burghardt RC, Ing NH and Jaeger LA. Transforming growth factor beta (TGFB) signaling is activated during porcine implantation: Proposed role for latency associated peptide-integrins at the conceptus-maternal interface. Reproduction 2009; 139:465-478.

105. Massuto DA, Hooper RN, Kneese EC, **Johnson GA**, Ing NH, Weeks BR and Jaeger LA. Intrauterine infusion of latency associated peptide (LAP) during early porcine pregnancy affects conceptus elongation and placental size. Biol Reprod 2009; 82:534-542.

104. Wu G, Bazer FW, Burghardt RC, **Johnson GA**, Kim SW, Knabe DA, Li X, Satterfield MC, Smith SB, Spencer TE. Functional amino acids in swine nutrition and production. In: Dynamic Animal Nutrition. Eds ???, Wageningen Academic Publishers; p p69-98.

103. *Erikson DW*, Burghardt RC, Bayless KJ [t] and **Johnson GA** [t]. Secreted phosphoprotein 1 (SPP1, osteopontin) binds to integrin alphavbeta6 on porcine trophectoderm cells and integrin alphavbeta3 on uterine luminal epithelial cells, and promotes trophectoderm cell adhesion and migration. Biol Reprod 2009; 81:814-825.
[t] co-corresponding authors

102. Simmons RM, *Erikson D*, Kim J, Burghradt RC, Bazer FW, **Johnson GA** and Spencer TE. Insulin-like growth factor bining protein one in the ruminant uterus: potential endometrial marker and regulator of of conceptus. Endocrinology 2009; 150:4295-42305.

101. **Johnson GA**, Bazer FW, Burghardt RC, Spencer TE, Wu G and Bayless KJ. Conceptus-uterus interactions in pigs: endometrial gene expression in response to estrogens and interferons from conceptuses. Soc Reprod Fertil Suppl 2009; 66:321-332.

100. Bazer FW, Spencer TE, **Johnson GA**, Burghardt RC and Wu G. Comparative Aspects of Implantation. Reproduction 2009; 138:195-205.

99. Banerjee A, Rose R, **Johnson GA**, Burghardt RC and Ramaiah SK. The influence of estrogen on hepatobiliary osteopontin expression in a female model of alcoholic steatohepatitis. Toxicol Pathol 2009; 37:492-501.

98. Li X, Bazer FW, Gao H, Jobgen W, **Johnson GA**, Li P, McKnight JR, Satterfield MC, Spencer TE and Wu G. Amino acids and gaseous signaling. Amino Acids 2009; 37:65-78.

97. Gao H, Wu G, Spencer TE, **Johnson GA** and Bazer FW. Select nutrients in the ovine uterine lumen: VI. Expression of FK506-binding protein 12-rapamycin complex-associated protein 1 (FRAP1)

and associated regulators and effectors of mRORC1 and mTORC2 complexes in ovine uteri and peri-implantation conceptuses. Biol Reprod 2009; 81:87-100.

96. Gao, H, Wu G, Spencer TE, **Johnson GA** and Bazer FW. Select nutrients in the ovine uterine lumen: V. Nitric oxide synthase, GTP cyclohydrolase and ornithine decarboxylase in ovine uteri and peri-implantation conceptuses. Biol Reprod 2009; 81:67-76.

95. Gao H, Wu G, Spencer TE, **Johnson GA** and Bazer FW. Select Nutrients In the Ovine Uterine Lumen: IV. Expression of Neutral And Acidic Amino Acids Transporters In Ovine Uteri and Peri-Implantation Conceptuses Biol Reprod 2009; 80:1196-1208.

94. Hyashi, K, *Erikson DW*, Tilford SA, Bany BA, Maclean II JA, Rucker III EB, **Johnson GA** and Spencer TE. Wnt genes in the mouse uterus: potential regulation of implantation. Biol Reprod 2009; 80:989-1000.

93. Burghardt RC, *Burghardt JR, Taylor II JD, Reeder AT, Nguyen BT,* Spencer TE and **Johnson GA.** Enhanced focal adhesion assembly reflects increased mechanosensation and mechanotransduction along the maternal/conceptus interface during pregnancy in sheep. Reproduction 2009; 137:583-593.

92. Gao H, Wu G, Spencer TE, **Johnson GA** and Bazer FW. Select nutrients in the ovine uterine lumen: III. Cationic amino acid transporters in the ovine uterus and peri-implantation conceptuses. Biol Reprod 2009; 80:602-609.

91. Gao, H, Wu G, Spencer TE, **JohnsonGA** and Bazer FW. Select nutrients in the ovine uterine lumen: II. Glucose transporters in the uterus and peri-implantation conceptuses. Biol Reprod 2009; 80:94-104.

90. Gao H, Wu G, Spencer TE, **Johnson GA**, Li X and Bazer FW. Select nutrients in the ovine uterine lumen: I. amino acids, glucose and ions in uterine luminal fluid from cyclic and pregnant ewes. Biol Reprod 2009; 80:86-93.

89. Bazer FW, Burghardt RC, **Johnson GA**, Spencer TE and Wu G. Interferons and progesterone for establishment and maintenance of pregnancy: interactions among novel signaling pathways. Reproductive Biology 2008; 8:179-211.

88. Bazer FW, Spencer TE and **Johnson GA**. Interferons and uterine receptivity. Seminars in Reprod Med 2009; 27:90-102.

87. Song G, *Dunlap KA,* Kim J*, Bailey DW*, Spencer TE, Burghardt RC, **Johnson GA**[t] and Bazer FW[t]. Stanniocalcin 1 is a Luminal Epithelial Marker for Implantation in Pigs Regulated by Progesterone and Estrogen. Endocrinology 2009; 150:936-945.
[t] co-corresponding authors

86. Wu G, Bazer FW, Datta S, Gao H, **Johnson GA**, Lassala A, Li P, Satterfield MC and Spencer TE. Intrauterine growth retardation in livestock: Implications, mechanisms and solutions. Arch Tierz., Dummerstorf 2008; 51 (Special Issue):4-10.

85. *Dunlap KA*, Burghardt RC, *Erikson DW, Reed KM, White FJ*, Farmer JL, Spencer TE, Magness RR, Bazer FW, Bayless KJ and **Johnson GA**. Progesterone and placentation increase uterine glandular and stromal secreted phosphoprotein 1 (osteopontin) that may function for histotrophic and hematotrophic support of ovine pregnancy. Biol Reprod 2008; 79:983-990.

84. *Joyce MM*, *Burghardt JR*, Burghardt RC, Hooper RN, Bazer FW and **Johnson GA**. Uterine major histocompatibility class I molecules and beta 2 microglobulin are regulated by progesterone and conceptus interferons during pig pregnancy. J Immunol 2008; 181:2494-2505.

83. Bridger PS, Haupt S, Leiser R, **Johnson GA**, Burghardt RC, Tinneberg H-R and Pfarrer C. Integrin activation in bovine placentomes and in caruncular epithelial cells isolated from pregnant cows. Biol Reprod 2008; 79:274-282.

82. Kim J, Song G, Gao H, Farmer JL, Satterfield MC, Burghardt RC, Wu G, **Johnson GA**, Spencer TE and Bazer FW. Insulin-like growth factor 2 (IGF2) activates P13K-AKT1 and MAPK cell signaling pathways and stimulates proliferation and migration of ovine torphectoderm cells. Endocrinology 2008; 149:3085-3094.

81. Wu G, Bazer FW, Datta S, **Johnson GA**, Li P, Satterfield MC and Spencer TE. Proline metabolism in the conceptus: Implications for fetal growth and development. Amino Acids DOI 10.1007/s00726-008-0052-7.

80. **Johnson GA.** Uterine Stromal Cell Differentiation in Non-Decidualizing Species. In: The Endometrium: Molecular, Cellular & Clinical Perspectives, 2nd Edition. Aplin JD, Fazleabas AT, Glasser SR, Giudice LC, Eds., Informa Healthcare Ltd, 2008, pp 409-421.

79. Bazer FW, Spencer TE, Ott TL and **Johnson GA.** Mediators of Maternal Recognition of Pregnancy. In: The Endometrium: Molecular, Cellular & Clinical Perspectives, 2nd Edition. Aplin JD, Fazleabas AT, Glasser SR, Giudice LC, Eds., Informa Healthcare Ltd, 2008, pp 260-285.

Professor Peter S. Liss, CBE, FRS

Curriculum Vitae

Professor Peter Liss is a distinguished environmental scientist whose research is internationally recognised and has covered many aspects of the subject and particularly the interaction between the oceans and the atmosphere. Through his 5-year term as chairman of the International Geosphere-Biosphere Programme (IGBP) he is also well acquainted with many aspects of climate and other global changes. Until the end of 2007 he was Chair of the Surface Ocean – Lower Atmosphere Study (SOLAS of IGBP, WCRP, SCOR and CACGP). He served on the UK's Natural Environment Research Council (NERC) for 5 years, chairing both its Marine and Atmospheric Sciences Boards. He served 3 times on the UK's Research Assessment Exercise, the last as Chair of the Earth and Environmental Sciences Panel in 2001. He was President of the Challenger Society for Marine Sciences (2006-2008). From 2005 to 2011 he was a Commissioner of the Royal Commission on Environmental Pollution. He was the first recipient of the Challenger Society Medal, has been awarded the Plymouth Marine Sciences Medal and the John Jeyes Medal of the Royal Society of Chemistry, and is Guest Professor of the Ocean University of Qingdao, China. Prof. Liss is a Fellow of the Royal Society and was created Commander of the British Empire in 2008 for his services to science. He is currently Chair of the European Research Council 'Earth System Science' Advanced Grants Panel. Further activities in Europe include chairmanship of COST Action 735 (Tools for Assessing Global Air-Sea Fluxes of Climate and Air Pollution Relevant Gases), membership of international advisory boards for funding agencies, institutes and universities in several European countries, as well as participation in many EU Framework Research programmes. He is a member of the Executive Group of the 'Future Earth' Task Team of ICSU, the Belmont Forum and others. Prof. Liss has recently been elected to the Academia Europaea and in 2013-2014 will be one of the first 6 Eminent Scholars of the newly established Institute for Advanced Studies at Texas A & M University.

Name: Peter Simon Liss
Place of Birth: Watford, England
Nationality: British
Marital Status: Married, three children

Work Address: School of Environmental Sciences
University of East Anglia
Norwich, NR4 7TJ, UK
Tel. +44 (0)1603 592563
Fax. +44 (0)1603 591327
Email. p.liss@uea.ac.uk

Education:
1964-1967: Marine Science Laboratories, University of Wales, Ph.D. Thesis entitled "The Chemistry of Silicon in Sea Water".
1961-1964: University College, Durham University, B.Sc. Honours in Chemistry and Physics.

Experience:
2013-2014 Eminent Scholar, Texas Institute for Advanced Studies, Texas a & M University.
2009-2010: Acting Director, Climatic Research Unit, University of East Anglia.
Summers 1989 and 1990: Visiting Scientist, Graduate School of Oceanography, University of Rhode Island, U.S.A.
1985-present, Professor in the School of Environmental Sciences, University of East Anglia (1977-1985, Reader; 1969-1977, Lecturer)
September-October 1982: Visiting Scientist CSIRO Atmospheric Science Division, Aspendale, Australia.
1979-1983: Half-time Scientific Advisor, Environmental Studies Section, U.K. Central Electricity Generating Board, London.

June-December 1977: Visiting Associate Professor, Department of Oceanography, University of Washington, Seattle, U.S.A.

January-June 1975: Visiting research scientist Ocean Chemistry Laboratories, Department of the Environment, Victoria, B.C., Canada.

Summers 1972 and 1973: Visiting research scientist Scripps Institution, UCSD, U.S.A.

1967-1969 N.E.R.C. Postdoctoral Research Fellow, Department of Oceanography, Southampton University. Research on processes controlling the exchange of gases across the air-sea interface.

AWARDS AND HONOURS

Fellow of the Royal Society (2008).
Commander of the British Empire (CBE, 2008).
Royal Society of Chemistry, John Jeyes Medallist and Lecturer (2003).
Royal Society of Chemistry, Environmental Chemistry Distinguished Lecturer (2002).
1st Recipient Challenger Society Medal (2000).
Royal Society, John Murray Travelling Studentship (1972).
Plymouth Marine Sciences Medallist (1992).
Guest Professor, Ocean University of Qingdao, China.
Fellow of the Geological Society(2001).
Fellow of the Institute of Marine Engineering, Science and Technology.
Elected Member of Academia Europaea (2012).

NATIONAL ACTIVITIES

Royal Society:

Chair, Global Environmental Research Committee (2007-2009).
Environmental, Climate and Marine Advisory Networks.
Member, Working Groups on Ocean Acidification (2004-2005) and Ground-level Ozone in the 21st century (2007-2008).
National Committee for the International Geosphere-Biosphere Programme (IGBP).
Member, Organising Group for Royal Society Discussion meetings on "Tracers in the Ocean", 1987-1988; "Understanding the North Sea System", 1992-1993; "Atmospheric Chemistry of Sulphur in Relation to Aerosols, Clouds and Climate", 1996-1997; and "Greenhouse Gases in the Earth System: Setting the Agenda to 2030", 2011.
Co-organiser of Royal Society/NERC Discussion Meeting on "Future Chemical Changes to the Atmosphere", 2004.
Chair, Environmental Travel Grants Committee

Natural Environment Research Council:

Chair, Oceans 2025 Advisory Board (2008-2011).
Chair National Oceanography Centre Associates Board (2010-present).
Member, Advisory Board National Oceanography Centre (2011-present).
Chair, Earth System Science Strategy Group (2006-7).
Member British Antarctic Survey International Review Committee.
Member of Steering Committees for NERC Special Topics/Directed Programmes in Estuarine Processes, Atmospheric Chemistry, North Sea Community Research Programme, Atmospheric Chemistry Studies in the Oceanic Environment (ACSOE), Surface Ocean-Lower Atmosphere Study (SOLAS).
Co-Director Earth System Science Summer School (2001-2004)
Atmospheric Sciences Committee and Atmospheric Sciences Science and Technology Board, Resources and Strategy Committee (1990-1995).
Chair, Marine Sciences Committee and Marine Science and Technology Board (1990-1995).
Member of Natural Environment Research Council (1990-1995)

Marine Biological Association of the UK:

Member of the Council (3 terms).

British Council: Member Science, Engineering and Environment Advisory Committee.

Inter-Agency Committees:

Chair, Global Environmental Change Committee – Coordination and Agenda Sub-group.
Global Environmental Change, Chairs of Biogeochemical Dynamics Working Group and Expert Panel on UK Strategy for Global Environmental Research.
Marine Science and Technology, Independent Member (1999-2009).

Challenger Society: President (2006-2008).
Chair, UK Oceanography 1988.

Higher Education Funding Council's Research Assessment Exercise, Panel for Earth and Environmental Sciences:

Chair 2001.
Member 1992 and 1996.

Science Council: Member of Council (representing President of IMarEST).

Department of the Environment/Department of Environment, Food and Rural Affairs:

Radioactive Waste Management Advisory Committee (1985-1991).
Member Defra Scientific Advisory Council(2011-present).

H.M. Government: Commissioner, Royal Commission on Environmental Pollution (2005-2011).
Member MoD Expert Panel on Sustaining Scientific Excellence at the Meteorological Office (2001-2004).
Expert Witness and Advisor to various House of Commons/Lords Science and Technology Select Committees.

Sir Alistair Hardy Foundation for Ocean Sciences (SAHFOS):

President of the Council 2011- present.

Marine Alliance for Science & Technology in Scotland (MASTS):

Chair of the International Advisory Board (2011-present).

Marine Environmental Data and Information Network (MEDIN):

Chair of the Sponsors Board and the Executive Team (2009-present).

INTERNATIONAL ACTIVITIES

International Geosphere-Biosphere Programme (IGBP of ICSU):

Scientific Steering Committee for International Global Atmospheric Chemistry Project (IGAC).
Co-Chair Planning Committee for Surface Ocean Lower Atmosphere Study (SOLAS); appointed Chair of Scientific Steering Committee (2001-2007).
Chair, Scientific Committee IGBP (1993-1997).
Treasurer, Scientific Committee IGBP (1990-1993).

Other ICSU: Commission on Atmospheric Chemistry and Global Pollution (of IAMAS).
Scientific Committee on Oceanic Research (SCOR), Member of Working Groups on the Ocean as a Source and Sink for Atmospheric Constituents (No.72) and Oceanic CO_2 Measurements (No.75).
Scientific Committee for International Human Dimensions Programme (IHDP).
Joint Scientific Committee for World Climate Research Programme (WCRP).
Member Executive Group of the 'Future Earth' Task Team.

NATO Science Committee:

Co-Director of Advanced Study Institute on Air-Sea Exchange of Gases and Particles (1982).

U.S. National Science Foundation:

Principal Investigator on Sea-Air Exchange (SEAREX) Program.
Member various review/evaluation committees.

European:

Chair, European Research Council Earth System Science Advanced Grants Awards Committee (2006-2012).
Member International Advisory Committees for Kiel Oceanographic Institute and Max-Planck Environmental Institutes in Hamburg, Mainz and Jena.
Co-ordinator for EUROTRAC sub-project 'Air-Sea Exchange' (ASE).
Chair, COST Action 735 (Tools for Assessing Global Air-Sea Fluxes of Climate and Air Pollution Relevant Gases)(2006-2011).
Chair, Advisory Board for Marine Alliance for Science and Technology Scotland (MASTS)(2011-present).
Member, Science Review Committees in UK and several European countries.
Member Science Europe Committee for Life, Environment & Geo-Sciences (2012-present).

GESAMP (Group of Experts on Scientific Aspects of Marine Protection):

Member various working groups and currently Co-Chair of Working Group 38.

Editorial Boards:

Journal of Atmospheric Chemistry.
Tellus B.
Journal of Environmental Monitoring.
Aquatic Sciences.
Global Environmental Research.
Indian Journal of Marine Sciences.
Environmental Research Letters.
Malaysian Journal of Marine Sciences.

PROFESSOR Peter S. LISS – SELECTED PUBLICATIONS

Avgoustidi, V., Nightingale, P.D., Joint, I., Steinke, M., Turner, S.M., Hopkins, F.E. and Liss, P.S. (2012). Decreased marine dimethyl sulfide production under elevated CO_2 levels in mesocosm and in vitro studies. Environmental Chemistry 9, 399-404. doi:10.1071/EN11125.

Hughes, C., Johnson, M., vonGlasow, R., Chance, R., Atkinson, H., Souster, T., Lee, G.A., Clarke, A., Meredith, M., Venables, H.J., Turner, S.M., Malin, G. and Liss, P.S. (2012). Climate-induced change in biogenic bromine emissions from the Antarctic marine biosphere. Global Biogeochemical Cycles 26, GB3019, doi:10.1029/2012GB004295.

Martino, M., Leze, B., Baker, A.R. and Liss, P.S. (2012). Chemical controls on ozone deposition to water. Geophysical Research Letters 39, L05809, doi:10.1029/2011GL050282.

Beale, R., Liss, P.S., Dixon, J.L. & Nightingale, P.D. (2011) Quantification of oxygenated volatile organic compounds (OVOCs) in seawater by membrane inlet-proton transfer reaction/mass spectrometry (MI-PTR/MS). Analytica Chimica Acta 706, 128-134.

Hopkins, F., Nightingale, P. and **Liss, P.S.** (2011). Effects of ocean acidification on the marine sources of atmospherically active trace gases. In: *Ocean Acidification*, Gattuso, J-P. and Hansson, L. (eds), Oxford University Press, 210-229.

Hunter, K.A., **Liss, P.S.** et al. (2011). Impacts of anthropogenic SOx, NOx and NH_3 on acidification of coastal waters and shipping lanes. *Geophysical Research Letters* **38**, L13602. doi:10.1029/2011GL047720.

Lana, A., Bell, T.G., Simó, R., Vallina, S.M., Ballabrera-Poy, J., Kettle, A.J., Dachs, J., Bopp, L., Saltzman, E.S., Stefels, J., Johnson, J.E. and **Liss, P.S.** (2011). An updated climatology of surface dimethylsulfide concentrations and emission fluxes in the global ocean. *Global Biogeochemical Cycles* **25**, GB1004, doi:10.1029/2010GB003850.

Johnson, M.T., Bell, T.G., Hughes, C. and **Liss, P.S.** (2011). A Rumsfeldian analysis of uncertainties in air-sea trace gas exchange. *Gas Transfer at Water Surfaces*, Komori, S., McGillis, W. and Korose, R. (eds), Kyoto University Press, 464-484.

Beale, R., **Liss, P.S.** and Nightingale, P.D. (2010). First oceanic measurements of ethanol and propanol. *Geophysical Research Letters* **37**, L24607, doi:10.1029/2010GL045534.

Hopkins, F.E., Turner, S.M., Nightingale, P.D., Steinke, M., Bakker, D. and **Liss, P.S.** (2009). Ocean acidification and marine trace gas emissions. *Proceedings of the National Academy of Sciences* **107**, 760-765.

Hughes, C., Chuck, A.L., Rossetti, H., Mann, P.J., Turner, S.M., Clarke, A., Chance, R. and **Liss, P.S.** (2009). Seasonal cycle of seawater bromoform and dibromomethane concentrations in a coastal bay on the western Antarctic Peninsula. *Global Biogeochem. Cycles* **23**, GB2024, doi:10.1029/2008GB003268.

Hughes, C., Turner, S.M., Johnson, M.T., Ezzi, I., Brand, T., Gibb, S.W., Nightingale, P.D., **Liss, P.S.** and Malin, G. (2009). Dibromethane and bromoform concentrations in the Norwegian Arctic Ocean: an analysis of their sources, ratios and sea-air emissions. *Global Biogeochemical Cycles* 2009GB003744.

Vogt, M. and **Liss, P.S.** (2009). Dimethylsulfide and climate. In: *Surface Ocean-Lower Atmosphere Processes* (Le Quéré, C. and Saltzman, E.S. (eds.)) *AGU Geophysical Monograph* **187**, 197-232.

Duce, R.A., LaRoche, J., Altieri, K., Arrigo, K.R., Baker, A.R., Capone, D.G., Cornell, S., Dentener, F., Galloway, J., Ganeshram, R.S., Geider, R.J., Jickells, T., Kuypers, M.M., Langlois, R., **Liss, P.S.**, Liu, S.M., Middleburg, J.J., Moore, C.M., Nickovic, S., Oschlies, A., Pedersen, T., Prospero, J., Schlitzer, R., Sorensen, L.L., Umatsu, M., Ulloa, O., Voss, M., Ward, B. and Zamora, L. (2008). Impacts of atmospheric anthropogenic nitrogen on the open ocean. *Science* **320**, 893-897.

Martino, M., Mills, G.P., Woeltjen, J. and **Liss, P.S.** (2008) A new source of volatile organoiodine compounds in surface seawater. *Geophysical Research Letters* **36**, L01609, doi:10.1029/2008GL036334.

Jickells, T.D., **Liss, P.S.** et al. (2008) A Lagrangian biogeochemical study of an eddy in the Northeast Atlantic. *Progress in Oceanography* **76**, 366-398.

Watson, A.J., Boyd, P.W., Turner, S.M., Jickells, T.D. and **Liss, P.S.** (2008) Designing the next generation of ocean iron fertilization experiments. *Marine Ecology Progress Series* **364**, 303-309.

Johnson, M.T., **Liss, P.S.** et al. (2008). Field observations of the ocean-atmosphere exchange of ammonia: fundamental importance of temperature as revealed by a comparison of high and low latitudes. *Global Biogeochemical Cycles* **22**, GB1019, DOI: 10.1029/2007GB003039.

Liss, P.S. and Lovelock, J.E. (2007). Climate change: the effect of DMS emissions. *Environmental Chemistry* **4**, 377-378. DOI: 10.1071/EN07072.

Liss, P.S. (2007). Trace gas emissions from the marine biosphere. *Philosophical Transactions of the Royal Society A* **365**, 1697-1704.

Martino, M., **Liss, P.S.** and Plane, J.M.C. (2006). Wavelength-dependence of the photolysis of diiodomethane in seawater. *Geophysical Research Letters* **33**, L06606, doi:10.1029/2005GL025424.

Chuck, A.L., Turner, S.M. and **Liss, P.S.** (2005). Oceanic distributions and air-sea fluxes of biogenic halocarbons in the open ocean. *Journal of Geophysical Research* **110** (C10), Art. No. C10022.

Martino, M., **Liss, P.S.** and Plane, J.M.C. (2005). The phytolysis of di-halomethanes in surface seawater. *Environmental Science and Technology* **39**, 7097-7101.

Raven, J., Caldeira, K., Elderfield, H., Hoegh-Guldberg, O. **Liss, P.**, Riebesell, U., Shepherd, J., Turley, C. and Watson, A. (2005). Ocean acidification due to increasing atmospheric carbon dioxide. Royal Society Policy Document 12/05, 57pp.

Jickells, T.D., An, Z.S., Andersen, K.K., Baker, A.R., Bergametti, G., Brooks, N., Cao, J.J., Boyd, P.W., Duce, R.A., Hunter, K.A., Kawahata, H., Kubilay, N., laRoche, J. **Liss, P.S.**, Mahowald, N., Prospero, J.M., Ridgwell, A.J., Tegen, I., and Torres, R. (2005). Global iron connections between desert dust, ocean biogeochemistry, and climate. *Science* **308**, 67-71.

Liss, P.S., Chuck, A.L., Turner, S.M. and A.J. Watson (2004). Air-sea gas exchange in Antarctic waters. *Antarctic Science* **16**, 517-529.

Liss, P.S., Chuck, A., Bakker, D. and Turner, S. (2005). Ocean fertilization with iron: effects on climate and air quality. *Tellus* **57B**, 269-271.

Turner, S.M., Harvey, M.J., Law, C.S., Nightingale, P.D. and **P.S., Liss** (2004). Iron-induced changes in oceanic sulfur biogeochemistry. *Geophysical Research Letters* **31**, L14307, doi:10.1029/2004GL020296.

Chuck, A.L., Turner, S.M. and **P.S. Liss** (2002) Direct evidence for a marine source of C_1 and C_2 alkyl nitrates. *Science* **297**, 1151-1154.

Amouroux, D., **Liss, P.S.**, Tessier, E., Hamren-Larsson, M. and O.F.X. Donard (2001) Role of oceans as biogenic sources of selenium. *Earth and Planetary Science Letters* **189**, 277-283.

Carpenter, L.J. and **P.S. Liss** (2000) On the temperate sources of reactive organic bromine. *Journal of Geophysical Research* **105**, 20,539-20,548.

McArdle, N., **Liss, P.S.** and P. Dennis (1998) An isotopic study of atmospheric sulphur at three sites in Wales and at Mace Head, Eire. *Journal of Geophysical Research* **103**, 31079-31094.

Pan, G. and **P.S. Liss** (1998) Metastable-equilibrium adsorption theory. I. Theoretical. *Journal of Colloid and Interface Science*, **201**, 71-76.

Broadgate, W.J., **Liss, P.S.** and S.A. Penkett (1997) Seasonal emissions of isoprene and other reactive hydrocarbon gases from the ocean. *Geophysical Research Letters*, **24**, 2675-2678.

Liss, P.S., Hatton, A.D., Malin, G., Nightingale, P.D. and S.M. Turner (1997) Marine sulphur emissions. *Phil. Trans. R. Soc. Lond. B*, **352**, 159-169.

Turner, S.M., Nightingale, P.D., Spokes, L.J., Liddicoat, M.I. and **P.S. Liss** (1996) Increased dimethyl sulphide concentrations in sea water from *in situ* iron enrichment. *Nature*, **383**, 513-516.

P.S. Liss, A.J. Watson, M.I. Liddicoat, G. Malin, P.D. Nightingale, S.M. Turner and R.C. Upstill-Goddard (1993) Trace gases and air-sea exchange. *Philosophical Transactions of the Royal Society of London A* **343**, 531-541.

P.S. Liss and J.N. Galloway (1993) Air-sea exchange of sulphur and nitrogen and their interaction in the marine atmosphere. In: *Interactions of C, N, P and S Biogeochemical Cycles and Global Change*, edited by R. Wollast, F.T. Mackenzie and L. Chou, Springer, pp 259-281.

M.I. Walker, W.A. McKay, N.J. Pattenden and **P.S. Liss** (1986) Actinide enrichment in marine aerosols. *Nature* **323**, 141-143.

P.S. Liss and L. Merlivat (1986) Air-sea gas exchange rates: Introduction and synthesis. In: *The Role of Air-Sea Exchange in Geochemical Cycling*, edited by P. Buat-Menard, Reidel, pp 113-127.

P.S. Liss, P.W. Balls, F.N. Martinelli and M. Coantic (1981) The effect of evaporation and condensation on gas transfer across an air-water interface. *Oceanologica Acta* **4**, 129-138.

K.A. Hunter and **P.S. Liss** (1979) The surface charge of suspended particles in estuarine and coastal waters. *Nature* **282**, 823-825.

P.S. Liss and P.G. Slater (1974) Flux of gases across the air-sea interface. *Nature* **247**, 181-184.

P.S. Liss, J.R. Herring and E.D. Goldberg (1973) The iodide/iodate system in seawater as a possible measure of redox potential. *Nature* **242**, 108-109.

P.S. Liss (1973) Processes of gas exchange across an air-water interface. *Deep-Sea Research* **20**, 221-238.

Curriculum Vitae
Robert R. Lucchese

Department of Chemistry
Texas A&M University
3255 TAMU
lucchese@mail.chem.tamu.edu
College Station, TX 77843-3255 , USA

Phone: 979-845-0187
Fax: 979-845-4719
e-mail:

PERSONAL

Birthday: November 18, 1956 Birthplace: Oakland, California
Marital Status: Married Number of children: Two

EDUCATION

Degree	Date	Institution
B. S., Chemistry	1977	University of California, Berkeley
Ph. D., Chemistry	1982	California Institute of Technology

Dissertation title: "The Iterative Schwinger Variational Method Applied To Electron-Molecule Continuum Processes"

Postdoctoral Studies

	1981-1982	Princeton University Department of Chemistry
	1982-1983	AT&T Bell Laboratories

PROFESSIONAL APPOINTMENTS

Assistant Professor	1983-1989	Department of Chemistry, Texas A&M University
Associate Professor	1989-1994	Department of Chemistry, Texas A&M University
Visiting Lecturer	1993	Italian Ministry of Science, Technology and Universities (MURST) at the Faculty of Science of The University of Rome, Italy
Professor	1994-present	Department of Chemistry Texas A&M University
Invited Professor	2000,2005,2008,2009	
	2010	Physics Department Université Paris-Sud
Research Visiting Professor	1993, 2007	Department of Chemistry The University of Rome, Italy

Visiting Professor Research	2010	Institute of Multidisciplinary for Advanced Materials, Tohoku University, Sendai, Japan

HONORS AND AWARDS

ARCS Scholar, University of California, Berkeley	1974
Wilson Prize, University of California, Berkeley	1977
Phi Beta Kappa, University of California, Berkeley	1977
NSF Graduate Fellow	1977-1980
Exxon Education Foundation Graduate Fellow, Caltech	1980-1981
NSF Postdoctoral Fellow	1981-1982
NSF Presidential Young Investigator Award	1984-1989
Alfred P. Sloan Research Fellow	1988-1990
Camille and Henry Dreyfus Teacher-Scholar Award	1988-1993
Italian National Research Council Research Fellowship	1993
Japan Society for the Promotion of Science Fellowship	2006

RESEARCH AND SCHOLARLY ACTIVITY

PUBLISHED WORK (Last five years)

Published papers (total 274, citations 3910, h-index 38)

220. J. Franz, F. A. Gianturco, K. L. Baluja, J. Tennyson, R. Carey, R. Montuoro, R. R. Lucchese, T. Stoecklin, P. Nichols, T. L. Gibson, Correlation-Polarization Effects In Electron/Positron Scattering From Acetylene: A Comparison Of Computational Models, *Nucl. Instrum. Methods Phys. Res. B* **266**, 425-434 (2008).
221. H. Fukuzawa, X.-J. Liu, R. Montuoro, R. R. Lucchese, Y. Morishita, N. Saito, M. Kato, I. H. Suzuki, Y. Tamenori, T. Teranishi, T. Lischke, G. Prümper, and K. Ueda, Nitrogen K-shell photoelectron angular distribution from NO molecules in the molecular frame, *J. Phys. B* **41**, 045102:1-6 (2008).
222. M. Hoshino, R. Montuoro, R. R. Lucchese, A. De Fanis, U. Hergenhahn, G. Prümper, T. Tanaka, and K. Ueda, Vibrationally resolved partial cross sections and asymmetry parameters for nitrogen K-shell photoionization of the NO molecule, *J. Phys. B* **41**, 085105:1-7(2008).
223. Franco A. Gianturco, F. Sebastianelli, R. R. Lucchese, I. Baccarelli, and N. Sanna, Ring-Breaking Electron Attachment To Uracil: Following Bond Dissociations Via Evolving Resonances, *J. Chem. Phys.* **128**, 174302:1-8 (2008)
224. Ralph Carey, Robert R. Lucchese, and F. A. Gianturco, Positron scattering from C_{20}. *Phys. Rev. A* **78**, 012706:1-11 (2008).

225. Luis A. Rivera-Rivera, Robert R. Lucchese, and John W. Bevan, A Parameterized Compound-Model Chemistry for Morphing The Intermolecular Potential of OC-HCl, *Chem. Phys. Lett.* **460**, 352-358 (2008).
226. F. F. Willaert, B. A. McElmurry, R. R. Lucchese, and J. W. Bevan, Probing the Accuracy of the Isomerization Energy of the 3-D Morphed Potential of Ar-HBr, *Chem. Phys. Lett.* **460**, 525-530 (2008).
227. G. Prümper, D. Rolles, H. Fukuzawa, X. J. Liu, Z. Pešić, I. Dumitriu, R. R. Lucchese, K. Ueda, and N. Berrah, Measurements of molecular-frame Auger electron angular distributions at the CO C $1s^{-1}$ $2\pi^*$ resonance with high energy resolution, *J. Phys. B* **41**, 215101:1-11 (2008).
228. R. R. Lucchese, R. Carey, C. Elkharrat, J. C. Houver, D. Dowek, Molecular Frame and Recoil Frame Angular Distributions in Dissociative Photoionization of Small Molecules, *J. Phys.: Conf. Ser.* **141**, 012009:1-7 (2008).
229. Aloke Das, E. D. Poliakoff, R. R. Lucchese, and John D. Bozek, Mode-specific photoionization dynamics of a simple asymmetric target: OCS, *J. Chem. Phys.* **130**, 044302:1-8 (2009).
230. A. S. dos Santos, L. E. Machado, M.-T. Lee, L. M. Brescansin, and R. R. Lucchese, Cross sections and asymmetry parameters for photoionization of CH_3F in the VUV region, *Chem. Phys.* **358**, 96-102 (2009).
231. D. Dowek, A. Haouas, R. Guillemin, C. Elkharrat, J.-C. Houver, W.B. Li, F. Catoire, L. Journel, M. Simon, and R. R. Lucchese, Recoil Frame Photoemission in Inner-shell Photoionization of Small Polyatomic Molecules, *Eur. Phys. J. - Spec. Top.* **169**, 85-93 (2009).
232. Anh-Thu Le, R. R. Lucchese, M. T. Lee, C. D. Lin, Probing molecular frame photoionization via laser generated high-order harmonics from aligned molecules, *Phys. Rev. Lett.* **102**, 203001:1-4 (2009).
233. Anh-Thu Le, R. R. Lucchese, S. Tonzani, T. Morishita, C. D. Lin, Quantitative rescattering theory for high-order harmonic generation from molecules, *Phys. Rev. A* **80**, 013401:1-23 (2009).
234. Robert R. Lucchese, John D. Bozek, Aloke Das, and E. D. Poliakoff, Vibrational Branching Ratios in the $(b_{2u})^{-1}$ Photoionization of C_6F_6, *J. Chem. Phys.* **131**, 044311:1-8 (2009).
235. Anh-Thu Le, R. R. Lucchese, and C. D. Lin, Uncovering multiple orbitals influence in high harmonic generation from aligned N_2, *J. Phys. B* **42**, 211001:1-5 (2009).

236. George Lucchese, Robert R. Lucchese, and Simon W. North, A New JAVA Program for Graphical Illustration of the Franck-Condon Principle: Application to the I_2 Spectroscopy Experiment in the Undergraduate Physical Chemistry Laboratory, *J. Chem. Educ.* **87**, 345 (2010).
237. Cheng Jin, Anh-Thu Le, Song-Feng Zhao, R. R. Lucchese, C. D. Lin, Theoretical study of photoelectron angular distributions in single-photon ionization of aligned N_2 and CO_2, *Phys. Rev. A* **81**, 033421:1-12 (2010).
238. Robert R. Lucchese, Raffaele Montuoro, Konstantinos Kotsis, Motomichi Tashiro, Masahiro Ehara, John D. Bozek, Aloke Das, April Landry, Jeff Rathbone, and E. D. Poliakoff, The effect of vibrational motion on the dynamics of shape resonant photoionization of BF_3 leading to the $E\,^2A_1$ state of BF_3^+, *Molec. Phys.* **108**, 1055-1067 (2010).
239. C. D. Lin, Anh-Thu Le, Zhangjin Chen, Toru Morishita, and Robert Lucchese, Strong-field rescattering physics – self-imaging of a molecule by its own electrons, *J. Phys. B* **43**, 122001:1-33 (2010).
240. Luis A. Rivera-Rivera, Robert R. Lucchese, and John W. Bevan, A four-dimensional compound-model morphed potential for the OC:HBr complex, *Phys. Chem. Chem. Phys.* **12**, 7258-65 (2010).
241. G. L. C. de Souza, M.-T. Lee, I. P. Sanches, P. Rawat, I. Iga, A. S. dos Santos, L. E. Machado, R. T. Sugohara, L. M. Brescansin, M. G. P. Homem, and R. R. Lucchese, Cross sections for electron scattering by propane in the low- and intermediate-energy ranges, *Phys. Rev. A* **82**, 012709:1-8 (2010).
242. Anh-Thu Le, R. R. Lucchese, and C. D. Lin, Polarization and ellipticity of high-order harmonics from aligned molecules generated by linearly polarized intense laser pulses, *Phys. Rev. A* **82**, 023814:1-6 (2010).
243. C. Elkharrat, Y. J. Picard, P. Billaud, C. Cornaggia, D. Garzella, M. Perdrix, J. C. Houver, R. R. Lucchese and D. Dowek, Ion Pair Formation in Multiphoton Excitation of NO_2 Using Linearly and Circularly Polarized Femtosecond Light Pulses: Kinetic Energy Distribution and Fragment Recoil Anisotropy, *J. Phys. Chem. A* **114**, 9902-9918 (2010).
244. Luis A. Rivera-Rivera, Zhongcheng Wang, Blake A. McElmurry, Fabrice F. Willaert, Robert R. Lucchese, John W. Bevan, Richard D. Suenram, and Frank J. Lovas, A ground state morphed intermolecular potential for the hydrogen bonded and van der Waals isomers in OC:HI and a prediction of an anomalous deuterium isotope effect, *J. Chem. Phys.* **133**, 184305:1-13 (2010).

245. P. Rawat, M. G. P. Homem, R. T. Sugohara, I. P. Sanches, I. Iga, G. L. C. de Souza, A. S. dos Santos, R. R. Lucchese, L. E. Machado, L. M. Brescansin, and M.-T. Lee, Cross sections for electron scattering by ethane in the low- and intermediate-energy ranges, *J. Phys. B* **43**, 225202:1-8 (2010).
246. T. Tanaka, M. Hoshino, R. R. Lucchese, Y. Tamenori, H. Kato, H. Tanaka, K. Ueda, Bending-induced diminution of shape resonances in the core-level absorption region of hot CO_2 and N_2O, *New J. Phys.* **12**, 123017:1-18 (2010).
247. Misaki Okunishi, Hiromichi Niikura, R. R. Lucchese, Toru Morishita, and Kiyoshi Ueda, Extracting electron-ion differential scattering cross sections for partially aligned molecules by laser-induced rescattering photoelectron spectroscopy, *Phys. Rev. Lett.* **106**, 063001:1-4 (2011).
248. Z. Wang, B. A. McElmurry, R. R. Lucchese, J. W. Bevan, and L. H. Coudert, Paired Hydrogen Bonds in the Hydrogen Halide Homodimer $(HI)_2$, *J. Chem. Phys.* **134**, 064317:1-16 (2011).
249. N. Berrah, R. C. Bilodeau, I. Dumitriu, D. Toffoli, R. R. Lucchese, Shape and Feshbach Resonances in Inner-Shell Photodetachment of Negative Ions, *J. Electron Spectrosc. Relat. Phenom.* **183**, 64-69 (2011).
250. Song-Feng Zhao, Cheng Jin, R. R. Lucchese, Anh-Thu Le, and C. D. Lin, High-order-harmonic generation using gas-phase H_2O molecules, *Phys. Rev. A* **83**, 033409:1-7 (2011).
251. Cheng Jin, Hans Jakob Wörner, V. Tosa, Anh-Thu Le, Julien B. Bertrand, R. R. Lucchese, P. B. Corkum, D. M. Villeneuve, and C. D. Lin, Separation of target structure and medium propagation effects in high-harmonic generation, *J. Phys. B* **44**, 095601:1-5 (2011).
252. Bérenger Gans, Séverine Boyé-Péronne, Michel Broquier, Maxence Delsaut, Stéphane Douin, Carlos E. Fellows, Philippe Halvick, Jean-Christophe Loison, Robert R. Lucchese, and Dolores Gauyacq, Photolysis of methane revisited at 121.6 nm and at 118.2 nm: quantum yields of the primary products, measured by mass spectrometry, *Phys. Chem. Chem. Phys.* **13**, 8140-8152 (2011).
253. Luis A. Rivera-Rivera, Zhongcheng Wang, Blake A. McElmurry, Robert R. Lucchese, John W. Bevan, and Guido Kanschat, Morphing a Vibrationally-Complete Ground State Potential for the Hydrogen Bond OC-HF, *Chem. Phys.* **390**, 42-50 (2011).
254. F. Kelkensberg, A. Rouzée, W. Siu, G. Gademann, P. Johnsson, M. Lucchini, R. R. Lucchese, M. J. J. Vrakking, XUV ionization of aligned molecules, *Phys. Rev. A* **84**, 051404(R):1-4 (2011).

255. W. Siu, F. Kelkensberg, G. Gademann, A. Rouzée, P. Johnsson, D. Dowek, M. Lucchini, F. Calegari, U. De Giovannini, A. Rubio, R. R. Lucchese, H. Kono, F. Lépine, and M.J.J. Vrakking, Attosecond control of dissociative ionization of O_2 molecules, *Phys. Rev*. *A* **84,** 063412:1-4 (2011).
256. Cheng Jin, Julien B. Bertrand, R. R. Lucchese, H. J. Wörner, Paul B. Corkum, D. M. Villeneuve, Anh-Thu Le, and C. D. Lin, Intensity dependence of multiple orbital contributions and shape resonance in high-order harmonic generation of aligned N_2 molecules, *Phys. Rev. A* **85**, 013405:1-7 (2012).
257. G. L. C. de Souza, A. S. dos Santos, R. R. Lucchese, L. E. Machado, L. M. Brescansin, H. V. Manini, I. Iga, M.-T. Lee, Theoretical investigation of electron scattering from benzene in the intermediate-energy range, *Chem. Phys.* **393**, 19-24 (2012).
258. Luis A. Rivera-Rivera, Blake A. McElmurry, Zhongcheng Wang, Igor I. Leonov, Robert R. Lucchese, John W. Bevan, Morphed intermolecular potential of OC:HCCH complex based on infrared quantum cascade laser spectroscopy, *Chem. Phys. Lett.* **522**, 17-22 (2012).
259. Sean D. Springer, Luis A. Rivera-Rivera, Blake A. McElmurry, Zhongcheng Wang, Igor I. Leonov, Robert R. Lucchese, Anthony C. Legon, and John W. Bevan, A CMM-RS potential for characterization of the properties of the halogen-bonded OC-Cl_2 complex, and a comparison with the hydrogen-bonded OC-HCl complex, *J. Phys. Chem. A* **116**, 1213-1223 (2012).
260. D. Dowek and R. R. Lucchese, Photoionization dynamics: photoemission in the molecular frame of small molecules ionized by linearly and elliptically polarized light, in *Dynamical Processes in Atomic and Molecular Physics*, edited by G. Ogurtsov and D. Dowek, (Bentham, Bussum, Netherlands, 2012) pp. 57-95.
261. M. Lebech, J. C. Houver, G. Raseev, A. S. dos Santos, D. Dowek and Robert R. Lucchese, Valence and inner-valence shell dissociative photoionization of CO in the 26-33 eV range. II. Molecular-frame and Recoil-frame photoelectron angular distributions, *J. Chem. Phys.* **136**, 094303:1-24 (2012).
262. Hong Xu, U. Jacovella, B. Ruscic, S. T. Pratt, and R. R. Lucchese, Near-Threshold Shape Resonance In The Photoionization Of 2-Butyne, *J. Chem. Phys.* **136**, 154303:1-10 (2012).
263. Arnaud Rouzée, Freek Kelkensberg, Wing Kiu Siu, Georg Gademann, R. Lucchese, Marc J. J. Vrakking, Photoelectron kinetic and angular distributions

for the ionization of aligned molecules using a HHG source, *J. Phys. B* **45**, 074016:1-11 (2012).

264. C. Wang, M. Okunishi, R. R. Lucchese, T. Morishita, O. I. Tolstikhin, L. B. Madsen, K. Shimada, D. Ding, K. Ueda, Extraction of Electron-Ion Differential Scattering Cross Sections for C_2H_4 by Laser-Induced Rescattering Photoelectron Spectroscopy, *J. Phys. B* **45**, 131001:1-5 (2012).
265. M-T. Lee, G. L.C. de Souza, L. E. Machado, L. M. Brescansin, A. S. dos Santos, R. R. Lucchese, R. T. Sugohara, M. G. P. Homem, I. P. Sanches, and I. Iga, Electron scattering by methanol and ethanol: A joint theoretical-experimental investigation, *J. Chem. Phys.* **136**, 114311:1-7 (2012).
266. J.A. López-Domínguez, David Hardy, Aloke Das, E. D. Poliakoff, Alex Aguilar, and Robert R. Lucchese, Mechanisms of Franck-Condon breakdown over a broad energy range in the valence photoionization of N_2 and CO, *J. Electron Spectrosc. Relat. Phenom.* **185**, 211-218 (2012).
267. Luis A. Rivera-Rivera, Blake A. McElmurry, Robert R. Lucchese, and John W. Bevan, Predicted Properties of the CO-HF Isomer Using a Six-Dimensional Morphed Potential, *J. Mol. Struct.* **1023**, 43-48 (2012).
268. Robert R. Lucchese and Albert Stolow, Molecular-frame photoelectron angular distributions, *J. Phys. B* **45**, 190201:1 (2012).
269. C. D. Lin, Cheng Jin, Anh-Thu Le, and R. R. Lucchese, Probing molecular frame photoelectron angular distributions via high-order harmonic generation from aligned molecules, *J. Phys. B* **45**, 194010:1-9 (2012).
270. R. R. Lucchese, H. Fukuzawa, X.-J. Liu, T. Teranishi, N. Saito, and K. Ueda, Asymmetry in the molecular-frame photoelectron angular distribution for oxygen 1*s* photoemission from CO_2, *J. Phys. B* **45**, 194014:1-11 (2012).
271. Anh-Thu Le, T. Morishita, R. R. Lucchese, and C. D. Lin, Theory of high harmonic generation for probing time-resolved large-amplitude molecular vibrations with ultrashort intense lasers, *Phys. Rev. Lett.* **109**, 203004:1-5 (2012).
272. B. A. McElmurry, L. A. Rivera-Rivera, K. W. Scott, Z. Wang, I. I. Leonov, R. R. Lucchese, and J. W. Bevan, Studies of Low-frequency Intermolecular Hydrogen-Bonded Vibrations Using A Continuous Supersonic Slit Jet Mid-Infrared Quantum Cascade Laser Spectrometer, *Chem. Phys.* **409**, 1-10 (2012).
273. M. C. H. Wong, A.-T. Le, A. F. Alharbi, A. E. Boguslavskiy, R. R. Lucchese, J.-P. Brichta, C.D.Lin, and V.R.Bhardwaj, *Phys. Rev. Lett.* **110**, 033006:1-5 (2013).
274. J. R. Ferraz, A. S. dos Santos, G. L. C. de Souza, A. I. Zanelato, T. R. M. Alves, M.-T. Lee, L. M. Brescansin, R. R. Lucchese, and L. E. Machado, Cross sections

for electron scattering by formaldehyde and pyrimidine in the low- and intermediate-energy ranges, *Phys. Rev. A* **87**, 032717:1-10 (2013).

Papers accepted for publication

275. Ralph Carey, Robert R. Lucchese, and F. A. Gianturco, Electron scattering from gas phase cis-diamminedichloroplatinum(II): quantum analysis, *J. Chem. Phys.* – accepted for publication.

Papers submitted for publication

276. Ralph Carey and Robert Lucchese, Elastic scattering cross sections and one-electron resonances of pyridine and pyrimidine, *J. Chem. Phys.* – submitted for publication.
277. Robert R. Lucchese and Danielle Dowek, Angular distributions in molecular photoionization, in *Attosecond and XUV Spectroscopy*, edited by M. J. J. Vrakking and T. Schultz (Wiley, Hoboken, NJ) - submitted for publication.
278. J. Jose and R. R. Lucchese, Study of resonances in the photoionization of $Ar@C_{60}$ and C_{60}, *Phys. Rev. A* – submitted for publication.
279. S. Marggi Poullain, K. Veyrinas, P. Billaud, M. Lebech, Y. J. Picard, R. R. Lucchese and D. Dowek, The role of Rydberg states in Photoionization of NO_2 and (NO^+, O^-) Ion Pair Formation induced by One VUV Photon, *J. Chem. Phys.* – submitted for publication.
280. Anh-Thu Le, R. R. Lucchese, and C. D. Lin, Theory of high-order harmonic generation for polyatomic molecules, *Phys. Rev. A* – submitted for publication.

PRESENTATIONS (Invited Oral, last five years)

- Electron-Molecule Scattering Dynamics as Probed by Molecular Photoionization, Department of Applied Science, University of California, Davis, May 2008
- Molecular Frame, Recoil Frame, And Electron Frame Angular Distributions in Dissociative Photoionization of Small Molecules, Many Particle Spectroscopy of Atoms, Molecules, Clusters and Surfaces (MPS08), Paris, France, June 2008.
- Resonant and Nonresonant Photoelectron-Vibrational Coupling, 2008 Atomic, Molecular and Optical Sciences Research Meeting, Office of Basic Energy Sciences, U. S. Department of Energy, Warrenton, Virginia, September 2008.
- The Effects of Resonances in Molecular Photodetachment and Photoionization: Total and Differential Cross Sections, Advanced Light Source Users' Meeting, Lawrence Berkeley Nation Laboratory, Berkeley, California, October 2008.

- Molecular Frame and Recoil Frame Angular Distributions in Dissociative Photoionization of Small Molecules, Department of Physics, Kansas State University, Manhattan, Kansas, December 2008.
- The Effects Of Resonances on Molecular Frame Photoelectron Angular Distributions and Vibrational Branching Ratios, Department of Chemistry, Johns Hopkins University, Baltimore, MD, February 2009.
- Probing Molecular Photoionization with Molecular Frame Photoelectron Angular Distributions and Vibrational Branching Ratios, Steacie Institute for Molecular Sciences, National Research Council Canada, Ottawa, Ontario, Canada, May 2009
- Probing Molecular Photoionization with Molecular Frame Photoelectron Angular Distributions and Vibrational Branching Ratios, Service des Photons, Atomes et Molécules (SPAM), Saclay, France, June 2009.
- Single and Multi-Photon Molecular Frame Photoelectron Angular Distributions, Gordon Research Conference on Photoions, Photoionization, and Photodetachment, Galveston, Texas, February 2010.
- Photoionization in the Molecular Frame, Institute of Multidisciplinary Research for Advanced Materials, Tohoku University, Sendai, Japan, March 2010.
- Photoionization in the Molecular Frame, TAMU/Princeton Summer Workshop on Quantum Optics and Molecular Physics, Casper, Wyoming, July 2010.
- Photoionization in the Molecular Frame, X-Ray Science Division, Argonne National Laboratory, September 2010.
- Morphed Intermolecular Interaction Potentials of Molecular Dimers, Cátedra Nacional de Química CUMex, Querétaro, México, May 2011.
- Resonant and Nonresonant Photoelectron-Vibrational Coupling, 2011 Atomic, Molecular and Optical Sciences Research Meeting, Office of Basic Energy Sciences, U. S. Department of Energy, Warrenton, Virginia, September 2011.
- Photoionization in the Molecular Frame, Department of Basic Science, University of Tokyo, June 2012.
- Nuclear Motion in Molecular Photoionization, Institute of Multidisciplinary Research for Advanced Materials, Tohoku University, Sendai, Japan, June 2012.
- Probing Molecular Structure with Photoionization, 2012 Ultrafast Dynamic Imaging of Matter Conference, Banff, Alberta, Canada, July 2012.

- Vibrational Motion in Molecular Photoionization, TAMU/Princeton Summer Workshop on Quantum Optics and Molecular Physics, Casper, Wyoming, July 2012
- Photoionization in the Molecular Frame, Workshop on Theory of Electron-Molecule Collisions for Astrophysics, Biophysics and Low-Temperature Plasmas: Opportunities and Challenges, at the Institute for Theoretical Atomic Molecular and Optical Physics, Cambridge, MA, December 2012

GRANTS AND CONTRACTS (last 5 years)

- Welch Foundation, Nondipole Effects in Photoelectron Angular Distributions of Molecular Photoionization, $240,000, 6/1/2006-5/31/2009.
- National Science Foundation, Spectroscopic and Computational Characterization of Non-Covalent Interactions, with J. W. Bevan, $390,000, 8/15/2006-7/31/2009.
- Department of Energy, Resonant and Nonresonant Vibrational Effects in the Photoionization Dynamics of Asymmetric Systems, with E. D. Poliakoff, LSU, $258,268 (amount of TAMU subcontract), 05/01/2007-10/31/2010
- Welch Foundation, Molecular and Recoil Frame Photoelectron Angular Distributions from Nonlinear Molecules, $240,000, 6/1/2009 - 5/31/2012
- National Science Foundation, Spectroscopic and Computational Investigations of Fundamental Characteristics in Non-covalent Interactions (with J. W. Bevan), $322,749, 08/01/2009- 07/31/2012
- Department of Energy, Molecular photoionization studies of nucleobases and correlated systems, with E. D. Poliakoff, LSU, $218,126 (amount of TAMU subcontract), 11/01/2010-10/31/2013
- Welch Foundation, Reaction Dynamics Probed by Molecular-Frame Photoionization, $150,000, 6/1/2012 – 5/31/2014.

Submitted

DIRECTED RESEARCH

Undergraduate

- Grant Gilson, Stochastic Sensitivity Analysis of Scattering Distributions, B. S. Chemistry, 1984
- Thomas R. Krawietz, Photoionization of OCS, B. S. Chemistry, 1991.
- Scott Griggs, Resonances in electron scattering from CF_nH_{4-n} n = 1, 2, 3, 4, B. S. Chemistry, 1998.

- Anthony Rodriguez, Rovibrational dynamics of molecular clusters, B. S. Chemistry, 2003.
- Sondra Steele, Intermolecular Interactions in CO-HI, B. S. Chemistry, 2005.

Masters Students

- Chi-Huang Nee, Modeling of Friction Kernel for Surface Vibrations, M. S. Computer Science, 1985
- Bryan C. Basden, Application of the Close-Coupling Approximation to the Photoionization of Molecular Nitrogen Using Higher Order Newton-Cotes Integration Formulae, August, 1987
- Joseph M. Watson, Photon Induced Desorption from Surfaces, December 1991.
- Shaleen K. Botting, Auger Resonance Study for the C1$s \rightarrow 2\pi^*$ Excitation of CO, May, 1997

Doctoral Students

- R. Eric Stratmann, Correlation Effects and Resonances in Molecular Photoionization, August, 1994.
- Robert W. Zurales, One- and Two-Electron Resonances in Molecular Photoionization and Electron-Molecule Scattering, August, 1997. (Assistant Professor, Middle Georgia College)
- Monna Wells, Models Of The Photoionization Of Small Molecules and Biological Electron Transfer *Via* Superexchange, May, 1999. (Assistant Professor, Tennessee Technological University)
- Jairo Castillo-Chara, Ab Initio Calculation of Rovibrational Energy Levels and Dynamics of van der Waals Complexes, December, 2000. (Assistant Professor, Fayetteville State University)
- Ping Lin, Theoretical Study of the Photoionization, Photodetachment and Electron Scattering Processes of Small Molecules and Ions, May 2002
- Indrani Sinha, Tight Binding Simulation of the Interaction of Light with Matter, December 2007.
- Luis Rivera-Rivera, Morphed Potential Energy Surfaces From the Spectroscopy of Weakly Bound Complexes, May 2011
- Ralph Carey, Electron, Photon, and Positron Scattering Dynamics of Complex Molecular Targets, May 2012
- Jesus Lopez-Dominguez, Molecular Photoionization, current student

Postdoctoral

- Charles B. Smith, Rotational and Vibrational Energy Transfer in Gas-Surface Collisions, Fall 1984 - Fall 1986
- I. NoorBatcha, Postdesorption Interaction Dynamics, Spring 1986 - Spring 1988
- Shyi-Long Lee, Dynamics of Thermal Desorption, Summer 1986 - Summer 1988
- Gunadya Bandarage, Electron Impact Ionization of Molecules, Spring 1990 - Summer 1992.
- Jurgen Schulte, Theory of Cluster-Cluster Collisions, Spring 1990-Summer 1992.
- Alexandra Natalense, Photoionization of Polyatomic Molecules, Spring 1998-Fall 1999.
- Daniele Toffoli, Molecular Frame Photoelectron Angular Distributions, Spring 2003 - Spring 2005
- Raffaele Montuoro, Vibrational Effects in Resonant Photoionization, Fall 2004-Spring 2007
- Antonio Sérgio dos Santos, Molecular Frame Photoelectron Angular Distributions Beyond the Dipole Approximation, Spring 2005 - Spring 2007
- Konstantinos Kotsis, Vibrational Effects in Molecular Photoionization, Spring 2009 – Fall 2011.
- Jobin Jose, High Harmonic Generation in Molecular systems, Spring 2012 – present.

TEACHING

COURSES TAUGHT AT TAMU

Undergraduate

- Physical Chemistry I (Chem. 323) Summer 1996, Spring 1998, Fall 1998, Spring 2000, Summer 2000, Spring 2001, Summer 2001, Spring 2003, Fall 2003, Spring 2004, Fall 2005, Spring 2007
- Physical Chemistry II (Chem. 324) Fall 1983, Spring 1984, Spring 1992, Spring 1994, Spring 1996, Summer 2002, Summer 2004, Summer 2005, Summer 2006, Summer 2007
- Physical Chemistry for Engineers (Chem. 322), Fall 2001, Spring 2005
- Physical Chemistry II (Chem. 328) Fall 2010, Fall 2011

Graduate

- Principles of Quantum Mechanics (Chem. 648) Fall 1984, Fall 1985, Fall 1986, Fall 1987, Fall 1988, Fall 1989, Fall 1994, Fall 1995, Fall 1996, Fall 1998, Fall 1999, Fall 2000, Fall 2002, Fall 2006, Fall 2007, Fall 2008, Fall 2009
- Molecular Quantum Mechanics (Chem. 649) Spring 1985, Spring 1986, Spring 1987, Spring 1988, Spring 1989, Spring 1990, Spring 1995, Spring 1997, Spring 1999
- Principles of Physical Chemistry (Chem. 611) Fall 1990, Fall 1991, Fall 1992, Fall 1993
- Chemical Kinetics (Chem. 621) Spring 1997, Spring 2002, Spring 2008, Spring 2009
- Statistical Thermodynamics (Chem. 631) Spring 2011, Spring 2012
- Seminar (Chem. 681) Spring 2000, Fall 2004, Spring 2011, Spring 2012
- Modern Topics in Physical Chemistry, (Chem. 689), Fall 2002, Fall 2003, Fall 2004

Laboratory Supervision

- Fundamentals of Chemistry Laboratory I. (Chem. 111) Fall 1983, Fall 1984, Spring 1985, Fall 1985, Fall 2011
- Fundamentals of Chemistry Laboratory II, (Chem. 112) Spring 1984, Spring 1988, Fall 2011
- Physical and Chemical Principles (Chem. 113H) Fall 1986, Fall 1987, Fall 1988, Fall 1990, Fall 1991
- Qualitative Analysis (Chem. 114H) Spring 1987, Spring 1989
- Physical Chemistry Laboratory I (Chem. 325) Fall 1983, Spring 1984

OTHER COURSES TAUGHT

- Molecular Photoionization: Experimental Aspects and Theoretical Interpretation, 16 hour short course, Department of Chemistry, University of Rome, Italy, Spring 1993

DEPARTMENTAL AND UNIVERSITY SERVICE

DEPARTMENTAL COMMITTEES

- Computer User Group, 1983-present
- Graduate Brochure Committee, Chairman, 1985-1988
- Graduate Curriculum Committee, 1985-1986
- Graduate Recruiting Committee, 1986-1989, 1990-1992

- Library Committee, 1988-present, Chairman, 1988-2002
- Publicity Committee, 1992-1995
- Departmental Advisory Council, alternate, 1994-1996
- Departmental Advisory Council, member, 1996-1998, 2004
- Departmental Executive Committee, member, 2009-present
- Physical/Nuclear Division Chairman, 1996-1998, 2006-present
- Promotion and Tenure Committee, 1995-1997, 2002-2004, 2006-2008, Chairman, 1997, 2004, 2008
- Post-Tenure Review Committee, 1999-2001, Chairman, 2001

COLLEGE OF SCIENCE COMMITTEES

- Faculty Advisory Council, 1987-1989, 2003-2005
- Computing Advisory Committee, 1989-1990
- Information Technology Advisory Committee, 1997-present

UNIVERSITY COMMITTEES

- Technical Advisory Group - Supercomputer Acquisition, 1988-1989
- Supercomputer Center Technical Committee, 1989-1990
- Evans Library Council, 1992-1994
- Electronic Database Task Force, 1992
- Faculty Senate Bookstore Advisory Committee, 1996-1999, Chairman, 1997-1999
- Faculty Senate, 1996-2000
- Faculty Senate Research Committee, 1996-2000
- Faculty Senate Elections Committee, 1997-1999
- Networking and High Performance Computing Subcommittee, 1999
- Executive Committee of the Center for Atmospheric Chemistry and the Environment, 2004-present, Chairman, 2007-present

STATE AND NATIONAL SERVICE

- National Science Foundation Young Investigator Panel, April 1992.
- Member of the organization committee of the 17th Southwest Theoretical Chemistry Conference, in College Station, Texas, November 2000
- Chair of the organization committee of the 23rd Southwest Theoretical Chemistry Conference, in College Station, Texas, October 2007

WILLIAM H. MARLOW
Curriculum Vita and Publications

Born: Beaumont, Texas-March 1, 1944 Marital Status: Married, one child

	Employment	Home
Address:	Department of Nuclear Engineering Texas A&M University College Station, Texas 77843-3133	1217 Orr Street College Station, Texas 77840
Phone:	(979) 845-2271	(979) 693-8141
FAX	(979) 845-6443	
e-mail	w-marlow@tamu.edu	whmarlow@verizon.net

Special Fields: Microphysical processes of cluster and ultrafine particle formation and evolution; applications of theory of collective long-range intermolecular forces; aerosols; clusters and aerosols for nanotechnology, atmospheric science, materials, transport of radioactivity

Education: Ph.D., University of Texas at Austin, Physics, 1973
B.S., Massachusetts Institute of Technology, Physics, 1966

Employment:

1973-74	Post-Doctoral Research Associate Department of Environmental Sciences and Engineering School of Public Health University of North Carolina at Chapel Hill
1975-86	Assistant Physicist (1975-77), Associate Physicist (1977-80), Physicist (1980-86) Environmental Chemistry Division Department of Applied Science Brookhaven National Laboratory
1985-86	Research Scientist (Visiting) Civil Engineering Department, Texas A&M University
1986-	Associate Professor (1986-96), Professor (1996-) Nuclear Engineering Department, Texas A&M University

Other Positions, University Appointments, Recognition

1981	Adjunct Assistant Professor of Environmental Medicine New York Medical School
1987-88	Technical Advisor to the Aerospace Corporation
1988, 1991	Member, Grant Review Panel for Air Chemistry and Physics, Office of Research and Development, U. S. Environmental Protection Agency
1991	Member, National Science Foundation Emerging Technologies Initiation Program proposal evaluation panel for proposals on Ultrafine Particle Engineering.
1992-93	Member, Publications Committee of the American Association for Aerosol Research
1993-97	Associate Editor, *Aerosol Science and Technology*
1993-96	Member, Board of Directors of American Association for Aerosol Research
1996	Faculty Fellow of the College of Engineering, Texas A&M University
1997-00	Faculty Senate, Texas A&M University

2000	Wenner Gren Visiting Professor of Physics and Guest in the Ångstrom Laboratory, Uppsala University, Uppsala, Sweden
2001	Guest Professor (same)
2000	Japan Society for the Promotion of Science Fellow. Chemical Engineering Department of the University of Hiroshima, Hiroshima, Japan
2001	Chair of 2001 Awards Committee, American Association for Aerosol Research
2001-	Undergraduate Program Coordinator, Nuclear Engineering Department, Texas A&M
2002	Chair, Review Committee of Midwestern Regional Center of National Institute for Global Environmental Change. This is first review ever conducted of NIGEC Regional Center.
2002	Member, Peer Review Panel for HEPA Filter Monitoring Project, Diagnostic Instrumentation and Analysis Laboratory, Starkville, MS. Panel appointed by Institute for Regulatory Science for USDOE.
2004	Member, Virtual Panel for National Science Foundation Nanotechnology Exploratory Research: Theory and Simulation, March 9, 2004.
2005	Invited Participant. Workshop on Detection of Environmental Nanoparticles, Paul Scherrer Institute, Villigen, Switzerland. 17-19 January, 2005.
2008/9	American Physical Society, Member, ad hoc advisory committee for formation of Energy Research Topical Group
2011	Invited Lecturer, Leader of Workshop at Wuhan University on Collection of Airborne Radioactive Materials; Guest Professor, Three Gorges University. China

INVITED, FEATURED TECHNICAL MEETING PRESENTATIONS

February, 1982	"Microparticle Physics and Particle Interactions" delivered at the First National Meeting of the American Association for Aerosol Research, Santa Monica, California.
July, 1982	"Long Range Attraction in the Collision of Free-Molecular and Transition Regime Aerosol Particles" delivered to the Thirteenth International Symposium on Rarefied Gas Dynamics, Novosibirsk, U.S.S. R.; Guest of USSR Academy of Sciences.[published paper in Refereed Literature below]
December, 1982	"Long Range Interaction of Small Soot Particles." Featured talk for Eastern Section: The Combustion Institute. Fall Technical Meeting, Atlantic City.
December, 1987	"Electrical charge and radon daughter deposition: a critical review." Invited talk for the Fourth International Symposium on the Natural Radiation Environment, Lisbon. [published paper in Refereed Literature below]
March, 1988	"Intercluster and interparticle forces in the collision rates of free-molecular and transition regime aerosols," Invited Review talk for the 1988 Gesellschaft für Aerosolforschung Workshop: Present Significant Issues in Aerosol Science, Karlsruhe, Federal Republic of Germany. Participation sponsored by Gesellschaft für Aerosolforschung. [publication in Proceedings below]
October, 1989	"Intermolecular forces for cluster and particle kinetics." Tutorial Lecture, 8th Annual Meeting of the American Association for Aerosol Research, Reno
November, 1990	"Physics of formation and interaction." Invited Position Paper, Fundamental Properties Session of the National Science Foundation Workshop on Submicron Particles, Washington, D. C. (publication in Proceedings below]
June, 1992	Invited Presentation and Panelist: Ultrafine Particle Processes Panel of Particulate Multiphase Processes Workshop. Organized by European Science Foundation and National Science Foundation. Strasbourg, France. Participation sponsored by National Science Foundation .
October, 1992	"Particle inception." Tutorial Lecture, 11th Annual Meeting of the American Association for Aerosol Research, San Francisco.

November, 1993 "Aerosol microphysics." Invited Lecture, International Topical Conference on Research Trends in Environmental Physics. La Jolla International School of Physics, La Jolla, CA. 29 November –1 December 1993.

August, 1994 "Ultrafine particle inception and growth." Tutorial Lecture, 4th International Aerosol Conference, Los Angeles

December, 1997 "Nanoparticle aggregates and semivolatiles". Invited Specialist Lecture, U.S.D.O.E. Workshop on Instrumentation and Measurement Issues for Nanometer Particles, 5-7 December, Minneapolis. Participation Sponsored by Workshop.

August, 1999 "Introductory comments" and "Nanoscale interaction physics in aerosols." Aerosol Science and Technology '99. Fronteir Sciences Research Conferences of La Jolla International School of Science. La Jolla, California, 16-18 August 1999

May,2003 "Spontaneously generated radioactive nanoparticles in the environment." Keynote Presentation, Nanotechnology Conference of the SPIE First International Symposium on Microtechnologies for the New Millenium 2003, Maspalomas, Gran Canaria, Canary Islands, Spain, 19-21 May 2003.

August, 2005 "Direct and Indirect Effects of Interaction forces on Aerosol Dynamics, Condensation, and Deposition." *Invited Overview Lecture*, European Aerosol Conference, 28 August – 2 September 2005, Ghent, Belgium. (participation sponsored by European Aerosol Society)

INVITED, FEATURED UNDERGRADUATE WORKSHOP PRESENTATIONS

July, 1989 "Indoor radon and ultrafine particles." National Science Foundation Research Experiences for Undergraduates Program, University of Missouri at Columbia. Participation sponsored by Program.

October, 1991 "From atomic clusters to aerosols: science and technology of matter in transiton." Third Intenational Symposium of the Physical Sciences. Instituto Technologico y de Estudios Superiores de Monterrey. Monterrey, Mexico. Participation sponsored by symposium.

July, 1992 "Cluster dynamics and thermodynamics for materials processing and climate change research." National Science Foundation Research Experiences for Undergraduates Program, University of Missouri at Columbia. Participation sponsored by Program.

ACADEMIC CONTRIBUTIONS

ADVISOR FOR COMPLETED GRADUATE THESES

Degree and Date	University	Thesis Title	Student
Ph.D., 12/83	State University of New York at Stony Brook	Phase Fluctuation Absorption Spectroscopy of Small Particles	David U. Fluckiger
Ph.D., 9/90	Texas A&M University	Measurement of the Effect of Indoor Atmos-pheric Trace Gases on the Polonium-218 Ion Mobility Spectrum by Alpha-Track Detection	Suk-Chul Yoon
Ph.D., 12/95	Texas A&M University	Classical Trajectory Calculations of Thermal Collisions of Two- to Fifteen-Atom Nickel Clusters	Ramasubbu Venkatesh
Ph.D., 12/96	Texas A&M University	Equilibrium Vapor Pressure of Water over Multiple Aerosol Particles	Jianyong Xie

Ph.D., 12/96	Texas A&M University	Ultrafine Aerosol Particles: Long-Range Interactions, Aggregation Kinetics, and Structure	Valli Arunachalam
Ph.D., 5/99	Texas A&M University	Computation and Application of Time Dependent Condensational Aerosol Growth	Mathangi Kalyanasundaram
Ph.D., 12/00	Texas A&M University	Conductivity Monitoring in Double-Walled Plutonium Containers	Mark A. Nelson
Ph.D., 8/2005	Texas A&M University	Water Adsorption on Aggregates of Spherical Aerosol Nanoparticles	Chu Nie
Ph.D., 8/2010	Texas A&M University	Aerosol Condensational Growth in Cloud Formation	Jun Geng
M. S., 12/89	Texas A&M University	Ultrafine Aerosol Diffusion Charging: An Improved Interaction Potential for Metallic Particles	Xiao-Wei Zhu
M. S., 12/89	Texas A&M University	Interaction Potentials of Molecular Clusters with Applications to Collision Rate Calculations	Alexis S. Amadon
M. S., 5/91	Texas A&M University	Solubility and Cluster Study of Mercury in Liquid Hydrocarbons	David L. McFarlane
M. S., 8/93	Texas A&M University	Equilibrium Vapor Pressure and Capillary Ring Formation of Adhering Spherical Aerosol Particles	Yoan Crouzet
M.S., 12/07	Texas A&M University	Time Series Study of Urban Rainfall Suppression During Clean-Up Periods	Jun Geng

NEW COURSES DEVELOPED AND REVISION OF COURSES: Nuclear Engineering 677 Aerosol Science – graduate course for students in engineering or physical science; Nuclear Engineering 475. Environmental Nuclear Engineering – course contents and approach completely revised and new syllabus developed

Short Course, Uppsala University, April and May, 2000: As Wenner Gren Visiting Professor of Solid State Physics, a short course was presented which consisted of 7 hours of lectures entitled “Nanoscale physics in aerosol particle interactions.”

RESEARCH FUNDING RECORD

Competitive, Peer-Reviewed Grants at Texas A&M University

Title and Duration	Principal Investigators	Sponsor	Total Support
Aerosol Microphysics of Indoor Radon 3/87 – 9/91	William H. Marlow	U. S. Department of Energy, Office of Health and Environmental Research	$467,797
Dynamical Processes of Gas Phase Clusters. 5/89 – 4/92	Robert R. Lucchese William H. Marlow	U. S. Department of Defense, Office of Naval Research Physics Division	$311,140

Device for Measurement of Size Distribution and Concentration of Ultrafine Aerosol Particles. 1/90 – 8/92	William H. Marlow Andrew R. McFarland	Texas Higher Education Coordinating Board – Advanced Technology Program	$115,000 (without overhead)
Atmospheric Aerosol Microphysics: Formation, Characterization, Interaction. 9/91 – 8/94	William H. Marlow	U. S. Department of Energy, Environmental Sciences Division, Office of Energy Research	$322,000
Atmospheric Condensation Properties of Ultrafine Chain and Fractal Aerosol Particles. 9/92 – 8/95.	William H. Marlow	National Aeronautics and Space Administration, Office of Space Science and Applications, Innovative Research Program (Earth Science and Applications Div.)	$444,226
Atmospheric Aerosol Microphysics: Formation, Characterization, Interaction. 9/94 – 8/96	William H. Marlow	U. S. Department of Energy, Environmental Sciences Division, Office of Energy Research	$213,000

Other Grants at Texas A&M University

Pu Leak Detection by Conductivity Methods and Optical Detection of Pu Aerosols. 6/95 – 1/97	William H. Marlow,	Amarillo National Resource Center for Plutonium	$161,000
Transportation of Mixed Oxide Fuels. 6/95 – 1/97	Y. A. Hassan, W. H. Marlow, P. Nelson	Amarillo National Resource Center for Plutonium	$158,000
Conductivity Monitoring for Detection of Leaks in Double-Walled Plutonium Containers. 1/97 – 1/00	William H. Marlow	Amarillo National Resource Center for Plutonium	$251,000
Scoping Study for Issues of Particles, Aerosols and Semi-Volatile Compounds in Plutonium Processing and Handling. 1/98-1/99	William H. Marlolw	Amarillo National Resource Center for Plutonium	$53,000
Migration and Dispersal of Particulate Plutonium. 1/99 – 1/00	Y. A. Hassan, W. H. Marlow	Amarillo National Resource Center for Plutonium	$103,700
Measurement of Particles Spontaneously Produced by Plutonium 8/02 - 7/03	William H. Marlow	Los Alamos Nat'l Lab, through Lovelace Respiratory Research Institute	$30,000

1975-1986: Brookhaven National Laboratory

Atmospheric Aerosol Microphysics. 1975 – 1986	William H. Marlow	U.S. D.O.E., Office of Health and Environmental Research	$55,000/yr to $115,000/yr
Probe for Sampling Erosive Range Particulate Matter from High Temperature and Pressure Flow Stream. 1980 – 1983	William H. Marlow	U.S. D.O.E., Office of Fossil Energy	$100,000/yr
Colligative and Sorptive Properties of Coal Combustion Particulate Matter. 1982 – 1985	William H. Marlow	U.S. D.O.E., Office of Fossil Energy	$75,000/yr

PUBLICATIONS

Refereed Literature (last 5 years):

Nie, C., Jun Geng, W. H. Marlow, 2008. Study of thermal properties of the metastable supersaturated vapor with the restricted ensemble. *Physica A: Statistical Mechanics and Its Applications* **387**(7), 1433-1438, [http://dx.doi.org/10.1016/j.physa.2007.11.007].

Nie, C., W. H. Marlow, Y. A. Hassan, 2008. Discussion of proposed mechanisms of thermal conductivity enhancement in nanofluids. *Int. J. Heat and Mass Transfer* **51**, 1342-1348.

Nie, Chu, Jun Geng, W. H. Marlow, 2008. The free energy of the metastable supersaturated vapor via restricted ensemble simulations. II. Effects of constraints and comparison with molecular dynamics simulations *J. Chem. Phys.* **128**, 234310

Nie, Chu, W. H. Marlow, 2008. Radial density distribution of the metastable supersaturated vapor via restricted ensemble simulations. *Phys. Rev. E* **78,** 12101

Nie, Chu, Youhua Zhou, W. H. Marlow, Y. A. Hassan, 2008. Self-diffusion coefficients of the metastable Lennard-Jones vapor. *Journal of Physics: Condensed Matter* **20**, 415105

Geng, Jun, Chu Nie, William H. Marlow, 2012. Polydisperse Aerosol Condensation with Heat and Mass Conservation, I: Model Description with Applications to Homogeneous Systems. *Int. J. Heat and Mass Transfer* **55**(9-10), pp.2429-2439.

Geng, Jun, Chu Nie, William H. Marlow, 2012. Polydisperse Aerosol Condensation with Heat and Mass Conservation II: Fluid Dynamic Couplings for an Embedded Aerosol Zone. *Int. J. Heat and Mass Transfer* **55**, pp.7570-7576.

Pirye, Aashish, William H. Marlow, 2013. Computations of Lifshitz-van der Waals interaction energies between irregular particles and surfaces at all separations for resuspension modeling. Submitted for publication.

Editorships:

Aerosol Measurement. Editors: Dale, A. Lundgren, Morton Lippman, Franklin S. Harris, Jr., William E. Clark, William Marlow, Michael D. Durham. University Presses of Florida (Gainesville, 1979). Proceedings of 1976 Conference on Aerosol Measurement, Gainesville, Florida.

Aerosol Microphysics, I: Particle Interactions. Editor: W.H. Marlow. Volume 16 of Topics in Current Physics, Springer-Verlag (Berlin, Heidelberg, New York, 1980).

Aerosol Microphysics, II: Chemical Physics of Microparticles. Editor: W.H. Marlow. Volume 29 of Topics in Current Physics, Springer-Verlag (Berlin, Heidelberg, New York, 1982).

Gas-Phase Nanoparticle Synthesis. Edited by C.-G. Granqvist, L. B. Kish, W. H. Marlow. (Kluwer, Dordrecht, 2004)

Book Chapters:

Marlow, W.H., Introduction:The Domains of Aerosol Physics, Chapter 1 *of Aerosol Microphysics, I: Particle Interactions.* Editor: W. H. Marlow . Volume 16 of Topics in Current Physics (Springer-Verlag, Berlin, Heidelberg, New York,1980), pp. 1-14.

Marlow, W.H., Survey of Aerosol Interaction Forces. Chapter 5 *of Aerosol Microphysics, I: Particle Interactions.* Editor: W. H. Marlow . Volume 16 of Topics in Current Physics (Springer-Verlag, Berlin, Heidelberg, New York,1980), pp. 117-156.

Marlow, W.H., Aerosol Chemical Physics. Chapter 1 of *Aerosol Microphysics, II: Chemical Physics of Microparticles.* Editor: W. H. Marlow. Volume 29 of Topics in Current Physics (Springer-Verlag, Berlin, Heidelberg, New York,1980) pp. 1-6.

Lucchese, R. R. and W. H. Marlow, Gas-Phase Cluster Dynamics: Clustering and Growth, in *On Clusters and Clustering: from Atoms to Fractals,* Edited by P. J. Reynolds (Elsevier Scientific Publishers,1993), pp. 143-156.

Marlow, William H., Van der Waals Energies in the Formation and Interaction of Nanopaticle Aggregates. *Gas-Phase Nanoparticle Synthesis*. Edited by C.-G. Granqvist, L. B, Kish, W. H. Marlow. (Kluwer, Dordrecht, 2004)

Proceedings:

Marlow, W.H. 1976. The diffusion charging mobility analysis hypothesis revisited. Presented at the Aerosol Measurement Workshop, Gainesville, FL, March, 1976. In *Aerosol Measurement,* D.A. Lundgren, W.E. Clark, F. Harris, M. Lippman, W.H. Marlow, M. Durham, Editors, University Presses of Florida, Gainesville, 1979.

Marlow, W.H. The diffusion processor. ibid.

Marlow, W.H. 1976. Calculations of unipolar aerosol charging. *Colloid and Interface Science*, Vol. II. Academic Press, New York, San Francisco, London. Presented at the International Conference on Colloids and Surfaces-50th Colloid and Surface Science Symposium, held in San Juan, PR, June 21-25, 1976.

Marlow, W.H. 1977. A limitation on electrical measures of aerosols. *Methods and Standards for Environmental Measurement*, National Bureau of Standards, Special Publication 464, Wm. H. Kirchhoff, Editor, U.S. Department of Commerce, Washington, DC.

Tanner, R.L. and Marlow, W.H. Size discrimination and chemical composition of ambient airborne sulfate by diffusion sampling. ibid.

Marlow, W.H. and Garber, R.W. 1978. A new airborne aerosol sampling system. Presented at the 71st Annual Meeting of the Air Pollution Control Association, Houston, TX, June 25-30, 1978.

Marlow, W.H. and Abuaf, N. 1978. Particle sampling from high temperature and pressure gas streams. *Proceedings of the 1978 Symposium on Instrumentation and Control for Fossil Demonstration Plants. Newport Beach, CA, June 19-21, 1978*. ANL-78-2. Available N.T.I.S.

Wegrzyn, J. Saunders, J., and Marlow, W.H. Real time coarse particle mass measurements in a high temperature pressure coal gasifier process treatment. Presented at the High Temperature, High Pressure Particulate and Alkali Control in Coal Combustion Process Steams Conference, U.S. Dept. of Energy, Morgantown, WV, February 3-5, 1981.

Wegrzyn, J. Saunders, J., and Marlow, W.H. Real time coarse particle mass measurements in a high temperature pressure coal gasifier process treatment. Presented at the Fourth Symposium on the Transfer and Utilization of a Particulate Control Technology, Denver, CO, March 10-12, 1981.

Marlow, W.H. and Slatest, L.A., Intermolecular forces in the collision rates of small molecular clusters. Presented at the First International Aerosol Conference, Minneapolis, MN., September, 1984. Abstract published in *Aerosols: Science, Technology, and Industrial Applications of Airborne Particles,* Editors: B.Y.H. Liu, D.Y.H. Pui, and H.J. Fissan,.Elsevier New York, Amsterdam, Oxford, 1984.

Marlow, W. H. Intercluster and interparticle forces in the collision rates of free-molecular and transition regime aerosols.*Proceedings of the Coagulation Workshop,16th - 18th March, 1988.* Editors: G. Metzig

and W. O. Schikarski. KfK-Report No. 4606, 1989 (Kernsforschungzentrum Karlsruhe GmbH, ISSN 0303-4003)

Venkatesh, S., Marlow, W., Lucchese, R., Schulte, J. Underlying dynamics from analysis of data from cluster collision simulations. (complete citation in Referreed Literature section above)

Marlow, William H. Marlow. Physics of formation and interactions of submicron particles. Workshop on Aerosols and Industry, National Science Foundations, 1991

Schulte, J., R. R. Lucchese, W. H. Marlow. Calculation of collisional energy transfer of thermal clusters. In *Nucle-ation and Atmospheric Aerosols*, Proceedings of the The Thirteenth International Conference on Nucleation and Atmospheric Aerosols, Editors: N. Fukuta, P. Wagner. A. Deepak Publishing (Hampton, Va., 1992)

Kish, Laszlo, Jose L. Solis, Robert Vajtai, Claes-G. Granqvist, William H. Marlow, J. Olsson, J. Schnurer, Vilho Lantto, Zoltan Gingl. How can noise "smell" and remember that "smell": Sampling-and-hold electronic noise. In *Noise in Physical Systmes and 1/f Fluctuations.*. Ed. Gijs Bosman (world Scientific: New Jersey, Singapore, Hong Kong, 2001) Proceedings of the 16th International Conference on Noise and Fluctuations, Gainsville, 2001.

PATENTS

Apparatus Having Reduced Background for Measuring Radiation Activity in Aerosol Particles by Andrew R. McFarland, Carlos, A. Ortiz, John C. Rodgers, and William H. Marlow. 1992. Patent No. 5,128,539.

Detonation/Deflagration Precursor Detection in Gases, Vapors, Aerosols, and Mixtures Thereof. by William H. Marlow and John P. Wagner. 1998. Patent No. 5,789,256.

Detonation/Deflagration Precursor Detection in Gases, Vapors, Aerosols, and Mixtures Thereof. by William H. Marlow and John P. Wagner. 1999. Patent No. 6,001,308.

Patent Disclosure

Van der Waals Enhanced MOSFET for Molecular and Particulate Sensing. M.Cheng, W. H. Marlow, L. B. Kish. Patent Disclosure, Texas A&M University, April 20, 2004.

CURRICULUM VITAE

JOHN WILLIAM NIELSEN-GAMMON

Regents Professor and Texas State Climatologist
Department of Atmospheric Sciences
Texas A&M University

3150 TAMU, College Station, TX 77843-3150
Eller O&M Building, Room 1012A
n-g@tamu.edu 979-862-2248

last updated April 14, 2013

POSITIONS HELD

Regents Professor, Texas A&M University, 2011-present
Texas State Climatologist, 2000-present
Professor of Meteorology, Texas A&M University, 2000-2011
Acting Executive Associate Dean and Associate Dean for Research, College of Geosciences, Texas A&M University, 2008-2009
Associate Director, The Center for Atmospheric Chemistry and the Environment, 2003-07
Deputy Speaker, Texas A&M Faculty Senate, 1997-98
Associate Professor of Meteorology, Texas A&M University, 1996-00
Assistant Professor of Meteorology, Texas A&M University, 1991-96
Postdoctoral Research Associate, State University of New York at Albany, 1990-91

PROFESSIONAL INTERESTS

Synoptic-scale dynamic meteorology and weather prediction
Air pollution meteorology
Mesoscale meteorology
Applied climatology

EDUCATION

Ph.D. Massachusetts Institute of Technology, Meteorology, 1990
- Dissertation title: Small-scale Cyclogenesis During the Genesis of Atlantic Lows Experiment

S.M. Massachusetts Institute of Technology, Meteorology, 1987
- Thesis title: The Formation of New England Coastal Fronts

S.B. Massachusetts Institute of Technology, Earth and Planetary Sciences, 1984

AWARDS AND HONORS

Sigma Xi – Texas A&M Chapter Outstanding Science Communicator, 2013
Texas A&M SEC Distinguished Achievement Award, 2013
Dean's Achievement Award, Service, Texas A&M College of Geosciences, 2012
2011 Weather Hero, The John C. Freeman Weather Museum, 2012
Regents Professor, The Texas A&M University System, 2011
Newsmaker Image Award, Texas A&M University, 2011
The Woody Guthrie Award Presented to a Thinking Blogger, 2011
Fellow, American Meteorological Society, 2011
Certificate of Recognition, National Aeronautics and Space Administration, 2007
Editor's Award, American Meteorological Society, 1997
Faculty Distinguished Achievement Award in Teaching, Texas A&M University Association of Former Students,

1996
Presidential Faculty Fellow, National Science Foundation/White House, 1995
Distinguished Teaching Award, College of Geosciences and Maritime Studies, Association of Former Students, 1995
National Collegiate Weather Forecasting Contest, First Place, 1989-91

EXTERNAL SUPPORT

Submitted

"Effects of Climate Variability and Change on the Emergence and Re-emergence of High-Threat Diseases of Livestock in the United States", October 2013, 36 months, $1,000,000, United States Department of Agriculture, Beto Perez de Leon, PI (my share $70,000).

Current

"Development of a High Resolution Drought Trigger Tool (HiRDTT) for the United States", January 2011, 36 months, $496,000, United States Department of Agriculture, RF 409011.
"Drought Decision Making Tool for Agricultural Producers", November 2010, 36 months, $499,000, United States Department of Agriculture, Clyde Munster, PI, RF 501021-02001.
"Application of weather dynamics to predict population changes and enhance IPM strategies for the Gulf Coast Tick", July 2011, $133,000, United States Department of Agriculture, Pete Teel, PI.

Previous (last 5 years)
"Wind Modeling Improvements with the Ensemble Kalman Filter", January 2011, 11 months, $80,000, Air Quality Research Program (University of Texas/TCEQ).
"Analysis of Historical Drought Stress in the Big Bend Region", October 2009, 9 months, $23,000, subcontract from the World Wildlife Fund (project funded by NOAA).
"Urban-Scale Meteorological Modeling for the Corpus Christi Area", September 2008, 30 months, $200,000, subcontract from the University of Texas.
"Boundary Layer Parameterization Improvement", May 2007, 3 years, $47,000, Environmental Protection Agency (through the University of Houston), RF 497251-03001.
"Validation and Improvement of Vertical Mixing and Surface Fluxes", June 2008, 15 months, $160,000, Texas Environmental Research Consortium, H-96-2008-TAMU.
"Sources and Trends of Background Ozone", June 2008, 13 months, $40,000, Texas Environmental Research Consortium, H-107-2008-TAMU.
"Ensemble Kalman Filter (EnKF) Implementation and Testing In Support of Air Quality Modeling", April 2008, 16 months, $185,000, Texas Commission on Environmental Quality. 582-5-64593-FY08-24.

INTERNAL COMPETITIVE SUPPORT

"METR151 Web Module Development", 1998, one year, $3,000, Academy for Advanced Telecommunications and Learning Technologies

PROFESSIONAL AND SERVICE ACTIVITIES
(leadership activities in boldface)

Department of Atmospheric Sciences

Promotion and Tenure Committee, Member, 1996-present
Chair, 2003-05; 2008-09; 2010-2011
Weather Analysis and Forecasting Faculty Search Committee, Member, 2008; 2011-2012
Undergraduate Advisor, 1995-present
Shared Mobile Atmospheric Research and Teaching Radar Steering Committee, Member, 2008-present
Teaching Committee Member, 2007
Radar/Mesoscale Faculty Search Committee, Chair, 2007-2008
Graduate Committee, Member, 2005-2007

Web Page Committee, Member, 2005-2007
Budget Committee, Member, 2004-2006
Faculty Search Committee, Member, 2005-2006
Undergraduate Program Committee, Member, 2001-05
Vice-chair, 2002-03
Chair, 2003-05
Mentor, 2005-07
Executive Committee, Cooperative Institute for Applied Meteorological Studies, Member, 1995-2005
Climate Faculty Search Committee, Member, 2003-04
Atmospheric Chemistry Faculty Search Committee, Member, 2003-04
Radar Faculty Search Committee, Member, 2002-03
Facilities Committee, Member, 1998-03
Synoptic/Mesoscale Faculty Search Committee, Chair, 1999-01
TAMU Rewarding Teaching Project, Departmental Team Member, 1999-01
Graduate Program Committee, Member, 1995-98
Ad Hoc Peer Teaching Evaluation Committee, Member, 1993-96
Chair, 1993-96
Data Resources Committee, Member 1993-95
Chair, 1993-95
Radar Committee, Member, 1992-95
Undergraduate Curriculum Committee, Member, 1992-95
Computer Committee, Member, 1992-95

College of Geosciences

College Advisory Committee on Promotion and Tenure
• Member, 2000-02, 2009-2010, 2012-
• Chair, 2001-02, 2010, 2012-
Environmental Studies Program
• Water Focus Working Group, Chair, 2008
• Member, 2011-present
GeoConnections Committee, 2006-07
Research Council, Member, 2004-06
Oceans and Atmospheres Reinvestment Committee, Member, 2003-06
Climate Geographer Faculty Search Committee, 2004-05
College Curriculum Committee, Member, 2003-05
Search Committee for Faculty Position in Physical Oceanography, Member, 1999-00
Faculty Workshop, "Putting Your Course Online" (joint with B. Herbert and S. Bednarz), 1998
College of Geosciences and Maritime Studies Dean Search Committee, Member, 1997
Meteorology Department Head Search Committee, Member, 1995

Texas A&M University

Member, Faculty, Water Degree Program, 2012-present
Graduate Merit Fellowships, Reviewer, 2013
Center for Teaching Excellence
• Graduate Student Teaching Workshop, Instructor, 2010
Student Research Week Competition, Judge, 1997-2008, 2010
Fellow, Institute for Science, Technology and Public Policy, 2007-present
Responsible Conduct in Research Working Group, 2010
University Research Committee, 2008-09
Illegal Discrimination Appeals Panel, 2008-present
Association of Former Students Distinguished Achievement Awards Selection Committee, Member, 1997, 2006
Presidential Professor for Teaching Excellence Selection Committee, Member, 2003
TAES/TCE Statewide Evapotranspiration Network Technical Committee, Member, 2002
Core Curriculum Oversight Subcommittee, Member, 1997-01

Letters, Arts, and Sciences Task Force, Member, 2000-01
Ad Hoc Committee on Reconciling the Faculty Reward System with the Multiple Missions of Texas A&M University, Member, 1997-00
- **Co-Chair, 1998-00**
- Cross-College Inventory and Comparison Subcommittee, Member, 1997-98
  - **Chair, 1997-98**

GIS Laboratory Committee, Member, 1999
Life Sciences Task Force
- Integrative Biology and Environmental Health Committee, Member, 1999

System Employee Benefits Advisory Committee Election Committee, Member, 1999
Faculty Senate, Elected Member, 1995-99
- **Deputy Speaker, 1997-98**
- **Executive Committee, Member, 1997-98**
  - Ad Hoc Subcommittee for Revisions to the Statement on Academic Freedom, Responsibility, and Tenure, Member, 2000-01
  - Ad Hoc Subcommittee to Examine the Statewide Core Curriculum, Member, 1998-99
  - Staff Assistant Search Committee, Member, 1998
  - Student Senate Liaison, 1997-98
- Texas Council of Faculty Senates, Representative, 1998-98
- Bylaws Committee, Member, 1998-99
- Faculty Senate Election Committee, Member, 1996-98
- Personnel and Welfare Committee, Member, 1995-99
  - **Chair, 1998-99**
  - Research Faculty Subcommittee, Member, 1998-99
  - Ad Hoc Post Tenure Review Committee, Member, 1996
  - Parking and Transit Subcommittee, Member, 1995-97
    - **Chair, 1995-97**
  - Bicycle Issues Subcommittee, Member, 1996-97
    - **Chair, 1996-97**

Residence Hall Check-In Coordination Committee, Member, 1995-99
APC Committee to Study the Use of Personnel, Equipment, and Resources by Faculty in their Consulting/Outside Employment Arrangements, Member, 1998
Faculty Work-Life Satisfaction Survey Focus Group, Member, 1998
Vision 2020 Task Force
- Committee on Leadership, Governance, and Organization, Member, 1998

Academic Convocation Planning Committee, Member, 1997-98
Science, Technology, and Youth Symposium, session leader, 1995-97

External and Scientific

National Academy of Sciences
- Committee Member, Regional Approaches to Urban Sustainability: A Focus on Metropolitan Houston, 2011-2012
- Committee Member, Review Panel for NOAA Climate Change Science Program Scientific Assessment Product 1.3: Reanalysis and Attribution, 2007-08
- Consultant, Panel on Coastal Meteorology, 1991

International Association of Meteorology and Atmospheric Sciences (IAMAS)
- International Commission for Dynamical Meteorology, Member, 2000-present
  - **Past President and EC Member, 2011-present**
  - **President, 2007-2011**
  - **Secretary, 2003-2007**

American Meteorological Society (AMS), Member, 1989-present
- Education and Human Resources Commission, Member, 2008-2012

- Board on Higher Education, Member, 2006-2012
  - **Chair, 2008-2011**
  - **Program Co-Chair, 2008 AMS Student Symposium**
  - **Program Co-Chair, 2007 AMS Student Symposium**
- AMS/Industry Minority Scholarships Selection Committee
  - Member, 2008-2011
  - **Chair, 2010-2011**
- **AMS/AGU Heads & Chairs Meeting, co-convenor, 2008 and 2010**
- **Drafting Committee, AMS Statement on the Bachelor's Degree in Atmospheric Sciences, Chair, 2010-2011**
- Drafting Committee, AMS Statement on Communicating Science, Member, 2010-2011
- Committee on Mesoscale Processes, Member, 1998-01

American Geophysical Union (AGU), Member, 2001-present

- **Co-Convener, 2007 Fall Meeting Session A35, Transport and Mixing Affecting Air Quality in Coastal and Complex Terrain Urban Areas**

American Association of State Climatologists

- Member, Climate Change Statement Drafting Committee, 2009-present
- Member, Climate Curriculum Committee, 2010-present
- Member, Dissertation Award Selection Committee, 2009
- Member, Nominating Committee, 2007
- **AASC-Recognized State Climate Office, Director, 2002-present**

National Science Foundation

- Member, Observing Facilities Advisory Panel, 2000-02
- Member NCAR Earth Observing Laboratory Site Visit External Review Team, 2011

National Oceanic and Atmospheric Administration

- Occasional Presenter, NOAA/SCIPP/NIDIS/NDMC Biweekly Stakeholder Webinar Series, "Managing Drought in the Southern Plains", 2011-present
- Member, climate.gov Science Panel, 2011-present
- Member, NWS Southern Region Climate Coordination Team, 2011-present
- Featured Guest Speaker, NOAA/NCDC Monthly Climate Outlook Press Briefing, September 2011
- National Meteorological Center Surface Analysis Workshop, 1991

National Environmental Education Foundation

- Member, Earth Gauge Climate Facts Focus Group, 2010-2013

Air Quality Research Program (Texas)

- Member, Independent Technical Advisory Committee, 2010-present

USACE/FEMA Joint Texas Coastal Surge Project

- Member, Independent Technical Review Panel, 2007-2011

University of California Davis/Lawrence Livermore National Laboratory Point-of-Care Technologies Center

- Member, Meteorological Board, 2009-present

Cooperative Program for Operational Meteorology, Education and Training

- Fall COMAP Course, Guest Lecturer, 1995
- Subject Matter Expert, Distance Learning Program, 1993-95

Unidata Program, University Corporation for Atmospheric Research

- Member, Unidata Policy Committee, 1991-94
- Member, Unidata Implementation Working Group 1991-93

Georgia Institute of Technology

- External Review Team, School of Earth and Atmospheric Sciences, 2009

Genesis of Atlantic Lows Experiment, Lead Forecaster, Ground Mission Scientist, Airborne Mission Scientist, 1986

Associate Editor, Monthly Weather Review, 1994-98; 2000-02

Chapter Editor, Handbook of Weather, Climate, and Water, 1999-03

Texas Environmental Research Consortium

- Member, Research Teams Committee, 2004-present

• Member, Science Advisory Committee, 2004

Texas Commission for Environmental Quality

• Member, TexAQS-II Coordination Committee, 2004-2006
• Member, Science Coordinating Committee, 2001-2008
• Member, Science Executive Committee, 2001-2008
• **Chair, Meteorological Modeling Working Group, 2001-2008**

Texas Drought Preparedness Council, Member, 2001-present

TexAQS-2 Field Program

• Member, Science Planning Team, 2004-06
• **Chair, Meteorological Processes Committee, 2004-06**
• **Lead Forecaster, 2005-06**

TexAQS 2000 Field Program

• Member, Science Planning Team, 1999-00
• **Co-Chair, Boundary Layer Processes Committee, 1999-01**
• **Lead Forecaster, 2000**

Cooperative Institute for Applied Meteorological Studies

• Spring Doppler Programs, Mission Scientist, Radar Operator, Sounding Chief, 1992, 1993

49th International Science and Engineering Fair, Grand Awards Judge, 1998

Texas and Florida Underflights Experiment, Lead Forecaster, 1998

Genesis of Atlantic Lows Experiment, Lead Forecaster, 1986

Reviewer of grant applications for the following agencies:

National Science Foundation, Department of Defense, National Oceanographic and Atmospheric Administration, US Civilian Research and Development Foundation, Natural Environment Research Council (UK), Israel Science Foundation, Canadian Foundation for Climate and Atmospheric Sciences, Georgia National Science Foundation, Texas Air Quality Research Program

Reviewer of articles in the following journals:

Atmospheric Chemistry and Physics, Atmospheric Environment, Atmospheric Science Letters, Bulletin of the American Meteorological Society, Climatic Change, Continental Shelf Research, Electronic Journal of Operational Meteorology, Environmental Modeling and Software, Environmental Science and Technology, Eos, GeoJournal, Geophysical Research Letters, International Journal of Climatology, Journal of Applied Meteorology and Climatology, Journal of Atmospheric and Oceanic Technology, Journal of Atmospheric and Solar-Terrestrial Physics, Journal of Climate, Journal of Earth System Science, JGR - Atmospheres, Journal of Hydrologic Engineering, Journal of Marine Science, Journal of the Atmospheric Sciences, Journal of the Air and Waste Management Association, Journal of the Meteorological Society of Japan, Meteorologische Zeitschrift, Meteorology and Atmospheric Physics, Monthly Weather Review, National Weather Digest, Nature, Pure and Applied Geophysics, Quarterly Journal of the Royal Meteorological Society, Tellus, Texas Water Journal, Water Resources Research, Weather and Forecasting.

TEACHING

ATMO/METR 151 Weather Forecasting. (0-2). Credit 1. Basic principles of meteorology as applied to short-range weather forecasting; numerical weather prediction, guidance and forecasting techniques; daily map discussions and forecasts.
1995 (new; 2 sections), 1996 (2), 1997 (2), 1998 (4; coordinator), 2002 (2)

ATMO/METR 201 Atmospheric Science. (3-0). Credit 3. Structure, energy, and motions of the atmosphere; climate; fronts and cyclones; atmospheric stability; clouds and precipitation; severe storms.
2000 (honors; co-instructor), 2009(2), 2010(2)

ATMO 251 Weather Observation and Analysis. (2-2). Credit 3. Standard and experimental weather observing techniques; subjective and objective analysis; application of conceptual models; simple kinematic and dynamic constraints.
2003 (new, 3 sections), 2004 (2), 2005(2), 2006(2)

ATMO 324 Physical and Regional Climatology. (2-2). Credit 3. Climate causes; global and surface energy balance; hydrologic cycle; general circulation; climate change; climate data analysis. Prerequisites: ATMO

201 and 203; MATH 172; course that satisfies departmental computer science requirement.
2011(2), 2012(2), 2013(2)

ATMO 435 Synoptic-Dynamic Meteorology. (3-0). Credit 3. Dynamics and diagnosis of synoptic-scale systems; perturbation theory and baroclinic instability; wave energetic, frontogenesis. Prerequisite: ATMO 336 or equivalent.
2007

METR 451 Weather Observation and Analysis. (2-9). Credit 5. Standard and experimental weather observing techniques; structure of tropospheric phenomena and their representation on weather charts; computer technology in weather service. Prerequisite: METR 336 or registration therein.
1999, 2000, 2001 (co-instructor)

METR 452 Dynamics of Weather Processes. (2-9). Credit 5. Development of large-scale processes in the troposphere; prognostic techniques, including numerical methods. Prerequisite: METR 451.
1991, 1993, 1994, 1995, 1996, 1997, 1998, 1999

ATMO 455/489/689 Numerical Weather Prediction. (2-2). Credit 3. Basic principles of computer models of the atmosphere; parameterizations; use and critical evaluation of models and model output. Prerequisites: MATH 308; ATMO 336 or registration therein.
2003 (new)

ATMO 456/489 Practical Weather Forecasting. (1-4). Credit 3. Application of meteorological concepts to particular forecasting situations; advanced forecasting techniques.
2005 (new), 2006, 2008, 2012

ATMO 459/659 Tropical Cyclones. (3-0). Credit 3. Tropical climatology; structure evolution and motion of tropical cyclones, tropical cyclone hazards; large scale tropical phenomena. Prerequisites: ATMO 451; junior or senior classification.
2003 (co-instructor)

ATMO/METR 485 Directed Studies. Supervision of research projects carried out by undergraduates.
1997 (1 student), 1999 (2), 2001 (2), 2003 (2), 2005 (5), 2006 (3), 2007 (1), 2008 (2)

METR 602 Principles of Atmospheric Physics and Chemistry. (3-0). Credit 3. Integrated treatment of fundamental aspects of physical meteorology and atmospheric chemistry; ultraviolet and infrared absorption and emission; radiative transfer; photochemistry of ozone and OH; cloud and precipitation microphysics and thermodynamics.
1993 (new), 1994

ATMO/METR 658 Synoptic Meteorology. (3-0). Credit 3. Mechanism and energetics of general circulation. Structure of large-scale systems.
1992, 1995, 2000, 2004, 2007

ATMO 685 Directed Studies. Offered to enable majors in meteorology to undertake and complete, with credit, in their particular fields of specialization, limited investigations not covered by any other courses in established curriculum.
1992 (2 students), 1993 (2), 1995 (1), 1997 (2), 1998 (2), 2000 (1), 2004 (1), 2005 (2), 2006 (1), 2007 (1)

PUBLICATIONS

*denotes graduate student co-author

Refereed literature (last 5 years)

54. Hoerling, M., A. Kumar, R. Dole, **J. W. Nielsen-Gammon**, J. Eischeid, J. Perlwitz, X.-W. Quan, T. Zhang, P. Pegion, and M. Chen, 2013: Anatomy of an extreme event. *J. Climate*, early online release, doi:10.1175/JCLI-D-12-00270.1.
53. **Nielsen-Gammon, J. W**., 2012: The 2011 Texas drought. *Texas Water J*., 3(1), 59-95.
52. Bei, N., F. Zhang, and **J. W. Nielsen-Gammon**, 2012: Ensemble-based observation targeting for improving ozone prediction in Houston and the surrounding area. *Pure Appl. Geophys*., 163, 539-554, doi:10.1007/s00024-011-0386-z
51. *McRoberts, D. B., and **J. W. Nielsen-Gammon**, 2012: The use of a high-resolution SPI for drought monitoring and assessment. *J. Appl. Meteor. Clim*., 51, 68-83, doi:10.1175/JAMC-D-10-05015.1
50. Fall, S., A. Watts, **J. Nielsen-Gammon**, E. Jones, D. Niyogi, J. R. Christy, and R. A. Pielke Sr., 2011: Analysis of the impacts of station exposure on the U.S. Historical Climatology Network temperatures and temperature trends. *J. Geophys. Res*., 116, D14120, doi:10.1029/2010JD015146

49. *McRoberts, D. B., and **J. W. Nielsen-Gammon**, 2011: A new homogenized United States climate division precipitation data for analysis of climate variability and change. *J. Appl. Meteor. Clim.*, 50, 1187-1199, doi:10.1175/2010JAMC2626.1

48. Banta, R. M., C. J. Senff, R. J. Alvarez, A. O. Langford, D. D. Parrish, M. K. Trainer, L. S. Darby, R. M. Hardesty, B. Lambeth, J. A. Neuman, W. M. Angevine, **J. Nielsen-Gammon**, S. P. Sandberg, and A. B. White, 2011: Dependence of daily peak O3 concentrations near Houston, Texas on environmental factors: Wind speed, temperature, and boundary-layer depth. *Atmos. Env.*, 45, 162-173, doi:10.1016/j.atmosenv.2010.09.030.

47. Hu, X.-M., **J. W. Nielsen-Gammon**, and F. Zhang, 2010: Evaluation of three planetary boundary layer schemes in the WRF model. *J. Appl. Meteor. Clim.*, 49, 1831-1844, doi: 10.1175/2010JAMC2432.1.

46. Nielsen-Gammon, J. W., X.-M. Hu, F. Zhang, and J. Pleim, 2010: Evaluation of planetary boundary layer scheme sensitivities for the purpose of parameter estimation. *Mon. Wea. Rev.*, 138, 3400-3417, doi: 10.1175/2010MWR3292.1.

45. *Myoung, B., and **J. W. Nielsen-Gammon**, 2010: The convective instability pathway to warm season drought in Texas. Part II: Free-tropospheric modulation of convective inhibition. *J. Climate*, 23, 4474-4488, doi: 10.1175/2010JCLI2947.1.

44. *Myoung, B., and **J. W. Nielsen-Gammon**, 2010: The convective instability pathway to warm season drought in Texas. Part I: The role of convective inhibition and its modulation by soil moisture. *J. Climate*, 23, 4461-4473, doi: 10.1175/2010JCLI2946.1.

43. Hu, X.-M., F. Zhang, and **J. W. Nielsen-Gammon**, 2010: Ensemble-based simultaneous state and parameter estimation for treatment of mesoscale model error: A real-data study. *Geophys. Res. Lett.*, **37**, L08802, doi:10.1029:2010GL043017.

42. *Myoung, B., and **J. W. Nielsen-Gammon**, 2010: Sensitivity of monthly convective precipitation to environmental conditions. *J. Climate*, 23, 166-188, doi: 10.1175/2009JCLI2792.1.

41. Nielsen-Gammon, J. W., L. B. Avilés, and E. Joseph, 2009: What does it take to get into graduate school? A survey of atmospheric science programs. *Bull. Amer. Meteor. Soc.*, 90, 1698-1705.

40. Parrish, D. D., D. T. Allen, T. S. Bates, M. Estes, F. C. Fehsenfeld, G. Feingold, R. Ferrare, R. M. Hardesty, J. F. Meagher, **J. W. Nielsen-Gammon**, R. B. Pierce, T. B. Ryerson, J. H. Seinfeld, M. Trainer, and E. J. Williams, 2009: Overview of the Second Texas Air Quality Study (TexAQS II) and the Gulf of Mexico Atmospheric Composition and Climate Study (GoMACCS). *J. Geophys. Res.,* 114, D00F13, doi:10.1029/2009JD011842.

39. Pielke Sr., R., C. Davey, D. Niyogi, S. Fall, J. Steinweg-Woods, K. Hubbard, X. Lin, M. Cai, Y.-K. Lim, H. Li, **J. Nielsen-Gammon**, K. Gallo, R. Hale, J. Angel, R. Mahmood, S. Foster, R. T. McNider, and P. Blanken, 2009: Reply to comment by David E. Parker et al. on "Unresolved issues with the assessment of multidecadal global land surface temperature trends". *J. Geophys. Res.*, 114, D05105, doi:10.1029/2008JD010938.

38. *Gold, D. A., and **J. W. Nielsen-Gammon**, 2008: Potential vorticity diagnosis of the severe convective regime. Part IV: Comparison with modeling simulations of the Moore tornado outbreak. *Mon. Wea. Rev.*, 136, 1612-1629.

37. *Gold, D. A., and **J. W. Nielsen-Gammon**, 2008: Potential vorticity diagnosis of the severe convective regime. Part III: The Hesston tornado outbreak. *Mon. Wea. Rev.*, 136, 1593-1611.

36. Nielsen-Gammon, J. W., and *D. A. Gold, 2008: Potential vorticity diagnosis of the severe convective regime. Part II: The impact of idealized anomalies. *Mon. Wea. Rev.*, 136, 1582-1592.

35. *Gold, D. A., and **J. W. Nielsen-Gammon**, 2008: Potential vorticity diagnosis of the severe convective regime. Part I: Methodology. *Mon. Wea. Rev.*, 136, 1565-1581.

34. Nielsen-Gammon, J. W., *C. L. Powell, M. J. Mahoney, W. Angevine, C. Senff, A. White, C. Berkowitz, C. Doran, and K. Knupp, 2008: Multi-sensor estimation of mixing heights over a coastal city. *J. Appl. Meteor. Climatol.*, 47, 27-43.

33. Nielsen-Gammon, J. W., and *D. A. Gold, 2008: Potential vorticity diagnosis in the quasigeostrophic and nonlinear balance systems. *J. Atmos. Sci.*, 65, 172-188.

32. Nielsen-Gammon, J. W., 2007: *An Inconvenient Truth*: The scientific argument. *GeoJournal*, 70, 21-26, doi:10.1007/s10708-008-9126-z.

Books, Monographs, and Peer-Reviewed Reports

2. National Research Council, 2008: Review of the U.S. Climate Change Science Program's Synthesis and

Assessment Product 1.3: "Reanalysis of Historical Climate Data for Key Atmospheric Features: Implications for Attribution of Causes of Observed Change". National Academy Press, Washington, D.C., in press. (Panel member)

1. National Research Council, 1992: Coastal Meteorology: A review of the state of the science, National Academy Press, Washington, D.C., 99 pp. (Panel consultant and co-author)

Chapters in Books

6. Nielsen-Gammon, J. W., 2011: The changing climate of Texas. pp. 39-68 in *The Impact of Global Warming on Texas, second edition*. J. Schmandt, G. R. North, and J. Clarkson, eds., University of Texas Press, Austin, 318 pp., ISBN 978-0-292-72330-6.

5. Nielsen-Gammon, J. W., and *B. McRoberts, 2009: March 1843: The most abnormal month ever? pp. 123-148 in *Historical Climate Variability and Impacts in North America*. L.-A. Dupigny-Giroux and C. Mock, ed., Springer, Dordrecht, The Netherlands.

4. Nielsen-Gammon, J. W., and *D. A. Gold, 2008: Dynamical diagnosis: a comparison of quasigeostrophy and Ertel potential vorticity. pp. 183-202 in *Synoptic-Dynamic Meteorology and Weather Forecasting: A Tribute to Fred Sanders*. L. F. Bosart and H. B. Bluestein, Eds., Amer. Meteor. Soc., 423 pp.

3. Nielsen-Gammon, J. W., 2003: Weather and climate. (20 pp.) *Texas Master Naturalist Statewide Curriculum*, M. M. Haggerty, ed., Texas Cooperative Extension and Texas Parks and Wildlife Dept.,

2. Nielsen-Gammon, J. W., 2003: Large-scale atmospheric systems. *Handbook of Weather, Climate, and Water: Dynamics, Climate, Physical Meteorology, Weather Systems, and Measurements*, T. D. Potter and B. R. Colman, Eds. John Wiley and Sons, pp. 509-541.

1. Nielsen-Gammon, J. W., 2003: Overview of weather systems. *Handbook of Weather, Climate, and Water: Dynamics, Climate, Physical Meteorology, Weather Systems, and Measurements*, T. D. Potter and B. R. Colman, Eds. John Wiley and Sons, pp. 503-508.

Editor of Books

1. Potter, T. D., and B. R. Colman, 2003: Handbook of Weather, Climate, and Water: Dynamics, Climate, Physical Meteorology, Weather Systems, and Measurements. John Wiley and Sons, 973 pp. (Editor of "Weather Systems" section, pp. 501-688.)

Book Reviews

Nielsen-Gammon, J.W., 2012: Review of "Midlatitude Synoptic Meteorology: Dynamics, analysis, and forecasting" by Gary Lackmann. *Eos*, 93, 430, doi:10.1029/2012EO430010.

Encyclopedia Entries

6. Nielsen-Gammon, J. W., 2010: Cold fronts. Encyclopedia of Climate and Weather, Second Edition, S. H. Schneider, ed., Oxford University Press, in press.

5. Nielsen-Gammon, J. W., 2010: Divergence. Encyclopedia of Climate and Weather, S. H. Schneider, ed., Oxford University Press 250-254.

4. Nielsen-Gammon, J. W., 2010: Gust front. Encyclopedia of Climate and Weather, S. H. Schneider, ed., Oxford University Press 377-379.

3. Nielsen-Gammon, J. W., 1996: Cold fronts. Encyclopedia of Climate and Weather, S. H. Schneider, ed., Oxford University Press, 180-184.

2. Nielsen-Gammon, J. W., 1996: Divergence. Encyclopedia of Climate and Weather, S. H. Schneider, ed., Oxford University Press 250-254.

1. Nielsen-Gammon, J. W., 1996: Gust front. Encyclopedia of Climate and Weather, S. H. Schneider, ed., Oxford University Press 377-379.

Popular Press

Nielsen-Gammon, J.W., 2012: Is global warming heating Texas? *Austin American-Statesman*, Austin, TX, http://www.statesman.com/opinion/insight/is-global-warming-heating-texas-2453771.html

Nielsen-Gammon, J., 2012: Too early for the worst fears. *The New York Times, Room for Debate*, http://www.nytimes.com/roomfordebate/2012/07/25/how-can-we-prevent-another-dust-bowl/too-early-for-the-worst-fears-of-a-drought-induced-dust-bowl

Nielsen-Gammon, J., 2011: The drought of record was made to be broken. *Fountainhead*, 3rd quarter, pp. 1, 4, and 5, Texas Ground Water Association

Nielsen-Gammon, J., September 28, 2008: Next one could be worse – and totally unlike Ike. *Houston Chronicle*, Houston, Texas.

The Cattleman Magazine, Texas and Southwestern Cattle Raisers Association, author of monthly column, *The Way of the Weather*, 2000-2005.

Selected Technical Reports

Nielsen-Gammon, J. W., 2011: The 2011 Texas Drought: A Briefing Packet for the Texas Legislature. 43 pp. Available online at http://atmo.tamu.edu/osc/library/osc_pubs/2011_drought.pdf

Nielsen-Gammon, J., and B. McRoberts, 2009: An Assessment of the Meteorological Severity of the 2008-09 Texas Drought through July 2009. Office of the State Climatologist, Texas, Publication OSC-0901, 24 pp. Available online at the OSC web site.

National Climatic Data Center, and **Nielsen-Gammon, J. W.,** 2006: Climate of Texas. From the series "Climatography of the United States No. 60", available online (Oct. 2006) at http://cdo.ncdc.noaa.gov/cgi-bin/climatenormals/climatenormals.pl?directive=prod_select2&prodtype=CLIM60&subrnum=". 13pp.

Nielsen-Gammon, J. W., J. Tobin, and A. McNeel, 2005: A Conceptual Model for Eight-Hour Ozone Exceedances in Houston, Texas. Part II: Eight-Hour Ozone Exceedances in the Houston-Galveston Metropolitan Area. HARC/TERC/TCEQ Report, 79 pp.

Nielsen-Gammon, J. W., J. Tobin, A. McNeel, and G. Li, 2005: A Conceptual Model for Eight-Hour Ozone Exceedances in Houston, Texas. Part I: Background Ozone Levels in Eastern Texas. HARC/TERC/TCEQ Report, 52 pp.

Nielsen-Gammon, J., and H. Johnson, 2004: Texas and Oklahoma's Greatest Hits: The most significant weather events to strike Texas and Oklahoma. OSC Report 04-1, 14 pp.

Nielsen-Gammon, J. W., and *S.-O. Han, 2003: Meteorological Modeling for the August 2000 Houston-Galveston Ozone Episode: Implementation and Initial Evaluation of GOES Skin Temperature Assimilation. TCEQ Report, 46 pp.

Nielsen-Gammon, J. W., 2002: Meteorological Modeling for the August 2000 Houston-Galveston Ozone Episode: Improved Data Assimilation and Statistical Evaluation. TNRCC Report, 30 pp.

Erukhimova, T., **J. Nielsen-Gammon**, and K. Bowman, 2002: Trajectory Analysis of Meteorological Simulations of the August 2000 Houston-Galveston Ozone Episode. TNRCC Report, 172 pp.

Nielsen-Gammon, J. W., 2002: Meteorological Modeling for the August 2000 Houston-Galveston Ozone Episode: METSTAT Statistical Evaluation and Model Runs from March-June 2002. TNRCC Report, 23 pp.

Nielsen-Gammon, J. W., 2002: Meteorological Modeling for the August 2000 Houston-Galveston Ozone Episode: PBL Characteristics, Nudging Procedure, and Performance Evaluation. TNRCC Report, 109 pp.

Nielsen-Gammon, J. W., 2002: Evaluation and Comparison of Preliminary Meteorological Modeling for the August 2000 Houston-Galveston Ozone Episode. TNRCC Report, 83 pp.

Nielsen-Gammon, J. W., 2001: Initial Modeling of the August 2000 Houston-Galveston Ozone Episode. TNRCC Report, 71 pp.

*Han, S.-O., and **J. W. Nielsen-Gammon**, 2000: The Real-Time MM5 at Texas A&M: Model Configuration and Performance during TexAQS-2000. TNRCC Preliminary Report, 20 pp.

Nielsen-Gammon, J. W., and *S. Naumann, 2000: Application of the MM5 Mesoscale Model to the Houston-Galveston Metropolitan Area. TNRCC Report, 92 pp.

Gammon, B. E., E. J. Zipser, **J. W. Nielsen-Gammon**, N. W. Tindale, J. G. Guynes, R. E. Orville, and M. I. Biggerstaff, 1995: Texas MesoNet: A Plan for a Texas Mesoscale Meteorological Monitoring Network. Cooperative Institute for Applied Meteorological Studies and TNRCC, 63 pp.

*Studwell, A., and **J. Nielsen-Gammon**, 1995: Mesoscale Analysis of the March 27, 1994, Severe Weather Outbreak. NOAA Technical Memorandum NWS SR-166, 13 pp.

Nielsen-Gammon, J. W., and *R. C. Igau, 1994: A Synoptic Overview of the Intensification of the Storm of the Century. NOAA Technical Memorandum NWS SR-158, 18 pp.

THESES AND DISSERTATIONS

Doctoral Dissertations

Myoung, B., August 2007: Interannual Variability of Summer Precipitation in Texas and its Implication to Summer Drought.
Aksoy, A., August 2005: Mesoscale Ensemble-Based Data Assimilation and Parameter Estimation.
Han, S.-O., August 2004: Investigation of Surface Inhomogeneity and Estimation of the GOES Skin Temperature Assimilation Errors of the MM5 Implied by the Inhomogeneity over Houston Metropolitan Area.
Gold, D. A., May 2004: A Potential Vorticity Diagnosis of the Relationship Between Upper Level Troughs and the Severe Convective Regime.
Cantrell, L. E., May 2002: Initialization of Clouds in the PSU/NCAR Mesoscale Model Using the Air Force's Real-Time Nephanalysis.
Lefevre, R. J., May 1995: Using the Quasigeostrophic Potential Vorticity Height Tendency Equation to Diagnose the Development of Midtropospheric Mobile Troughs.

Master's Theses

McRoberts, D. B., May 2008: Drought Over the Past Century in Texas and New Mexico: Reducing Inhomogeneities in Long-Term Climate Records Via Statistical Methods to Study Drought.
Smith, C. L., May 2005: Mixing Heights in Southeast Texas as Observed by Rawinsonde, Profiler, Lidar, and Microwave Temperature Profiler.
Odins, A. M., December 2004: Mesoscale Predictability of an Extreme Warm-Season Precipitation Event.
Sippel, J. A., December 2004: The Multiple Vortex Nature of Tropical Cyclogenesis.
Walter, K., August 2004: Idealized Models of the Coastal Circulation.
Ames, D. S., December 2003: Verification of the WRF Model During a High Ozone Event Over Houston, TX.
Schulze, K. W., August 2003: An Investigation into the Contamination of WSR-88D VAD Wind Profile Output by Migrating Birds.
Myoung, B., August 2002: Seasonal Variation of Upper-Level Mobile Trough Development Upstream of the Pacific Storm Track.
Overpeck, S. A., December 2001: A Numerical Simulation of Slantwise Convection: Its Structure and Evolution.
Scott, R. K., August 2001: The South Central Texas Heavy Rain Event of October 1998: An MM5 Simulation and Diagnosis of Convective Initiation.
Peyraud, L., August 2001: Radiation Fog Forecasting Using a 1-Dimensional Model.
Naumann, S. A., August 2001: Sea Breeze Characteristics during a High Ozone Event over Houston.
Petroski, T. J., May 2000: Numerical Simulation of the 16-19 October 1994 Southeast Texas Heavy Rain Event: Precipitation Results and Diagnosis of the Lifting Mechanism.
Sonmez, I., May 2000: Design of the Texas Mesonet from the Aspect of Station Spacing.
Stewart, J. P., May 1999: An Eta-Model Output Study of Frontogenesis Conditions Favoring Development of a Troposphere-Spanning Front.
Wandishin, M. S., May 1998: A Potential Vorticity Diagnostic Approach to Upper-Level Frontogenesis Within a Developing Baroclinic Wave.
Stacey, I. M., August 1997: Three-Dimensional Simulation of Slantwise Convection During GALE IOP 1.
Gold, D. A., August 1996: A Quantitative Analysis of Baroclinic Instability in Extratropical Cyclogenesis.
McEver, G. D., August 1996: Mobile Trough Genesis over the Mongolian Plateau.
Komar, K. N., May 1996: A Study of Mobile Trough Genesis over the Yellow Sea - East China Sea Region.
Walters, T. A., May 1996: An Air Pollution Trajectory Model for Southeast Texas.
Igau, R. C., August 1994: Low Level Jet Development During a Numerically Simulated Return Flow Event.
Wood, L. T., August 1994: A Case Study of Symmetric Instability in the Presence of a Small-Scale Cyclone.

CURRENT GRADUATE STUDENTS (Committee chair or co-chair)

Ph.D.: Yoon-So Kang, Brent McRoberts
M.S.: Andrew McNeel, David Coates, John Cambareri

Invited Testimony

Hearing, State of Texas Senate Agricultural and Rural Affairs Committee, Sept. 11, 2012.
Hearing, State of Texas House of Representatives, Committee on Natural Resources, March 22, 2012.
Hearing, State of Texas House of Representatives, Committee on Natural Resources, Nov. 2, 2011.
Joint Hearing, State of Texas Senate, Committee on Natural Resources and Committee on Agriculture, Nov. 1, 2011.

Gerald R. North

Distinguished Professor
Department of Atmospheric Sciences
College of Geosciences
Texas A&M University
College Station, TX 77843-3150
February, 2007

Ph: (979) 845-8077
E-Mail: g-north@tamu.edu
Office Fax: (979) 862-4466
Website: http://www.met.tamu.edu/personnel/faculty/north.html
Office

Birthdate: 28 June 1938
Birthplace: Sweetwater, Tenn.

PROFESSIONAL INTERESTS

Modern and Paleo- Climate Analysis
Climate and Hydrology Modeling
Satellite Remote Sensing, Mission Planning
Statistical Methods in Atmospheric Science

EDUCATION

Ph.D., 1966, Physics, The University of Wisconsin
B.S., 1960, Physics, The University of Tennessee

EXPERIENCE

Holder of the Harold J. Haynes Endowed Chair in Geosciences, 2003-2009.
Head, Department of Atmospheric Sciences, Texas A&M University. September 1995-2003.
Visiting Scientist. University of Reading. Reading, UK. June-July 1994.
Director of Climate System Research Program, Texas A&M University. September 1986 – 1999.
Distinguished Professor of Meteorology and of Oceanography, Texas A&M University. September 1986 – present.
Adjunct Professor of Geography, Texas A&M University. March 1990-present.
Senior Consulting Scientist, Applied Research Corporation. Landover, MD. 1986-1993.
Senior Consulting Scientist, Applied Res. Corp. Technologies. College Station, TX. 1987-93.
Physical Scientist, AST (GS-15), Climate/Radiation Branch, NASA/GSFC. Greenbelt, MD. l978-86.
Lecturer/Adjunct Prof., Department of Meteorology. University of Maryland. College Park, MD. 1980-86.
Professor, Department of Physics. University of Missouri. St. Louis, MO. 1977-80.
Visiting Professor, Columbia University, Summer Lecture Program. NASA/Goddard Institute for Space Studies. New York, NY. July, 1979.
Associate Professor, Department of Physics. University of Missouri. St. Louis, MO. 1972-77.
Visiting Scientist, Main Geophysical Observatory. Leningrad, USSR. May-July 1977.
Guest Investigator, Woods Hole Oceanographic Institution. Woods Hole, MA. Summer 1976.
Senior Fellow, National Center for Atmospheric Research. Boulder, CO. 1974-75.
Assistant Professor, Department of Physics, University of Missouri. St. Louis, MO. 1968-72.
Research Associate, Department of Physics. University of Pennsylvania, PA. 1966-68.
Technician/Programmer, Oak Ridge National Laboratory. Oak Ridge, TN. Sept. 1957-Aug. 1961.

HONORS, AWARDS, LISTINGS

Member, Faculty Advisory Board, Texas Institute for Advanced Studies, 2011-2013.
Member AMS, Awards Oversight Committee, 2013.
Chairman, Panel to Revise AGU Statement on Climate Change 2012-2013.
Chairman, NRC Organizing Committee on Solar Variability and Climate Change, 2011-2013.
Member, AMS Research Awards Committee, 2010-2013 (Chair, 2013).
Member, AGU Fellows Selection Committee, 2009-2011.
Editor in Chief, *Encyclopedia of Atmospheric Sciences*, Elsevier, 2010-
Recipient of the Jule G. Charney Award from the American Meteorological Society, January 2008.
Chairman, NRC/NAS Committee on Surface Temperature Reconstructions for the Last 2000 years, 2006.
Editor's Citation for Outstanding Referee for *Geophysical Research Letters*, American Geophysical Union. 2006.
Editor in Chief, *Reviews of Geophysics,* Jan. 2005-2010.
Holder of the Harold J. Haynes Endowed Chair in Geosciences, July 2003-2008.
Listed among the Most Highly Cited Authors in Geosciences (top 0.5%) by Science Citation Index, 2002.
Member, Board of Trustees, National Institute for Global Environmental Change, 1999-2002, Chairman, 2001-2.

Member, Board of Trustees, Universities Space Research Association, 2001-2007
Chancellor's Distinguished Lecturer, Louisiana State University, April 1999
Speaker and Moderator, Houston Forum, Sept. 1998
Interim Editor, Journal of Atmospheric Sciences, 1995-1996
Associate Editor, Journal of Atmospheric & Oceanic Technology, 1993-1996
Selected Speaker, Texas A&M University Faculty Lecturer Series. 1993-94
Distinguished Achievement Award for Research, Association of Former Students, Texas A&M University. 1993
Elected Member (twice), Univ. Corp. of Atmos. Res. (UCAR), Board of Trustees. 1990-94
Member, Executive Committee, Board on Atmospheric Science and Climate. National Research Council. 1989-96
Editor's Citation for Outstanding Referee for JGR, American Geophysical Union. 1985
Member, Editorial Board, Climate Dynamics. 1984-
Exceptional Scientific Achievement Medal for NASA. 1983
Exceptional Performance Award (NASA/GSFC). 1982
Outstanding Performance Rating by NASA/GLAS. 1982
Outstanding Performance Rating by NASA/GLAS. 1981
Associate Editor, Journal Geophysical Research. 1979-84
Outstanding Publication Award, National Center for Atmospheric Research. 1975

PUBLICATIONS,

Journal Papers (last 5 years)

145 North, G. R., 2012: Apportioning natural and forced components in climate change. *Proc. Natl. Acad. Sci.,* **109,** 14285-14286.
144 Mahajan, S. G. R. North, R. Saravanan, M. G. Genton, 2012: Statistical significance of trends in monthly heavy precipitation over the US. *Clim. Dyn*., **38**, 1375-1387. DOI 10.1007/s00382-011-1091-4
143 North, G. R., J. Wang, and M. Genton, 2011: Correlation Models for Temperature Fields, *J. Clim*., **24,** 5850-5862.
142 Liu, Xioadong, Libin Yan, Ping Yang, Zhi-Yong Yin, and Gerald R. North, 2010: Influence of Indian Summer Monsoon on Aerosol loading in East Asia, *J. Appl. Meteorol. & Climatol.*, doi: 10.1175/2010JAMC2414.1
141 Banner, Jay L., Charles S. Jackson1, Zong-Liang Yang, Katharine Hayhoe, Connie Woodhouse, Lindsey Gulden, Kathy Jacobs, Gerald North, Ruby Leung, Warren Washington, Xiaoyan Jiang, and Richard Casteel, 2010: Climate Change Impacts on Texas Water: A White Paper Assessment of the Past, Present and Future and Recommendations for Action. TX Water Journ., 1, 1-19.
140 Li, Yue, Gerald R. North, Ping Yang, Bryan A. Baum, 2010: Exploration of the MODIS Cloud-Top Retrieval Products for the Investigation of Equatorial Wave Systems, *J. Appl. Meteorol. & Climatol*., 49, 2050-2057.
139 Monahan, A. H., J. C. Fyfe, M. H. P. Ambaum, D. P. Stephenson, G. R. North, 2009: Empirical Orthogonal Functions: The Medium is the Message, *J. Climate*, 22, 6501-6514.
138 Hong, Gang, Ping Yang, Patrick Minnis, Yong X. Hu, and Gerald North, 2008: Do contrails significantly reduce daily temperature range? 35, doi:10.1029/2008GL036108
137 Lee, C. K., S. S. P. Shen, B. Bailey, G. R. North, 2008: Factor analysis for El Nino signals in sea surface temperature and precipitation. *Theor. Appl. Climatol*., DOI 10.1007/s00704-008-0056-y.
136 Wu, Q., Karoly, D., G. R. North, 2008: Role of water vapor feedback on the amplitude of the seasonal cycle of the global average temperature. Geophys. Res. Lett., 35, doi:10.1029/2008GL033454, 2008.
135 Li, B, A. Murthi, K. Bowman, G. North, M. Genton, M. Sherman, 2009: Statistical tests of the Taylor hypothesis: an application to precipitation fields, *J. Hydrol.,* **10,** 254-265.

Books and Contributions to Books, Book Reviews

44 Schmandt, J., J. Clarkson, G. R. North, 2009: Impact of Global Warming on Texas; Revised 2nd Edition. University of Texas Press, in press.
43 North, G. R., and T. Erukhimova 2009: An Introduction to Atmospheric Thermodynamics, Cambridge University Press, 267p.
42 North, G. R. 2006: Book Review in Bulletin of the American Meteorological Society of the book: *Global Climate Modeling* by Washington and Parkinson.
41 North, G. R., 2005, Toward a More Complete Milankovitch Theory, Milankovitch Volume..
40 North, G. R., M. Stevens and Q. Wu, 2006: Energy Balance Climate Models. In *Frontiers in Climate Modeling*. Cambridge University Press. 2006.
39 **North, G. R., et al. Editors, 2006: Report of the NRC/NAS Committee on Surface Temperature Reconstructions for the Last 2000 Years, National Academies Press, 2006.**
38 North, G. R., 2002: GATE and TRMM. Chapter 18, Meteorological Monographs. Allen Press., p201-206.
37 North, G. R. and C. R. Mechoso, Mathematical Models of Climate, in Encyclopedia of Life Support Systems.

36 North, G. R. and Robert Duce, 2002: Climate and the Oceans, pages 85-108, in *Oceans 2020*, J. G. Field, G. Hempel, C. P. Summerhayes (Eds), Island Press, Washington, 366p.

35 North, G. R. 2001: Book Review of *Global Warming: The Hard Science* by Danny Harvey. (An extended essay) *Climatic Change,* 49, 493-497. (2500 wds).

34 North, G. R., and S. S. P. Shen, Global Circulation of the Atmosphere and the Oceans, , *Encyclopedia of Environmetrics*, John Wiley & Sons, Ltd. Article, (10,000 wds), galleys, etc., in October, 2000.

33 North, G. R., and S. S. P. Shen, 2002: *Global Warming*, *Encyclopedia of Environmetrics*, John Wiley & Sons, Ltd. Article, (3,000 wds).

32 North, G. R., *Time Series Analysis*, *Encyclopedia Atmospheric Sciences*. Academic Press, Article, (3,000 wds).

31 North, G. R., *Energy Balance*, *Encyclopedia of Global Environmental Change*, John Wiley & Sons, Ltd., (3000 wds), submitted in final form, December, 2000.

30 North, G. R., 2001: *GATE and TRMM*. A book chapter in the AMS Monograph: *Symposium on Cloud Systems, Hurricanes and TRMM: Celebration of Dr. Joanne Simpson's Career - The First 50 years.* (5,300 wds).

29 North, G. R., and M. J. Stevens, 2000: *Energy Balance Models*, a book chapter in *Frontiers in Climate Modeling*, Cambridge University Press. (approx. 4,000 wds).

28 North, G. R., 2001**:** *Introduction to Thermodynamics and Kinematics for Atmospheric Scientists*. 6th Edition now available at Notes 'n Quotes, 200p.

27 North, G.R., 1998 *The Atmospheric Sciences: Entering the Twenty-First Century*. 364 pages. National Research Council. 364p (one of several editors).

26 North, G.R., 1997: Glossary Editor, *Encyclopedia of Weather and Climate,* Oxford Univ. Press.

25 Norwine, J. R., J. R. Giardino, G. R. North and J. Valdes (Editors), 1995: *The Changing Climate of Texas: Predictability and Implications for the Future*. Author of two chapters. 348 pages. *Geo Books*, a Division of Cartographics, TAMU.

24 North, G. R., J. Schmandt and J. Clarkson, (Editors), 1994: *Impact of Global Warming on Texas.* Author of two chapters. 242 pages. Univ. of Texas Press, Austin, TX.

23 North, G. R., 1993: Introduction to simple climate models. *Mathematics, Climate and Environment.* Edited by J.-I. Diaz and J.-L. Lions. Masson Pub. Co. pp. 139-159.

22 Shen, S., G. R North and J. Hardin, 1993: Estimation of global average temperature. *Mathematics, Climate and Environment.* Edited by J.-I. Diaz and J.-L. Lions. Masson Pub. Co. pp. 307-315.

21 North, G. R., 1992: Characteristics of Tropical Precipitation Important for its Estimation by Satellites. *The Global Role of Tropical Rainfall.* Edited by J. S. Theon, T. Matsuno, T. Sakata and N. Fugono. Deepak Pub.

20 Crowley, T. C. and G. R. North, 1991: *Paleoclimatology*. Oxford Univ. Press. 340 pages. 1996: First Paperback Printing.

19 North, G. R., 1990: *Climate Fluctuations and climate Sensitivity. Solar Variability and Climate Change*. NASA Conference Publication.

18 ___ , 1990: *Measuring Moisture Variables from Satellites and Global change*. Tutorial Chapter in URSI Proceedings. Oxford Univ. Press. pp. 103-112.

17 ___ , 1989: Climate Modification. *McGraw-Hill Science Encyclopedia*.

16 ___ , 1989: Climate Modelling. *McGraw-Hill Science Encyclopedia*.

15 Chiu, Long, G. R. North and D. A. Short, 1988: Errors in Satellite Rainfall Estimation Due to Nonuniform Field of View of Space-Borne Microwave Sensors. (Ed. A. Deepak). Deepak Pub.

14 Nakamoto, S., J.-T. Wang, Da. A. Short and G. R. North, 1988: *Estimation of Lagged Space-Time Correlations in Rain Data*. (Ed. A. Deepak) Deepak Pub.

13 North, G. R., 1988: *Survey of Sampling Problems for TRMM*. Proceedings of Conference on Measurement of Tropical Rainfall. (Ed. A. Deepak), Deepak Pub.

12 ___ , 1988: "Lessons From Energy Balance Models," in *Physically-Based Modeling and Simulation of Climate and Climatic Change.* (Ed., M. Schlesinger) Part 2, NATO ASI Series, **243**. p. 627. Series C: Mathematical and Physical Sciences.

11 Schneider, S. H., D. Peteet and G. R. North, 1988: "A Climate Model Intercomparison for the Younger Dryas and its Implications for Paleoclimatic Data Collection." In *Abrupt Climatic Change* . (W. Berger, Ed.) D. Reidel, Dordrecht.

10 North, G. R., 1986: "Lessons From Energy Balance Models." In *Physically-Based Modelling and Simulation of Climate and Climatic Change* (M. Schlesinger, Ed.) D. Reidel, Dordrecht.

9 ___ , J. G. Mengel and D. A. Short, 1984: "A Two-Dimensional Climate Model Useful in Ice Age Applications." *In Milankovitch and Climate* (A. Berger et al., Eds.). D. Reidel, Dordrecht.

8 ___ , J. G. Mengel and D. A. Short, 1984: "On the Transient Response Patterns of Climate to Time Dependent Concentrations of Atmospheric CO_2." In *Climate Processes and Climate Sensitivity*, Geophys. Monograph 29, Maurice Ewing, **5**. pp. 164-170 (J. E. Hansen and T. Takahashi, Eds.) Am. Geophys. Union.

7 ___ , J. G. Mengel and D. A. Short, 1983: "Climatic Response to a Time Varying Solar Constant." In *Weather and Climate Responses to Solar Variations* (B. M. McCormas, Ed.) Colorado Associated University Press. pp. 243-255.

6 ___ , 1981: "Impact of Solar Constant Changes on the Earth's Climate." In *Variations of Solar Output* (S. Sofia, Ed.) *NASA C.P. 2*, 191.

5 ___ , 1980: "Approaches to the Study of Climate Sensitivity." In *Environmental and Climatic Impact of Coal Utilization* (J. J. Singh and A. Deepak, Eds.) pp. 417-431. Academic Press.

4 ___ and J. A. Coakley, 1979: "A Seasonal Climate Model for Earth." In *Evolution of Planetary Atmospheres and Climatology of the Earth*. pp. 249-259. Centre National D'Etudes Spatiales, Toulouse, France.

3___ , 1977: *Simple Mathematical Models of the Global Climate.* Brochure published by the Hydromet Service, Leningrad, USSR. 48 pp. (in Russian).

2 ___ , 1976: "Analytical Behavior of Simple Climate Models." Geosphysical Fluid Dynamics 1976 Summer Lecture Notes. Woods Hole Oceanographic Institution. Woods Hole, MA.

1 James, P. B. and G. R. North, 1972: *The Del Book*, UMSL Print Shop. 252 pp. Text Book distributed at University of Missouri-St. Louis, MO.

Research Reports

North, G. R., 1962: Containment Properties of the Toroidal Multipole. Technical Memo from The University of Wisconsin Plasma Physics Group.

___, 1957-1961: Numerous Technical Memo's from Oak Ridge National Laboratory.

___, 1960: "Some Properties of Infinite Lumped Solenoids," ORNL-2975, Aug. 10.

SIMON W. NORTH
Department of Chemistry, Texas A&M University.
P.O. Box 30012, College Station, TX 77842

Tel.: (979) 845-4947, Fax: (979) 845-2971
swnorth@tamu.edu, http://www.chem.tamu.edu/rgroup/north

DEGREES

Ph.D., 1995, Physical Chemistry, University of California, Berkeley, CA (Advisor Y. T. Lee)
B.S., 1990, Chemistry, University of New Hampshire, Durham, NH

PREVIOUS EXPERIENCE

Post-Doctoral Fellow, Brookhaven National Laboratory, 1995-1997

TEXAS A&M EXPERIENCE

Graduate Advisor, Department of Chemistry, 2009-
Professor, Texas A&M University, 2008-
Associate Professor, Texas A&M University, 2003-2008
Associate Director, Center for Atmospheric Chemistry and the Environment, Texas A&M University, 2007-
Co-Director, Aerothermochemistry Laboratory, Texas A&M University, 2006-
Physical Chemistry Laboratory Coordinator, 2006-2009
Assistant Professor, Texas A&M University, 1997-2003

HONORS & AWARDS

Distinguished Achievement University-Level Award in Teaching, The Association of Former Students (2009)
Distinguished Achievement College-Level Award in Teaching, The Association of Former Students (2004)
Mahan Award, Outstanding Graduate Student Instructor, U.C.B. (1996)
Bailey Prize, U.N.H. (1990)
American Chemist's Society Medal, U.N.H (1990)
Merck Award, U.N.H. (1989)
Marie-Langulair Scholarship, U.N.H. (1989)

PUBLICATIONS

TEXAS A&M UNIVERSITY PUBLICATIONS (LAST 5 YEARS)

48. K. S. Dooley, J. N. Geidosch, and S. W. North "Ion Imaging Study of IO radical Photodissociation: Accurate Bond Dissociation Energy determination" *Chem. Phys. Lett*. **457**, 303 (2008).

49. D. L. Osborn, P. Zou, H. Johnsen, C. C. Hayden, C. A. Taatjes, V. D. Knyazev, S. W. North, D. S. Peterka, M. Ahmed, and S. R. Leone "The Multiplexed Chemical Kinetic Photoionization Mass Spectrometer: A New Approach to Isomer-Resolved Chemical Kinetics" *Rev. Sci. Instrum.* **79**, 104103 (2008).

50. Y.Q. Huang, S. Peterman, S. E. Tichy, S. W. North, and D. H. Russell, "Unimolecular Dissociation Reactions of Methyl Benzoate Radical Cation" *J. Phys. Chem . A* **112**, 11590 (2008).

51. K. S. Dooley, M. P. Grubb, J. N. Geidosch, M. van Beek, G. C. Greonenboom, and S. W. North: "Correlated Fine Structure Branching Ratios Arising from State-Selected Predissociation of ClO ($^2\Pi_{3/2}$)" *Phys. Chem. Chem. Phys*. **11**, 4754 (2009).

52. A. Hsu, R. Srinivasan, R. D. W. Bowersox, and S. W. North: "Two-Component Molecular Tagging Velocimetry Utilizing NO Fluorescence Lifetime and NO_2 Photodissociation Techniques in an Underexpanded Jet" *Appl. Opt.,* **48**, 4414 (2009).

53. A. Hsu, R. Srinivasan, R. D. W. Bowersox, and S. W. North: "Molecular Tagging using Vibrationally Excited Nitric Oxide in an Underexpanded Jet" *AIAA Journal,***47**, 2597 (2009).

54. H. Kim, E. E. Greenwald, and S. W. North: Ion Imaging Studies of $ClONO_2$ Photodissociation: Primary Branching Ratios and Secondary Dissociation" *Chem. Phys*. **364**, 90 (2009).

55. B. Ghosh, A. Bugarin, B. T. Connell, and S. W. North: "OH Radical Initiated Oxidation of 1,3-Butadiene: Isomeric Selective Study of the Dominant Addition Channel" *J. Phys. Chem. A,* **114**, 5299 (2010).

56. R. D. W. Bowersox and S. W. North: "Algebraic Turbulent Energy Flux Models for Hypersonic Shear Flows", *Progress in Aerospace Sci*., **46**, 49 (2010).

57. B. Ghosh, A. Bugarin, B. T. Connell, and S. W. North: "Isomer-Selective Study of the OH-Initiated Oxidation of Isoprene in the Presence of O_2 and NO: II. The Major OH-Addition Channel" *J. Phys. Chem. A,* **114**, 2553 (2010).

58. E. E. Greenwald, B. Ghosh, K. C. Anderson, K. S. Dooly, P. Zou, T. Selby, D. L. Osborn, G. Meloni, C. A. Taatjes, F. Goulay, S. R. Leone, and S. W. North: "Isomer-Selective Study of the OH-Initiated Oxidation of Isoprene in the Presence of O_2 and NO: I. The Minor OH-Addition Channel" *J. Phys. Chem. A,* **114**, 904 (2010).

59. P. Zou, J. Shu, and S. W. North: "Three-body Dissociation of Cl_2O at 248 and 193 nm" *J. Photochem. Photobiology A*, **209**, 56 (2010).

60. B. Ghosh, J. Park, K. C. Anderson, and S. W. North: "OH-Initiated Oxidation of 1,3-Butadiene in the Presence of O_2 and NO" *Chem. Phys. Lett.,* **494**, 8 (2010).

61. M. P. Grubb, M. L. Warter, A. G. Suits, and S. W. North: "Evidence of Roaming Dynamics and Multiple Channels for Molecular Elimination in NO_3 Photolysis", *J. Phys. Chem. Lett*. **1**, 2455 (2010).

62. R. Sanchez-Gonzalez, R. Srinivasan, R. D. W. Bowersox, and S. W. North: "Simultaneous Velocity and Temperature Measurements in Gaseous Flow Fields using the VENOM Technique" *Optics Letters,* 36,196 (2011).

63. M. P. Grubb, M. L. Warter, **K. M. Johnson**, and S. W. North: "Ion Imaging Study of NO_3 Radical Photodissociation Dynamics: Characterization of Multiple Reaction Pathways", *J. Phys. Chem.* 115, 3218 (2011).

64. H. Kim and S. W. North: "Photodissociation Dynamics of Cl_2O at 235 nm using Velocity Map Ion Imaging", *J. Photochem. Photobiology A*. **221**, 123 (2011).

65. S. W. North: "Roaming in the Dark" Nature Chemistry, News and Views, 3, 504 (2011).

66. M. P. Grubb, M. L. Warter, **C. D. Freeman**, **N. A. West**, **K. M. Usakoski**, **K. M. Johnson**, J. A. Bartz, and S. W. North: "A Method for the Determination of Speed-Dependent Semi-Classical Vector Correlations from Sliced Image Anisotropy", *J. Chem. Phys.* **135**, 094201 (2011).

67. R. Sanchez-Gonzalez, D.Y. Kim, **A. J. Tindall**, J. Hofferth, R. Srinivasan, R. D. W. Bowersox, and S. W. North: "Repetitively Pulsed Hypersonic Flow Apparatus for Diagnostic Development" *AIAA Journal* **50**, 691 (2012).

68. M. P. Grubb, M. L. Warter, H. Xiao, S. Maeda, K. Morokuma, and S. W. North: "No Straight Path: Multistate Roaming as the Only Route for the $NO_3 \rightarrow NO + O_2$ Reaction" *Science*, **355**, 1075 (2012).

69. R. Sanchez-Gonzalez, R. D. W. Bowersox, and S. W. North: "Simultaneous Velocity and Temperature VENOM Measurements in Gaseous Flow Fields: A Comprehensive Study" *Applied Optics,* 36,196 (2012).

70. M. P. Grubb, M. L. Warter, and S. W. North: "Stereodynamics of Multistate Roaming" *Phys. Chem. Chem. Phys.* **14**, 6733-6740 (2012).

71. A. J. Traverso, R. Sanchez-Gonzalez, L. Yuan, K. Wang, D. V. Voronine, A. M. Zheltikova, Y. Rostovtsev, V. A. Sautenkov, A. V. Sokolov, S. W. North, and M. O. Scully: "Coherence brightened laser source for atmospheric remote sensing" *Proc. Nat. Acad. Sci*., **109**, 15185 (2012).

72. C. D. Freeman, M. P. Grubb, and S. W. North: "Vibrational State-Selected Photodissociation of the ClO^+" *Chem. Phys*. **408**,43 (2012).

EDUCATIONAL PUBLICATIONS

1. L. E. Ruebush and S. W. North "The Teaching of Consecutive First-Order Reaction Kinetics: A Chemical Education Research Study of the Impact of Hands On Demonstrations" *Chem. Educator* **13**, 131 (2008).

2. L. Ruebush, M. Sulikowski, and S. North "A Simple Exercise Reveals the Way Students Think About Scientific Modeling" *J. College Science Teaching*, 24 (2009).

3. L. Ruebush, E. Grossman, S. A. Miller, S. W. North, J. Schielack, and E. E. Simanek "Introducing Authentic Inquiry to High School Teachers with Curriculum-Relevant Principles during an Intensive Three Week Summer Session" *School Sci. and Math.*, **109**, 162 (2009).

4. **G. Lucchese**, R. R. Lucchese, and S. W. North "A New JAVA Program for Graphical Illustration of the Franck-Condon Principle: Application to the I_2 Spectroscopy Experiment in the Undergraduate Physical Chemistry Laboratory" *J. Chem. Ed*., **87**, 345 (2010).

PRESENTED PAPERS AND LECTURES (LAST 5 YEARS)

"Imaging Studies of the Photodissociation Dynamics of Halogen Oxides," Northwest and Rocky Mountain Regional ACS Meeting, Park City, UT, 2008.(Invited)

"Imaging Studies of the Photodissociation Dynamics of Halogen Oxides: Direct Measurement of XO Bond Dissociation Energies," 235th National ACS Meeting, New Orleans, LA, 2008.(Invited)

"Photolytic Launching of Selective Reactive Pathways: Isomeric Studies of Biogenic Hydrocarbon Oxidation," 235th National ACS Meeting, New Orleans, LA, 2008 (Invited)

"Assessing Physical Chemistry Laboratory Reforms Laboratory Development in the Texas A&M University Chemistry Department," 235th National ACS Meeting, New Orleans, LA, 2008

"Trends in the Photodissociation Dynamics of the Halogen Oxides," Atomic and Molecular Interactions Gordon Conference, Colby Sawyer College, New London, NH, 2008. (Invited)

"Understanding Hydrocarbon Oxidation Mechanisms through Isomeric Initiated Chemistry," TCEQ, Austin, TX, 2008.

"Chemistry and the Air We Breathe: A Molecular View of the Environment", Texas Junior Science and Humanities Symposium (2009).

"Refining Hydrocarbon Oxidation Mechanisms *via* Isomeric Specific Radical Initiated Chemistry", National Institute of Standards and Technology, Md. (2009).

"Photochemical Studies of Atmospheric Halogenated Species", 237^{th} National ACS Meeting, Salt Lake City, Utah (2009).

"NASA/AFOSR Hypersonic Center: Instrumentation for High-Enthalpy Transition Characterization", Texas A&M University (2009).

"Direct Imaging of Atmospheric Radical Photochemistry: from Energetics to State-to-state Dynamics" Tulane University, Department of Chemistry (2009).

"Refining Hydrocarbon Oxidation Mechanisms *via* Isomeric Specific Radical Initiated Chemistry" Texas A&M University, Department of Atmospheric Sciences (2009).

"Refining Atmospheric Oxidation Mechanisms *via* Photolytic Launching of Isomer Selective Chemistry" Gustavus Aldolphus, Minnesota (2009).

"Direct Imaging of Atmospheric Radical Photochemistry: from Energetics to Detailed Dynamics" University of Washington at St. Louis (2010).

"Direct Imaging of Atmospheric Radical Photochemistry: from Energetics to Detailed Dynamics" Texas Tech. University (2010).

"Measurements of Nighttime N_2O_5/NO_3 during the SHARP Campaign" CACE Symposium, Texas A&M University (2010).

"'A Chemists View on Isoprene Chemistry'" Guest Lecture, Atmos. 613, Texas A&M University (2010).

"Roaming in Atmospheric Chemistry: ROONO isomerization and NO_3 dissociation" Workshop, Argonne National Laboratory (2010).

"Direct Imaging Studies of Atmospheric Photochemistry: From Energetics to Roaming Dynamics" Brookhaven National Laboratory, NY (2011).

"Building an Undergraduate Physical Chemistry Laboratory Course for the 21st Century: A Case Study at Texas A&M University" Chemical Education Gordon Research Conference, Davidson College, VA (2011)

"Roaming in the Dark: Unraveling the Atmospheric Photochemistry of the Nitrate Radical" James Madison University (2011).

"Roaming in the Dark: Unraveling the Atmospheric Photochemistry of the Nitrate Radical" Washington and Lee University (2011).

"Roaming in the Dark: Unraveling the Atmospheric Photochemistry of the Nitrate Radical" Southwest Regional ACS Meeting Austin (2011) (Invited)

"Repetitively Pulsed Hypersonic Apparatus for Diagnostic Development" AIAA Conference, Tennessee (2012) (Invited)

"Refining Biogenic Hydrocarbon Oxidation Mechanisms via Isomeric Specific Radical Initiated Chemistry", National ACS Meeting, Philadelphia (2012) (Invited).

"Roaming in the Dark: Unraveling the Atmospheric Photochemistry of the Nitrate Radical" Texas A&M University, Department of Physics (2012).

"Roaming in the Dark: Unraveling the Atmospheric Photochemistry of the Nitrate Radical" Texas A&M University, Department of Chemistry (2012).

"Roaming in the Dark: Unraveling the Atmospheric Photochemistry of the Nitrate Radical" University of Maine (2012).

"Roaming in the Dark: Unraveling the Atmospheric Photochemistry of the Nitrate Radical" University of New Hampshire (2012).

UNDERGRADUATE RESEARCH STUDENTS

Summer Lax (Spring 1998)
Trieu Nguyen (Spring 1998-Fall 2000)
Tommy Balboa (NSF-REU, Summer 1998)
James Elam (NSF-REU, Summer 1998)
Angie Clinkenbeard (Fall 1998-Spring 1999)
Bridget Schmitz (NSF-REU, Summer 2000)
Marc Wilson (Fall 2000-Spring 2002)
Clark Church (Spring 2000-Spring 2001)
Javier Huertas (Summer 2002-)
Jennifer Putsche (Summer 2002-Fall 2003, NSF-REU, Summer 2003)
Joseph Stephens (NSF-REU, Summer 2002)
Tracey Niday (NSF-REU, Summer 2004)
Patrick Vinas (Fall 2004)
Gary 'Smitty' Grubbs (Fall 2004)
Jesse Rudy (Summer 2005)
Elizabeth Johnson (NSF-REU, Summer 2005)

Mike Ortiz (Fall 2005)
Jeremy Pope (Fall 2005)
Kelly DeCock (Spring 2006)
Nicole Johnson (NSF-REU, Summer 2006)
Christina Matz (Spring 2007)
Helen Hamilton (Summer 2007)
Trevor Makal (Summer 2007-Fall 2008)
Nadiezda Fernandez-Oropeza (REU Summer 2007)
Anna Molina (NSF-REU Student 2008)
Deirdre Manion-Fischer (NSF-REU Summer 2008)
Lesley Sevcik (NSF-REU Summer 2009)
Andrew Tindall (Fall 2009)
Jennifer Wallace (Spring 2009)
Ian Kissell (2009)
Jacob Dean (Fall 2008-Fall 2009)
Wilmarie Marrero Ortiz (NSF-REU Summer 2010)
Kurt Johnson (Summer 2010-Spring 2011)
Nic West (NSF-REU Summer 2011)
C. Daniel Freeman (Spring 2009-Spring 2012)
Stephanie White (Fall 2011-Spring 2013)

Undergraduates have been co-authors on 15 papers and 11 have presented at National ACS Meetings. Two have won awards (first prize and second prize) for presentations at the Baylor Undergraduate Symposium and Rice Undergraduate Research Conference.

GRADUATE RESEARCH STUDENTS

W. Sean McGivern, (Ph.D. 2002, National Institute of Standards and Technology, Staff Scientist)
Peng Zou (Ph.D. 2003, Postdoctoral Associate Sandia National Laboratory)
Jiho Park, (Ph.D. Fall 2004, Assistant Professor, Korean National Open University)
Hahkjoon Kim (Ph.D. Spring 2006, Assistant Professor, Duksung Women's University, Korea)
Erin Tullos (Greenwald) (Ph.D., Spring 2007, ConocoPhillips)
Laura Ruebush (M.S. 2006)
Kate Perkins (Anderson) (Ph.D., Spring 2009)
Andrea Hsu (Ph.D., Spring 2009, Aerospace Corporation)
Kristin Dooley (Ph.D., Spring 2009, Assistant Professor at the University of Central Arkansas)
Buddhadeb Ghosh (Ph.D., May 2010, Postdoctoral Associate, National Oceanographic and Atmospheric Administration, Conoco-Phillips)
Justine Geidosch (Ph.D., August 2011, Environmental Protection Agency, Ann Arbor)
Rodrigo Sanchez-Gonzalez (Ph.D., May 2012, Postdoctoral Associate, Oak Ridge National Laboratory)
Michael Grubb (Ph.D., May 2012, Postdoctoral Associate, Bristol England)
Michelle Warter (Anticipated completion of Ph.D., Spring 2014)
Wade Eveland (Anticipated completion of Ph.D., Spring 2016)
Wei Wei (Anticipated completion of Ph.D., Spring 2016)
Wilmarie Marrero Ortiz (Anticipated completion of Ph.D., Spring 2017)
Niclas West (Anticipated completion of Ph.D., Spring 2017)

POSTDOCTORAL FELLOWS

Dr. Runjun Li (Research Associate, Department of Atmospheric Sciences, Texas A&M University)
Dr. Qingnan Liu (2009-2011) (Postdoctoral Associate at National Institute of Standards and Technology)
Dr. Rodrigo Sanchez-Gonzalez (2013-)

INTERNATIONAL OR NATIONAL SERVICE

Ad Hoc Reviewer Granting Agencies
ACS, Petroleum Research Fund
Research Corporation
National Science Foundation
Department of Energy

Journal Reviewer
Chemical Physics Letters
Chemical Physics
Journal of Physical Chemistry
Journal of Chemical Physics
Journal of the American Chemical Society
Journal of Organic Chemistry
Physical Chemistry Chemical Physics
Science
Nature
and others

Session Chair
"Imaging in Chemical Dynamics", 218th ACS National Meeting, New Orleans, August 1999
"Kinetics and Mechanism of Hydrocarbon Reactions", AGU National Meeting, December 2000
"Frontiers in Chemical Dynamics", 223rd ACS National Meeting, Orlando, April 2002

Symposium Organizer
"Molecular Structure and Dynamics", ACS Southwest Regional Meeting, Baton Rouge LA 1998
"Modern Trends in Atmospheric Chemistry", ACS Southwest Regional Meeting, Houston, 2006
"Chemical Dynamics in the Gas and Condensed Phase", 238th National ACS Meeting, Washington D.C.

Member of the Project Research Team at the Advanced Light Source (Berkeley CA)

STATE OR UNIVERSITY SERVICE

Graduate Council Representative Dissertation Committee Member
Wang, Tao-Ming (Department of Horticulture)
Sines, Marylyn (Department of Education)

University Committee Service
Member of the Radiation Safety Committee 1999-2001
Faculty Advisor- HHMI Undergraduate Intern Program
Quality Enhancement Program Committee 2003-2004
Member of the Center for Atmospheric Chemistry and the Environment, 2003-
Member College Grievance Committee (chair), 2007-2010
Member, College Graduate Instruction Committee, 2009-
Member, Center for Teaching Excellence, 2010-
University Ethics Inquiry Committee (2012)

DEPARTMENTAL SERVICE

Dissertation Committee Member
Bluhm, Brian
Hettick, Justin
Stone, Earl
Marini, Joseph

Verbeck, Guido
Meier, Douglas
Sawyer, Holly
Autrey, Daniel
Ruotolo, Brandon
Locklear, Jay
Lei, Wenfeng (Atmos.)
Peterman, Scott
Cisneros, Lisbeth (Chem. Eng.)
Kumar, Dheeraj
Cheol Woo-Yi
Levitt, Nicholas (Atmos.)
Semper, Michael (Aero.)
Blase, Ryan
Fuller, Timothy (Aero.)
Garcia, Jason
Hsia, Chih-Hao
Li, Guohui
Mcelmurry, Blake
Kelly, Kelmara
Zhao, Jun
Xuebing Fu
Carlos Antonietti (Atmos.)
Fan, Jiwen (Atmos.)
Brandon Pruski (Aero.)
Benjamin English (Aero.)
Craig Freeman (Nucl. Eng.)
David Taylor (Aero.)
Timothy Guenthner (Aero.)
Alexander Craig (Aero.)
Adam Parkinson (Nucl. Eng.)
Rachel Vannelli (Aero.)
Scott Peltier (Aero.)
Junho Jeon
Kevin Kmiec
Stultz, Jeffrey
Zhang, Dan (Atmos.)
Barbacci, Damon
Min, Byoung Koun
Ozensoy, Emrah
Luo, Kai
Chandra, Richa
Wei, Tao
Villagran, Dino
Sahoo, Dipankar (Aero.)
Brandon Hudder
Axisa, Duncan
Vastine, Benjamin
Chen, Tai-Yen
Tichenor, Nathan (Aero.)
Wark, Stacey
Wu, Zhaoxiang
Suman, Sawan (Aero.)
Sun, Wenjian
May, Jody
Shao, Qiang
Ollie James
Les Sheffield (Physics)
Nicole Wagner
Ivica Milovanovic
Kyle Fort
Alexander Bayeh (Aero.)
Cassondra Bulaclac
Melanie Perera
Laura Marulanda
Daniel Cruz (Physics)
Nicole Mendoza (Aero.)
Miguel Cruz-Quinones (Atmos.)
Brandon Rotavera (Mech. Eng.)
Ravi Srinivasan (Aero.)

Departmental Committee Member

Department Graduate Recruiting Committee
Faculty Representative to the Departmental Working Group, 1999-2002
Chair Faculty Search Committee, Physical Division 2006
Department Webpage Committee 1999
Physical Chemistry Graduate Student Recruiting Committee, Chair
ACS Regional Section, Chair 2004
Departmental Self-Study Committee 2004-2005
Undergraduate Curriculum Committee 2002-2008 (chair 2006-2008)
Departmental Executive Committee 2005-2008
Department Head Search Committee 2005-2006
Graduate Admissions and Review Committee, 2002-2007, 2009-
Faculty Advisor, Phi Lambda Upsilon, 2006-2011
Member, Academic Operations Committee, 2009-
Departmental Shops Committee, Chair 2008-
Graduate Curriculum Committee, Chair 2009-
Promotion and Tenure Committee, 2008-2011

Physical Chemistry Laboratory Coordinator, 2006-2009
Departmental Executive Committee 2012-
Departmental Self-Study Committee 2012-2013
Faculty Representative to the Departmental Working Group, 2009-

ERIC L. PETERSEN
DEPARTMENT OF MECHANICAL ENGINEERING, TEXAS A&M UNIVERSITY.
3123 TAMU, COLLEGE STATION, TX 77843-3123
Tel: (979) 845-1257; Fax: (979) 845-3081
email: epetersen@tamu.edu; website: http://www1.mengr.tamu.edu/GDPL/index.html

Research Interests

- Combustion chemistry and chemical kinetics
- Shock tubes and shock waves
- Jet and rocket propulsion
- Gas dynamics
- Lasers and spectroscopy

Education

1998 Ph.D., Mechanical Engineering, Stanford University. Advisor: Prof. Ronald K. Hanson. Thesis: "*A Shock Tube and Diagnostics for Chemistry Measurements at Elevated Pressures with Application to Methane Ignition*." (April, 1998)

1990 M.S., Mechanical Engineering, University of Florida. Advisor: Prof. Vernon P. Roan. Thesis: "*Experimental and Theoretical Investigation of Ejectors Employing Dissimilar Fluids*." (May, 1990)

1988 B.S., Mechanical Engineering, University of Central Florida, Magna Cum Laude. (August, 1988)

Professional Experience

Professor, Texas A&M University, Department of Mechanical Engineering, College Station, TX (Sept. 2012 – present)

Associate Professor, Texas A&M University, Department of Mechanical Engineering, College Station, TX (Jan. 2008 – Sept. 2012)

Associate Professor, University of Central Florida, Mechanical, Materials & Aerospace Engineering Department, Orlando, FL (May 2006 – Dec. 2007)

Assistant Professor, University of Central Florida, Mechanical, Materials & Aerospace Engineering Department, Orlando, FL (Aug. 2001 – April 2006)

Research Scientist, The Aerospace Corporation, El Segundo, CA (Sept. 1997 – July 2001)

- Performed a comprehensive review on shock tubes for heterogeneous flows
- Developed research program in combustion synthesis of materials and aerosols
- Conducted research on soot formation and advanced fuel additives

- Rebuilt The Aerospace Corporation's shock-tube and -tunnel program
- Carried out research on the active control of vortex-driven instabilities in SRMs
- Applied optical techniques for the study of reacting and non-reacting flow fields
- Conducted an experimental study of a hypersonic, chemical-laser flow
- Performed fluid and thermal analyses and experiments in support of the AF SMC
- Supervised several students from UC Irvine as part of a summer internship program

Lecturer, University of California, Irvine, Dept. of Mechanical and Aerospace Engineering
(Sept. 1998 – Dec. 2000)

- Taught undergraduate course in applied thermodynamics
- Taught experimental aerodynamics course

Research Assistant, Stanford University, Thermosciences Dept.**,** Stanford, CA
(July 1993 – Aug. 1997)

- Designed and installed high-pressure (1000-atm) shock-tube facility
- Performed experiments and analyses for combustion kinetics and ignition
- Aided ARL Ram Accelerator effort by studying practical CH_4 mixtures
- Developed and applied spectroscopic optical diagnostic techniques
- Investigated non-ideal flows and real-gas effects at high pressures
- Applied optical diagnostics to transient, reacting, high-pressure flows

Analytical Engineer, Pratt & Whitney, West Palm Beach, FL
(May 1990 – July 1993)

- Specialized in injector design, atomization and sprays, and combustion instability
- PI, Liquid Stability Mechanisms research program under AFRL (w/UTRC, UCI)
- Performed fluid/thermal analyses for rocket combustor design and development
- Conducted experiments on advanced gas turbine augmentors and rocket injectors

Research Assistant, University of Florida, Mechanical Engineering, Gainesville, FL
(Aug. 1988 – May 1990)

- Received United Technologies Propulsion Research Fellowship
- Conducted experimental study of supersonic gas/gas ejectors for propulsion
- Researched shear-layer mixing and developed an analytical computer model
- Developed a 2D Euler solver CFD code for turbomachinery cascade analysis

Engineer Associate, Martin Marietta, Electronics Systems Division, Orlando, FL
(Dec. 1986 – Aug. 1988)

- Worked part time while attending school full time
- Designed low-level mechanical components for ADATS electro-optics system

Teaching and Related Activities

Texas A&M University

Courses Taught:

Course		Semesters	G/UG
MEEN 633	Combustion Science and Eng.	(Spr09, Spr10, F11)	(G)
MEEN 344	Fluid Mechanics	(F08, Spr11, Spr12. Spr13)	(UG)
MEEN 404	Engineering Laboratory	(Spr08, F10, F12)	(UG)
MEEN 472	Gas Dynamics	(F09, F10, F11, F12)	(UG)

University of Central Florida

Courses Taught:

Course		Semesters	G/UG
EML 6712	Mechanics of Viscous Flow	(F01)	(G)
EML 4411	Mechanical Power Systems	(Spr02)	(UG)
EGN 3343	Thermodynamics	(Spr02, F07)	(UG)
EML 3701	Fluid Mechanics I	(Su02)	(UG)
EML 6154	Conduction Heat Transfer	(Su02)	(G)
EML 3303	Mechanical Engineering Meas.	(F02,Su03,F03,Su04,F04,Su05,F05)	(UG)
EAS 5315	Rocket Propulsion	(F02, F03, F04, F06)	(G)
EAS 3101	Fundamentals of Aerodynamics	(Spr03)	(UG)
EML 4304	Thermal-Fluids Measurements	(Spr03, Spr04, Spr05)	(UG)
EAS 3800	Aerospace Engineering Meas.	(Su03, F03, Su04, F04,Su05,F05)	(UG)
EAS 3810	Design of Aerospace Experiments	(Spr04, Spr05, Spr06, Spr07)	(UG)
EAS 4300	Aerothermodynamics of Propulsion	(Spr04, Spr05, Spr06)	(UG)
EAS 6807	Aerospace Meas./Instrumentation	(F05)	(G)
EAS 4134	High-Speed Aerodynamics	(F06)	(UG)
EAS 3010	Fundamentals of Aerospace Flight	(F07)	(UG)

University of California, Irvine

Courses Taught:

Course		Quarters	G/UG
MAE 108	Aerospace Laboratory	(F99, F00)	(UG)
MAE 115	Thermodynamics of Mechanical Systems	(F98)	(UG)

Student and Researcher Supervision

Postdoctoral Researchers – Current

1) Dr. Olivier Mathieu (Ph.D., Chemistry, Orleans, France) (Mar. 11 – present)

Graduate Students - Current

1) Christopher Aul (PhD): (Jan. 07 – present)
Topic: *Laser Absorption Diagnostics for Shock Tubes*

2) Carmen Helena Osorio (PhD): (Aug. 09 – present)
Co-Advisor with: Dr. Sam Mannan, Chemical Engineering
Topic: *Chemical Kinetics of Fire Suppressants*
3) Sankar Ravi (PhD): (Nov. 10 – present)
Topic: *Turbulent Flame Speed Measurements*
4) Andrew Demko (Ph.D.): (May 11 – present)
Topic: *Solid Rocket Propellant Burning Rates with Advanced Additives*
5) Tyler Allen (MS): (May 11 – present)
Topic: *Solid Propellant Chemistry and Burning with Additives*
6) Brandon Marks (MS): (July 11 – present)
Topic: *Shock Tube Ignition Chemistry at Elevated Pressures*
7) Drew Plichta (MS): (Sept. 11 – present)
Topic: *Flame Speed Experiments*
8) Lori Sandberg (MS): (Sept. 11 – present)
Topic: *Aerosol Shock Tube*
9) Camilo Martinez (PhD – Co-Advisor with M. S. Mannan): (Mar. 11 – present)
Topic: *Detonation Transition Physics*
10) Alejandro Camou (MS): (Jan. 12 – present)
Topic: *Laser Absorption Spectroscopy in Reacting Systems*
11) Austin Bond (PhD – Co-Advisor with M. Holtzapple): (Jan. 12 – present)
Topic: *Shock-Induced Processing of Biofuels*
12) Kenneth McCown (MS): (May 12 – present)
Topic: *Liquid Monopropellant Chemistry*
13) Jose Emiliano Vivanco (MS): (Sept. 12 – present)
Topic: *Shock-Tube Experiments*
14) Anibal Morones (PhD): (Sept. 12 – present)
Topic: *Laminar and Turbulent Flame Speed Experiments*
15) Amira Chowdhury (Ph.D. – Co-Advisor with M. S. Mannan): (Sept. 12 – present)
Topic: *Dusty Gas Shock Tube Studies*
16) Travis Sikes (Jan. 13 – present)
Topic: *Aerosol Flame Speed Experiment*

<u>Undergraduate Students – Current</u>

1) Clayton Mulvihill (Feb. 11 – present)
Topic: *Shock Tube Gas Dynamics*
2) James Thomas (Jan. 12 – present)
Topic: *Solid Rocket Propellants and Hybrid Rockets*
3) Thuy Tran (Jan. 13 – present)
Topic: *Shock-Tube Chemical Kinetics*

<u>Visiting Scholars – Current</u>

1) Sebastien Thion, Graduate student from Univ. of Orleans, France (March 2013 - present)
Topic: *Chemical Kinetics of Hydrocarbon Mixtures*
2) Irmis Osorio, Undergraduate Student from Columbia (Dec. 2012 – present)
Topic: *Shock-Tube Experiments of Propene Ignition Delay Times*
3) Thomas Sammet, RET Teacher Participant (Summers and year round part time)

Topic: *High Burn Rate Solid Rocket Propellants*

Graduate Students - Completed

33) Madeleine Kopp (MS): (Jan. 11 – Dec. 12)
Topic: *Rate Determination of the CO_2* Chemiluminescence Reaction $CO+O+M \rightarrow CO_2^*+M$*
32) Marissa Brower (MS): (Aug. 12)
Topic: *Ignition Delay Times of Natural Gas/Hydrogen Blends at Elevated Pressures*
31) Andrew Vissotski (MS): (Aug. 12)
Topic: *Development of an Experimental Facility for Flame Speed Measurements in Powdered Aerosols*
30) Brandon Rotavera (PhD) (May 12; Interdisciplinary Engineering major)
Topic: *Oxidation Kinetics of Pure and Blended Methyl Octanoate/n-Nonane/Methylcyclohexane: Measurements and Modeling of OH*/CH* Chemiluminescence, Ignition Delay Times and Laminar Flame Speeds*
29) William Warren (MS): (May 12)
Topic: *Experimental Techniques for the Study of Liquid Monopropellant Combus*tion
28) Michael Krejci (MS): (May 12)
Topic: *Development of a New Flame Speed Vessel to Measure the Effect of Steam Dilution on Laminar Flame Speeds of Syngas Fuel Blends at Elevated Pressures and Temperatures*
27) Corey Frazier (PhD): (Dec. 11)
Topic: *Modeling of Composite Solid Propellant Experiments Containing Nanoadditives*
26) John Pemelton (MS): (Aug. 2011)
Topic: *Shock-Tube Study of Methane Ignition with NO_2 and N_2O*
25) Nolan Polley (MS): (Dec. 2010)
Topic: *Detonation Diffraction into a Confined Volume*
24) Kevin Kreitz (MS): (Dec. 2010)
Topic: *Catalytic Nanoparticle Additives in the Combustion of AP/HTPB Composite Solid Propellant*
23) William Lowry (MS): (Dec. 2010)
Topic: *Effect of Blending on High-Pressure Laminar Flame Speed Measurements, Markstein Lengths, and Flame Stability of Hydrocarbons*
22) Mouna Lamnaouer (PhD, UCF) (May 10)
Co-Advisor: Alain Kassab (UCF)
Topic: *Numerical Modeling of the Shock Tube Flow Fields Before and During Ignition Delay Time Experiments at Practical Conditions*
21) Nicole Donato (MS) (Dec. 2009)
Topic: *OH* Chemiluminescence: Pressure Dependence of $O + H + M = OH^* + M$*
20) Alexander Barrett (MS) (Dec. 2009)
Topic: *Measurement of Water Vapor Concentration Using Tunable Diode Laser Absorption Spectroscopy*
19) Brandon Rotavera (MS) (Dec. 2009)
Topic: *Chemiluminescence and Ignition Delay Time Measurements of C_9H_{20} Oxidation in O_2-Ar Behind Reflected Shock Waves*
18) Christopher J. Aul (MS) (Dec. 2009)

Topic: *An Experimental Study into the Ignition of Methane and Ethane Blends in a Shock-Tube Facility*

17) Jaap de Vries (PhD): (May 2009)
Topic: *A Study on Spherical Expanding Flame Speeds of Methane, Ethane, and Methane/Ethane Mixtures at Elevated Pressures*

16) Matthew Stephens (MS) (May 2009)
Topic: *Tailoring the Plateau Burning Rates of Composite Propellants by the Use of Nanoscale Additives*.

15) Troy Flaherty (MS—ME, UCF): (May 2009)
Topic: *Characterization of a Hydrogen-Based Synthetic Fuel in a Shock Tube*

14) Christopher Zinner (MS—ME, UCF): (May 2008)
Topic: *Methane and Dimethyl Ether Oxidation at Elevated Temperatures and Pressure*

13) Danielle Kalitan (Ph.D. – ME, UCF) (Dec. 2007)
Topic: *A Study of Syngas Oxidation at High Pressures and Low Temperatures*

12) Brian Walker (MS – AE, UCF) (Dec. 2007)
Topic: *Shock-Tube Investigation of Ignition Delay Times of Blends of Methane and Ethane with Oxygen*

11) Rodolphe Carro (MS – ME, UCF) (Dec. 2007)
Topic: *High Pressure Testing of Composite Solid Rocket Propellant Mixtures: Burner Facility Characterization*

10) Corey Frazier (MS – AE, UCF) (May 2007) (Co-Advisor with Alain Kassab)
Topic: *Wall Heat Transfer Effects in the Endwall Region behind a Reflected Shock Wave at Long Test Times*

9) Peter Himmerich (MS – AE, UCF) (May 2007)
Topic: *Supersonic Crossflow Visualization at the UCF Supersonic Wind Tunnel*

8) Anthony Amadio (MS—ME, UCF): (July 2006)
Topic: *Driver-Gas Tailoring for Test-Time Extension using Unconventional Driver Mixtures*

7) Jason Arvanetes (MS—ME, UCF): (May 2006)
Topic: *Design and Implementation of an Emission Spectroscopy Diagnostic in a High-Pressure Strand Burner for the Study of Solid Propellant Combustion*

6) Kyle Platt (MS—AE, UCF): (May 2006) (Co-Advisor with J. Brandenburg)
Topic: *Design and Fabrication of a Full-Featured Labscale Hybrid Rocket Engine*

5) Joel Hall (MS—ME, UCF): (Dec. 2005)
Topic: *Optimization of a Kinetics Model for OH Chemiluminescence*

4) Jaap deVries (MS—AE, UCF): (Dec. 2005)
Topic: *Autoignition of Fuel Blends for Power Generation Gas Turbines*

3) Jami Ward (MS—AE, UCF): (July 05) (Co-Advisor with A. Leonessa)
Topic: *Active Control of a Cold-Flow Solid Rocket Motor*

2) Zaher El-Zahab (MS—ME, UCF): (Dec. 2003)
Topic: *An Experimental Study of Spray Ignition behind Reflected Shock Waves*

1) Sandeep Bhosale (MS—ME, UCF): (May 2003)
Topic: *Design and Operation of a Shock Tube for Combustion and Imaging Applications*

Funded Research (TAMU Only)

Funded Proposals

Total TAMU/TEES credit for funded proposals to date, internal and external: **$5,143,695**
Total worth of contracts as PI at TAMU: **$4,228,671**
Total worth of all contract involvement as PI or Co-PI at TAMU: **$6,508,671**

25) Agency: National Science Foundation
Principal Investigator (Co-PI: D. Ranjan)
Funding: $5,000 ($10,000 total)
Topic: RET Supplement: Texas Center for Undergraduate Research in Energy and Propulsion
Dates: May 1, 2013 – April 30, 2014

24) Agency: Missile Defense Agency
Principal Investigator
Funding Requested: $410,000
Topic: Ignition of Composite Propellants with Advanced Additives
Dates: Apri1 1, 2013 – March 31, 2015

23) Agency: National Science Foundation
Principal Investigator (D. Ranjan, Co-PI)
Funding: $201,961 ($403,921 total)
Topic: REU Site: Texas Center for Undergraduate Research in Energy and Propulsion
Dates: April 1, 2013 – March 31, 2016

22) Agency: Alstom Power
Principal Investigator
Funding Requested: $38,500
Topic: High-Temperature, High-Pressure Laminar Flame Speeds
Dates: Jan. 14, 2013 – Sept. 30, 2013

21) Agency: Parametric Solutions, Inc.
Principal Investigator
Funding: $149,907
Topic: Diagnostic Support for CO_2-CH_4 Combustor
Dates: Sept. 1, 2012 – May 31, 2013

20) Agency: National Science Foundation
Principal Investigator
Funding: $10,000
Topic: RET Supplement: Texas Center for Undergraduate Research in Energy and Combustion
Dates: Mar. 1, 2012 – February 28, 2013

19) Agency: Rolls-Royce Canada
Principal Investigator
Funding: $268,562
Topic: Hydrocarbon Fuel Ignition and Flame Speed Measurements at Gas Turbine Conditions

Dates: Oct. 1, 2011 – December 31, 2012

18) Agency: Alstom Power
Principal Investigator
Funding: $113,740
Topic: Kinetics of High-Hydrogen, CH_4-Based Fuels
Dates: Oct. 1, 2011 – September 30, 2012

17) Agency: Missile Defense Agency
Principal Investigator
Funding: $800,000
Topic: Solid Propellant Additives for DACS Applications
Dates: March 15, 2011 – March 14, 2014

16) Agency: National Science Foundation
Principal Investigator
Funding: $10,000
Topic: RET Supplement: Texas Center for Undergraduate Research in Energy and Combustion
Dates: Oct. 1, 2010 – Sept. 30, 2011

15) Agency: Department of Energy
Principal Investigator
Funding: $501,712 (+ $60,000 external match)
Topic: Turbulent Flame Speeds and NOx Kinetics of HHC Fuels with Contaminants and High Dilution Levels
Dates: October 1, 2010 – September 30, 2013

14) Agency: Air Force Research Laboratory (via Gray Research)
Principal Investigator
Funding: $71,200
Topic: Ignition Kinetics of Ionic-Liquid-Based Monopropellants
Dates: Oct. 1, 2010 – July 29, 2011

13) Agency: Alstom Switzerland
Principal Investigator
Funding: $24,699
Topic: Chemiluminescence of CO_2* and OH* at Elevated Pressure
Dates: June, 2010 – May 2011

12) Agency: National Science Foundation
Principal Investigator
Funding: $5,950
Topic: REU Supplement for Career Award
Dates: July, 2010 – January, 2011

11) Agency: National Science Foundation
Principal Investigator
Funding: $300,000
Topic: REU Site: Texas Center for Undergraduate Research in Energy and Combustion
Dates: July, 2010 – June 2013

10) Agency: Rolls-Royce Canada
Principal Investigator
Funding: $272,213
Topic: Flame Speed, Ignition, and NOx Kinetics Measurements for High Water Content Mixtures and Biodiesel Fuels
Dates: October, 2009 – December 31, 2010

9) Agency: National Science Foundation
Principal Investigator
Funding: $37,144
Topic: Graduate Research Supplement: Shock-Tube Studies of Ignition and Oxidation at Practical Conditions
Dates: September 2009 – January 2011

8) Agency: National Science Foundation
Co-Principal Investigator (PI: Renyi Zhang, Atmospheric Sciences)
Funding: $146,984 ($330,000 total)
Topic: Generation, Characterization, and Atmospheric Aging of Soot Particles from Diesel Combustion
Dates: September 2009 – August 2012

7) Agency: DARPA (via Army AMRDEC)
Co-Principal Investigator (PI: Terry Creasy, ME)
Funding: $975,000 ($1,950,000 total)
Topic: Nastic Materials Program – Phase 3
Dates: May 2009 – April 2010

6) Agency: Alstom Ltd.
Principal Investigator
Funding: $31,400
Topic: Experiments and Kinetics Modeling of Chemiluminescence at Gas Turbine Relevant Conditions
Dates: May 2009 – December 2009

5) Agency: Rolls-Royce Canada
Principal Investigator
Funding: $234,506
Topic: Shock Tube and Flame-Speed Measurements at Engine-Relevant Conditions
Dates: May 2008 – December 2009

4) Agency: National Science Foundation
Principal Investigator
Funding: $219,472 (Transfer from UCF in 3rd year)
Topic: CAREER: Shock-Tube Studies of Ignition and Oxidation at Practical Conditions
Date: January 2008 – January 2011

3) Agency: General Electric
Principal Investigator
Funding: $73,016
Topic: Natural Gas Sample Autoignition Testing
Date: May 2008 – March 2009

2) Agency: University of Central Florida (Missile Defense Agency, parent)
Principal Investigator
Funding: $237,250
Topic: High Impulse Rocket Propellants Using Nanoparticle Additives
Date: January 2008 – March 2010

1) Agency: University of Central Florida
Principal Investigator
Funding: $5,479
Topic: Analysis of High Pressure Methane/Hydrocarbon/Air Ignition Experiments
Date: January 2008 – May 2008

Patents

U.S. 7,419,516 B1 (9/2/2008) "Use of Oxide Nanoparticles in Soot Reduction," Seal, Petersen, Deshpande, Patil, Kuiry

U.S. 7,931,763 B2 (4/26/2011) "Burn Rate Sensitization of Solid Propellants Using a Nano-Titania Additive," Seal, Petersen, Small, Stephens, Arvanetes, Deshpande

U.S. 7,959,690 B1 (6/14/2011) "Nanoparticles for Soot Reduction," Seal, Petersen, Deshpande, Patil, Chandrakuiry

U.S. 8,114,229 B1 (2/14/2012) "Self-Extinguishable Solid Propellant," Petersen, Seal, Stephens, Reid, Carro, Sammet, LePage

U.S. 8,336,287 (12/25/2012) "Solid Propellant Rocket Motor Having Self-Extinguishing Propellant Grain and Systems Therefrom," Petersen, Seal, Stephens, Reid, Carro, Sammet, LePage

U.S. Patent Application 61/040,044 (filed: 3/27/2008) "Extinguishable Propellant Composites for Applications Including Divert and Attitude Control System (DACS) Propulsion," Petersen, Seal, Stephens, Reid, Carro, Sammet, LePage

U.S. Patent Application 61/040,056 (filed: 3/27/2008) "Extinguishable Solid Rocket Propellant Rocket Motor," Petersen, Seal, Stephens, Reid, Carro, Sammet, LePage

Provisional U.S. Patent Application 61/609,463 (filed 3/12/2012) "Polymer Composite Having Dispersed Aluminum Particles"

Provisional U.S. Patent Application 61/609,461 (filed 3/12/2012) "Polymer Composite Having Dispersed Transition Metal Oxide Particles"

U.S. Patent Application 13/797,044 (filed 3/8/2013) "Compositions Having Aluminum Particles Dispersed in a Continuous Phase," Reid, Draper, Seal, Petersen

U.S. Patent Application 13/797,448 (filed 3/8/2013) "Polymer Composite Having Dispersed Transition Metal Oxide Particles," Reid, Draper, Seal, Petersen

Committees, Service, and Awards

Committee Membership and Service– Texas A&M University

- Tenure and Promotion Committee (2013 – present)
- National Security Task Force committee (College) (2013 – present)
- Faculty Search Committees (2010-11; 2011-12; 2012-13)
- Chair, Graduate Program Review Committee (2012-2013)
- Graduate Committee (F09 – present)
- PI of REU Site: Texas Center for Undergraduate Research in Energy and Combustion (2010 – present)
- Pi Tau Sigma Faculty Advisor (2008-2012)
- Diversity Fellowship reviewer (Spr11)

Professional Service Activities

- Editorial Board Member, *Combustion and Flame* (2013 – present)
- Colloquium Co-Chair, ICDERS 2013 – 24th International Colloquium on the Dynamics of Explosives and Reactive Systems, July 28 – Aug. 2, 2013, Taipei, Taiwan
- External Thesis Examiner, *McGill University*, Montreal, Canada, Mechanical Engineering Department – Jimmy Vereault, Ph.D. Candidate (Mar. 2011)
- Session Co-Chair, 49th AIAA Aerospace Sciences Meeting and Exhibit, Orlando, FL (Jan. 2011)
- Session Chair, 33rd International Symposium on Combustion, Beijing, China (Aug. 2010)
- External Thesis Examiner, *National University of Ireland Galway*, Ireland, Department of Chemistry – Darren Healy, Ph.D. Candidate (Oct. 2009)
- Faculty Advisor, TAMU Pi Tau Sigma (Aug. 2008 – present)
- Board Member and Secretary, *Institute for Dynamics of Explosions and Reactive Systems* (Aug. 2009 – present)
- Session Chair, 2009 ASME Turbo Expo, Orlando, FL (June 2009)
- NSF Review Panels, CBET Division

- Invited Session Chair, NSF Hydrogen Combustion Workshop (April 2006)
- Co-Organizer, Fall 2005 Meeting of the Eastern States Section of the Combustion Institute, UCF, Orlando, FL (Nov. 2005)
- Session Chair, Fall 2005 Meeting of the Eastern States Section of the Combustion Institute, Orlando, FL (Nov. 2005)
- Session Chair, 20th International Colloquium on the Dynamics of Explosions and Reactive Systems, Montreal, Canada (Aug. 2005)
- NSF Review Panel, CST Division (April 2005)
- Session Chair, 4th Joint Meeting of the U.S. Sections of the Combustion Institute, Philadelphia, PA (Mar. 2005)
- Faculty Advisor, UCF AIAA (Fall 2002-Dec. 2008)
- Faculty Advisor, UCF *Sigma Gamma Tau* Honor Society (May 2004-Dec. 2008)
- Judge, Florida Science Olympiad, Cypress Creek HS, Orlando, FL (Mar. 2005)
- Advisor, SAE Heavy Lift Airplane Team (2003, 2004, 2005)
- Advisor, AIAA DBF/Electric Airplane Team (2003, 2004, 2005)
- Open House Mock Lecture, "Rocket Science at UCF," (April 2004)
- Board member, local ASME chapter (Florida section, Region XI) (2002-2003)
- Career Day, Winter Park High School, presenter (Fall 2003, Fall 2002)
- Represented Florida section of ASME at Regional Administrative Conference (April 2002, Jackson, MS)
- Judge for SAE AeroEast Heavy Lift Airplane design competition, Cocoa/Deland, FL (2002, 2004, 2005)

Honors and Awards

2011 *TEES Fellow Award*
2011 *Teaching Excellence Award* for Fall 2010
2010 *ASME Fellow*
2010 *Faculty Fellow, Mary Kay O'Connor Process Safety Center*
2010 *Leland T. Jordan Career Development Professorship*
2010 *Teaching Excellence Award* for Fall 2009
2009 *Best Paper Award*, 2008 ASME Turbo Expo, Combustion & Fuels Subcommittee
2009 *Outstanding Laboratory Safety Inspection of the Month*, Texas A&M, May 2009
2007 *Research Incentive Award*, UCF
2007 *Best Paper*, AIAA Annual Southeastern Regional Conference, UG Category
2006 *Outstanding Researcher Award*, Assistant Professor, CECS, UCF
2006 *Teaching Incentive Program Award*, UCF
2006 *Pi Tau Sigma Professor of the Year*, UCF
2006 *NSF CAREER Award*
2005 *Pi Tau Sigma Professor of the Year*, UCF
2005 *Best Paper*, AIAA Annual Southeastern Regional Conference, Graduate Category
2005 *Best Paper*, AIAA National Student Conference, Undergraduate Category
2004 *Pi Tau Sigma Advisor of the Year,* UCF
2004 *Best Paper*, AIAA Annual Southeastern Regional Conference, UG Category
2003 *CECS Professor of the Year* (for MMAE), UCF
2003 *Pi Tau Sigma Professor of the Year,* UCF

2000, 1998	*Performance Award* (2); outstanding efforts, The Aerospace Corporation.
1995	*Chuck Hawley Seminar Award*; best seminar, '94-'95 school year, Stanford.
1993, 1991	*Incentive Award* (2); outstanding accomplishments, Pratt & Whitney.
1991	*NASA Group Achievement Award*; NLS Subscale Injector test team.
1991	*Special Award*; Pratt & Whitney, NLS injector design and analysis.
1988 - 1990	*Florida Graduate Scholars Fund Fellowship*, University of Florida.
1988 - 1990	United Technologies *Propulsion Research Fellowship*, University of Florida.
1986 - 1988	INPO Scholarship, U. of Central Florida.
Other	Member of *Tau Beta Pi*, *Pi Tau Sigma*, and *Sigma Gamma Tau* engineering honor societies.

Journal Publications (last 5 years)

1) C. J. Aul, W. K. Metcalfe, S. M. Burke, H. J. Curran, and E. L. Petersen, "Ignition and Kinetic Modeling of Methane and Ethane Fuel Blends with Oxygen: a Design of Experiments Approach," *Combustion and Flame*, Vol. 160, 2013, pp. 1153-1167.

2) C. H. Osorio, A. J. Vissotski, E. L. Petersen, and M. S. Mannan, "Effect of CF_3Br on C_1-C_3 Ignition and Laminar Flame Speed: Numerical and Experimental Evaluation," *Combustion and Flame*, Vol. 160, 2013, pp. 1044-1059.

3) A. Kéromnès, W. K. Metcalfe, K. A. Heufer, N. Donahoe, A. K. Das, C. J. Sung, J. Herzler, K. Naumann, P. Griebel, O. Mathieu, M. C. Krejci, E. L. Petersen, W. J. Pitz, and H. J. Curran, "An Experimental and Detailed Chemical Kinetic Modeling Study of Hydrogen and Syngas Mixture Oxidation at Elevated Pressures," *Combustion and Flame*, Vol. 160, 2013, pp. 995-1011.

4) S. Ravi, S. J. Peltier, and E. L. Petersen, "Analysis of the Impact of Impeller Geometry on the Turbulent Statistics inside a Fan-Stirred, Cylindrical Flame Speed Vessel using PIV," *Experiments in Fluids*, Vol. 54, 2013, pp. 1424.

5) B. Rotavera and E. L. Petersen, "Ignition Behavior of Pure and Blended Methyl Octanoate, n-Nonane, and Methylcyclohexane," *Proceedings of the Combustion Institute*, Vol. 34, 2013, pp. 435-442.

6) M. Brower, E. L. Petersen, W. Metcalfe, H. J. Curran, M. Füri, G. Bourque, N. Aluri, and F. Güthe, "Ignition Delay Time and Laminar Flame Speed Calculations for Natural Gas/Hydrogen Blends at Elevated Pressures," *Journal of Engineering for Gas Turbines and Power*, Vol. 135, 2013, pp. 021504(10).

7) M. Krejci, O. Mathieu, A. J. Vissotski, S. Ravi, T. G. Sikes, E. L. Petersen, A. Kéromnès, W. Metcalfe, and H. J. Curran, "Laminar Flame Speed and Ignition Delay Time Data for the Kinetic Modeling of Hydrogen and Syngas Fuel Blends," *Journal of Engineering for Gas Turbines and Power*, Vol. 135, 2013, pp. 021503-(9).

8) O. Mathieu, M. M. Kopp, and E. L. Petersen, "Shock-Tube Study of the Ignition of Multi-Component Syngas Mixtures with and without Ammonia Impurities," *Proceedings of the Combustion Institute*, Vol. 34, Issue 2, 2013, pp. 3211-3218.

9) O. Mathieu, A. Levacque, and E. L. Petersen, "Effects of NO_2 Addition on Hydrogen Ignition behind Reflected Shock Waves," *Proceedings of the Combustion Institute*, Vol. 34, Issue 1, 2013, pp. 633-640.

10) N. L. Polley, M. Q. Egbert, and E. L. Petersen, "Methods for Re-Initiation and Critical Conditions for a Planar Detonation Transforming to a Cylindrical Detonation Within a Confined Volume," *Combustion and Flame*, Vol. 160, 2013, pp. 212-221.

11) S. Ravi and E. L. Petersen, "Laminar Flame Speed Correlations for Pure Hydrogen and High-Hydrogen-Content Syngas Blends with Various Diluents," *International Journal of Hydrogen Energy*, Vol. 37, 2012, pp. 19177-19189.

12) O. Mathieu, A. Levacque, and E. L. Petersen, "Effects of N_2O Addition on the Ignition of H_2-O_2 Mixtures: Experimental and Detailed Kinetic Modeling Study," *International Journal of Hydrogen Energy*, Vol. 37, 2012, pp. 15393-15405.

13) M. Kopp, M. Brower, O. Mathieu, E. Petersen, and F. Güthe, "CO_2* Chemiluminescence Study at Low and Elevated Pressures," *Applied Physics B*, Vol. 107, Issue 3, 2012, pp. 529-538.

14) K. Kreitz, E. Petersen, D. Reid, and S. Seal, "Scale-up Effects of Nanoparticle Production on the Burning Rate of Composite Propellant," *Combustion Science and Technology*, Vol. 184, 2012, pp. 750-766.

15) A. F. Khalizov, B. Hogan, C. Qiu, E. L. Petersen, and R. Zhang, "Characterization of Soot Aerosol Produced from Combustion of Propane in a Shock Tube," *Aerosol Science and Technology*, Vol. 46, 2012, pp. 925-936.

16) E. Petersen, M. Kopp, N. Donato, and F. Güthe, "Assessment of Current Chemiluminescence Kinetics Models at Engine Conditions," *Journal of Engineering for Gas Turbines and Power*, Vol. 134, May, 2012, p. 051501.

17) D. L. Reid, K. R. Kreitz, M. A. Stephens, J. E. S. King, P. Nachimuthu, E. L. Petersen, and S. Seal, "Development of Highly Active Titania-Based Nanoparticles for Energetic Materials," *Journal of Physical Chemistry C*, Vol. 115, No. 21, 2011, pp. 10412-10418.

18) W. Lowry, J. de Vries, M. Krejci, E. Petersen, Z. Serinyel, W. Metcalfe, H. Curran, and G. Bourque, "Laminar Flame Speed Measurements and Modeling of Pure Alkanes and Alkane Blends at Elevated Pressures," *Journal of Engineering for Gas Turbines and Power*, Vol. 133, 2011, pp. 091501-9.

19) C. Frazier, M. Lamnaouer, E. Divo, A. Kassab, and E. Petersen, "Effect of Wall Heat Transfer on Shock-Tube Test Temperature at Long Times," *Shock Waves*, Vol. 21, 2011, pp. 1-17.

20) W. B. Lowry, Z. Serinyel, M. C. Krejci, H. J. Curran, G. Bourque, and E. L. Petersen, "Effect of Methane-Dimethyl Ether Fuel Blends on Flame Stability, Laminar Flame Speed, and Markstein Length," *Proceedings of the Combustion Institute*, Vol. 33, Issue 1, 2011, pp. 929-937.

21) C. J. Aul, M. W. Crofton, J. D. Mertens, and E. L. Petersen, "A Diagnostic for Measuring H_2O_2 Concentration in a Shock Tube Using Tunable Laser Absorption Near 7.8 μm," *Proceedings of the Combustion Institute*, Vol. 33, Issue 1, 2011, pp. 709-716.

22) B. Rotavera, P. Diévart, C. Togbé, P. Dagaut, and E. L. Petersen, "Oxidation Kinetics of *n*-Nonane: Measurements and Modeling of Ignition Delay Times and Product Concentrations," *Proceedings of the Combustion Institute*, Vol. 33, Issue 1, 2011, pp. 175-183.

23) J. de Vries, W. B. Lowry, Z. Serinyel, H. J. Curran, and E. L. Petersen, "Laminar Flame Speed Measurements of Dimethyl Ether in Air at Pressures up to 10 atm," *Fuel*, Vol. 90, Issue 1, 2011, pp. 331-338.

24) T. E. Sammet, M. A. Stephens, E. L. Petersen, and B. A. Corbin, "Assessing the Mixedness of Composite Solid Rocket Propellants Using Fluorescent Particles," *Journal of Propulsion and Power*, Vol. 26, No. 5, 2010, pp. 987-992.

25) D. Healy, N. S. Donato, C. J. Aul, E. L. Petersen, C. M. Zinner, G. Bourque, and H. J. Curran, "Isobutane Ignition Delay Time Measurements at High Pressure and Detailed Chemical Kinetic Simulations," *Combustion and Flame*, Vol. 157, 2010, pp. 1540-1551.

26) D. Healy, N. S. Donato, C. J. Aul, E. L. Petersen, C. M. Zinner, G. Bourque, and H. J. Curran, "n-Butane: Ignition Delay Measurements at High Pressure and Detailed Chemical Kinetic Simulations," *Combustion and Flame*, Vol. 157, 2010, pp. 1526-1539.

27) M. Stephens, T. Sammet, E. Petersen, R. Carro, S. Wolf, and C. Smith, "Performance of Ammonium-Perchlorate-Based Composite Propellant Using Nanoscale Aluminum," *Journal of Propulsion and Power*, Vol. 26, No. 3, 2010, pp. 461-466.

28) M. A. Stephens, E. L. Petersen, R. Carro, D. L. Reid, and S. Seal, "Multi-Parameter Study of Nanoscale TiO_2 and CeO_2 Additives in Composite AP/HTPB Solid Propellants," *Propellants, Explosives, Pyrotechnics*, Vol. 35, Issue 2, 2010, pp. 143-152.

29) D. Healy, M. M. Kopp, N. L. Polley, E. L. Petersen, G. Bourque, and H. J. Curran, "Methane-/n-Butane Ignition Delay Measurements at High Pressure and Detailed Chemical Kinetic Simulations," *Energy & Fuels*, Vol. 24, 2010, pp. 1617-1627.

30) D. Healy, D. M. Kalitan, C. J. Aul, E. L. Petersen, G. Bourque, and H. J. Curran, "Oxidation of C1-C5 Alkane Quinternary Natural Gas Mixtures at High Pressures," *Energy & Fuels*, Vol. 24, 2010, pp. 1521-1528.

31) N. Donato, C. Aul, E. Petersen, C. Zinner, H. Curran, and G. Bourque, "Ignition and Oxidation of 50/50 Butane Isomer Blends," *Journal of Engineering for Gas Turbines and Power*, Vol. 132, Issue 5, 2010, pp. 051502-9.

32) G. Bourque, D. Healy, H. Curran, C. Zinner, D. Kalitan, J. de Vries, C. Aul, and E. Petersen, "Ignition and Flame Speed Kinetics of Two Natural Gas Blends with High Levels of Heavier Hydrocarbons," *Journal of Engineering for Gas Turbines and Power*, Vol. 132, 2010, pp. 021504-11.

33) E. L. Petersen, "Interpreting Endwall and Sidewall Measurements in Shock-Tube Ignition Studies," *Combustion Science and Technology*, Vol. 181, 2009, pp. 1123-1144.

34) M. A. Stephens, E. L. Petersen, D. L. Reid, R. Carro, and S. Seal, "Nano Additives and Plateau Burning Rates in Ammonium-Perchlorate-Based Composite Solid Propellants," *Journal of Propulsion and Power*, Vol. 25, No. 5, 2009, pp. 1068-1078.

35) M. Lamnaouer, R. C. Ryder, A. Brankovic, and E. L. Petersen, "Reduced Combustion Time Model for Methane in Gas Turbine Flow Fields," *Journal of Natural Gas Chemistry*, Vol. 18, No. 2, 2009, pp. 145-155.

36) J. D. Mertens, D. M. Kalitan, A. B. Barrett, and E. L. Petersen, "Determination of the Rate of $H + O_2 + M \rightarrow HO_2 + M$ ($M = N_2$, Ar, H_2O) from Ignition of Syngas at Practical Conditions," *Proceedings of the Combustion Institute*, Vol. 32, 2009, pp. 295-303.

37) B. Rotavera, A. Kumar, S. Seal, and E. L. Petersen, "Effect of Ceria Nanoparticles on Soot Inception and Growth in Toluene/Oxygen/Argon Mixtures," *Proceedings of the Combustion Institute*, Vol. 32, 2009, pp. 811-819.

38) N. S. Donato and E. L. Petersen, "Simplified Correlation Models for CO/H_2 Chemical Reaction Times," *International Journal of Hydrogen Energy*, Vol. 33, No. 24, 2008, pp. 7565-7579.

39) D. Healy, H. J. Curran, S. Dooley, J. M. Simmie, D. M., Kalitan, E. L. Petersen, and G. Bourque, "Methane/Propane Mixture Oxidation at High Pressures and at High, Intermediate and Low Temperatures," *Combustion and Flame*, Vol. 155, 2008, pp. 451-461.

40) D. Healy, H. J. Curran, J. M. Simmie, D. M. Kalitan, C. M. Zinner, A. B. Barrett, E. L. Petersen, and G. Bourque, "Methane/Ethane/Propane Mixture Oxidation at High Pressures and at High, Intermediate and Low Temperatures," *Combustion and Flame*, Vol. 155, 2008, pp. 441-448.

41) T. Lieuwen, V. McDonell, E. Petersen, and D. Santavicca, “Fuel Flexibility Influences on Premixed-Combustor Blowout, Flashback, Autoignition, and Instability,” *Journal of Engineering for Gas Turbines and Power*, Vol. 130, 2008, pp. 011506-10.

CURRICULUM VITAE

Ramalingam Saravanan

Professor, Department of Atmospheric Sciences
Texas A&M University, College Station, TX 77843-3150 *Phone:* (979) 845-0175; *e-mail:* sarava@tamu.edu

Education:

1990 *Ph. D.,* Atmospheric and Oceanic Program, Princeton University, New Jersey

1988 *M.A.,* Atmospheric and Oceanic Program, Princeton University, New Jersey

1986 *Master of Science (Physics),* Indian Institute of Technology, Kanpur, India

Professional Experience:

2005-present *Professor of Atmospheric Sciences,* Texas A&M University
2000-2005 *Scientist III,* National Center for Atmospheric Research, Boulder, Colorado
1996-2000 *Scientist II,* National Center for Atmospheric Research, Boulder, Colorado
1993-1996 *Scientist I,* National Center for Atmospheric Research, Boulder, Colorado
1990-1993 *Postdoctoral Research Associate,* Dept. of Applied Math. & Theoretical Physics, University of Cambridge, UK

Professional Service

Member, *Prediction and Research Moored Array in the Atlantic (PIRATA) Science Steering Committee* (2010-)

Member, *NRC Committee on the Assessment of Intraseasonal to Interannual Climate Prediction and Predictability* (2009)

Co-organizer, *Symposium on Climate, Statistics, and Satellites*, 2009

Editor, *Journal of Climate* (2007-)

Co-chair, Program Committee for the *14th AMS Conference on Atmospheric and Oceanic Fluid Dynamics*, San Antonio, Texas, 2003 Co-convener, *NCAR/ASP Colloquium on the Dynamics of Decadal-to-Centennial Climate Variability*,2000.
Member, *AMS Committee on Atmospheric and Oceanic Fluid Dynamics* (2000-2003) Member, *NASA Seasonal-to-Interannual Predictability (NSIPP) Science Team* (2000-2005)
Member, *U.S. CLIVAR Pacific Sector Implementation Panel* (1999-2000)

Collaborators: Salil Mahajan (Oakridge National Labs), Ping Chang (Texas A&M), Gerry Creager (TexasA&M), Marc Genton (Texas A&M), Bani Mallick (Texas A&M), Clara Deser (National Center for Atmos.Research), Alessandra Giannini (IRI/Columbia University), Gudrun Magnusdottir (Univ. of California, Irvine),Joe Tribbia (National Center for Atmos. Research), Marcelo Barreiro (Uruguay)

Graduate Advisor: Isaac Held (Geophysical Fluid Dynamics Laboratory/Princeton Univ.)

Post-doctoral Advisor: Michael E. McIntyre (Univ. of Cambridge) **Graduate students advised**: Melissa Ackerman (current), Xiaojie Zhu (current), Kyle Borg (M.S.), SalilMahajan (Ph.D., now at Princeton University), Kathleen Collins (MS, now at NOAA)

Post-doctoral Advisees: Alessandra Giannini (now at IRI/Columbia University), Jen-Shan Hsieh (current), Mingkui Li (current)

Awards, Scholarships

National Talent Search scholarship awarded by the National Council for Educational Research and Training (India), 1980–86.

Professional Societies

Member of the American Meteorological Society
Member of the American Geophysical Union

Thesis

Saravanan, R., 1990: *Mechanisms of equatorial superrotation: Studies with two-level models.* Ph.D. Thesis, Princeton University, 183pp.

Book Chapters

Saravanan, R., 2008: Seasonal-to-decadal prediction using climate models: successes and challenges. In:*Large-Scale Disasters: Prediction, Control and Mitigation*, Cambridge University Press, Mohamed Gad-El-Hak, ed., 318-328pp.

Book Reviews

Saravanan, R., 1991: Book Review -"Dynamics in Atmospheric Physics" by Richard Lindzen, *Quarterly Journal of the Royal Meteorological Society,* **117**, 1375-1376.

Peer-reviewed Publications (last 5 years)

Balaguru, K., P. Chang, R. Saravanan, and L. R. Leung, 2012: Effect of Ocean Barrier Layers on TropicalCyclone Intensification, PNAS, doi/10.1073/pnas.1201364109

Balaguru, P. Chang, R. Saravanan, and C. J. Jang, 2012: The Barrier Layer of the Atlantic warmpool: Formation mechanism and influence on the mean climate. *Tellus*. A 2012, 64, 18162, http://dx.doi.org/10.3402/tellusa.v64i0.18162

Patricola, C.M., M. Li, Z. Xu, P. Chang, R. Saravanan, and J.-S. Hsieh, 2012: An investigation of tropicalAtlantic bias in a high-resolution coupled regional climate model. *Climate Dynamics,* DOI 10.1007/s00382-012-1320-5

Zhu, X., R. Saravanan, and P. Chang, 2012: Influence of Mean Flow on the ENSO–Vertical Wind ShearRelationship over the Northern Tropical Atlantic, *Journal of Climate*, **25**, 858-864.

Mahajan, S., R. Saravanan, and P. Chang, 2011: The Role of the Wind-Evaporation-Sea Surface Temperature (WES) Feedback as a thermodynamic pathway for the equator-ward propagation of high Latitude Sea-Ice Induced Cold Anomalies. *Journal of Climate,* in press.

Wen, C., P. Chang, and R. Saravanan, 2011: Effect of Atlantic Meridional Overturning Circulation on Tropical Atlantic Variability: A Regional Coupled Model Study. *Journal of Climate,* in press.

Mahajan, S., R. Saravanan, and P. Chang, 2010: Free and Forced Variability of the Tropical Atlantic

Ocean: Role of the Wind-Evaporation-Sea Surface Temperature (WES) Feedback. *Journal of Climate,* **23**, 5958-5977.

Wen, C., P. Chang, and R. Saravanan, 2010: Effect of Atlantic Meridional Overturning Circulation Changes on Tropical Atlantic Sea-Surface Temperature Variability: A 2-1/2 layer Reduced Gravity Ocean Model Study, *J. Climate*, **23**, 312-332.

Wan, X., P. Chang, R. Saravanan, R. Zhang, and M. W. Schmidt, 2009: On the interpretation of Caribbean paleo-temperature reconstructions during the Younger Dryas, *Geophys. Res. Lett.*, **36**,L02701, doi:10.1029/2008GL035805.

Mahajan, S., R. Saravanan, and P. Chang, 2008: The role of the Wind-Evaporation-Sea Surface Temperature (WES) Feedback in air-aea coupled tropical variability, *Atmospheric Research*,doi:10.1016/j.atmosres.2008.09.017.

Manuscripts under review

Patricola, C.M., P. Chang, and R. Saravanan, 2013: Simulations of Extreme Climate Events Using aRegional Climate Model: A Case Study of the 1993 and 2008 Midwest Floods

Manuscripts in preparation

Zhu, X., and R. Saravanan, 2013: Observed and simulated modes of vertical wind shear variability over northern tropical Atlantic

M. Carey Satterfield, Ph.D.

Department of Animal Science
Texas A&M University
Room 442 Kleberg Center
2471 TAMU
College Station, Texas 77843-2471
Tel: (979) 845-6448
Fax: (979) 862-2662
E-mail: csatterfield@tamu.edu

Academic Background:

Institution	Degree	Year	Major
Texas A&M University	Postdoc	2009	Growth and Nutrition
Texas A&M University	Ph.D.	2008	Physiology of Reproduction
Texas A&M University	M.S.	2004	Physiology of Reproduction
Texas A&M University	B.S.	1999	Animal Science

Current Position:
2009-present; Assistant Professor, Department of Animal Science, Texas A&M University

Previous Positions:
2008-2009 Postdoctoral Research Fellow, Growth and Nutrition, Department of Animal Science, Texas A&M University
2004-2007: Graduate Research & Teaching Assistant, Physiology of Reproduction, Department of Animal Science and Center for Animal Biotechnology and Genomics, Texas A&M University, College Station, Texas. (Advisors-Drs. Fuller Bazer & Thomas Spencer)
2001-2004: Sheep and Goat Center Manager, Department of Animal Science, Texas A&M University, College Station, Texas.
2000-2003: Graduate Teaching Assistant, Sheep and Goat Production and Management and Livestock Practicum, Animal Science Department, Texas A&M University, College Station, Texas.
2000-2001: Graduate Research Assistant, Physiology of Reproduction, Department of Animal Science, Texas A&M University, College Station, Texas. (Advisor- Dr. Shawn Ramsey).

Professional Activities and Organizations:
Review Editorial Board: *Frontiers in Epigenomics*
Ad hoc reviewer for peer reviewed journals: *American Journal of Physiology-Endocrinology and Metabolism, Amino Acids, Animal Reproduction Science*, *Biology of Reproduction*, *Domestic Animal Endocrinology*, *Food and Function, Frontiers in Biosciences, Journal of Animal Science*, *Journal of Diabetes and Metabolism, Lab Animal, Reproduction, Molecular Reproduction and Development, Reproductive Toxicology*, and *Theriogenology*
Society for the Study of Reproduction (SSR): Member, 2005-present
Society for Gynecological Investigation (SGI): Member, 2009-present
American Society for Animal Science (ASAS): Member 2010-present
Intercollegiate Faculty of Reproductive Biology (IFRB) Texas A&M University: Member 2009-present
Intercollegiate Faculty of Reproductive Biology (IFRB) Texas A&M University: Program Committee (Member) 2010-present; Graduate Programs Committee (Member) 2011-present.

Honors
Young Scientist-Research Award, Southern Section-American Society of Animal Science (2013)
MALRC Fellow (2010-2013)
Dr. A.M. "Tony" Sorenson Achievement Award, Department of Animal Science, Texas A&M University (2008)
USDA-CSREES-NRI Travel Award Fellow, Aspen Perinatal Biology Symposium (2007)
Best Platform Presentation, Texas Forum on Reproductive Sciences (2007)

Graduate Student Travel Award, IFRB, Texas A&M University (2005, 2006, and 2007)
Graduate Student Tuition Remission Award, IFRB, Texas A&M University (2005, 2006, and 2007)
Larry Ewing Memorial Trainee Travel Award, Society for the Study of Reproduction (2005, 2006, and 2007)
Graduate Research and Presentation Grant Recipient, Office of Vice President for Research, Texas A&M University (2005)

Teaching Experience

ANSC 489/689	Special Topics in Reproductive Physiology of Domestic Livestock	2010-2011
ANSC 631	Reproductive Biology II	2012
ANSC 433	Reproduction in Farm Animals	2013

Graduate Student Advising

Jason R. McKnight, Texas A&M University, *"Impacts of maternal obesity on metabolic profiles in postpartum ewes."* M.S. 2010
Sorin M. Greff, Texas A&M University, *"A novel role for arginine in enhancing neonatal thermogenesis."* M.S. 2012
Colt M. Sharpton, Texas A&M University, since 2010
Michael G. Uzelac, Texas A&M University, since 2011
Ashley B. Keith, Texas A&M University, since 2011
Kim Hardan, Texas A&M University, since 2012
Hannah DelCurto, Texas A&M University, since 2012

Grants Funded

1. "A Novel Role for Arginine in Enhancing Thermogenic Capacity in Newborn Lambs". USDA-NRI Postdoctoral Fellowship Grant. (2008-2010). PI. M. Carey Satterfield ($125,000).
2. "Dietary glycine supplementation to obese diabetic rats as a strategy to improve metabolic function". Mexican American and U.S. Latino Research Center Grant. (2010). PI. M. Carey Satterfield ($5,000).
3. "Effect of maternal nutrient restriction on fetal hepatic development and long-term metabolic outcomes". Texas AgriLIFE Research Genomics Seed Grant Program (2011). PI. M. Carey Satterfield ($31,441.73).
4. "Effect of maternal overnutrition on fetal skeletal muscle development, differentitation, and oxidative capacity". Patricia Link Quasi-Endowment (2012). PI. M. Carey Satterfield ($20,000).
5. "Mechanisms regulating predisposition of the foal to metabolic syndrome by maternal overnutrition". Patricia Link Quasi-Endowment (2012). Co-PI. M. Carey Satterfield. ($20,000).

Publications in Peer-Reviewed Scientific Journals

1. M. Carey Satterfield, Fuller W. Bazer and Thomas E. Spencer (2006). Progesterone Regulation of Preimplantation Conceptus Growth and Galectin-15 (LGALS15) in the Ovine Uterus. Biology of Reproduction. 75(2):289-296.
2. M. Carey Satterfield, Kathrin A. Dunlap, Kanako Hayashi, Robert C. Burghardt, Thomas E. Spencer and Fuller W. Bazer (2007). Tight and Adherens Junctions in the Ovine Uterus: Differential Regulation by Pregnancy and Progesterone. Endocrinology. 148:3922-3931.
3. Shakila K. Banu, Jehoon Lee, M. Carey Satterfield, Thomas E. Spencer, Fuller W. Bazer and Joe A. Arosh (2008). Molecular Cloning and Characterization of Prostaglandin Transporter in Ovine Endometrium: Role for Multiple Cell Signaling Pathways in Transport of Prostaglandin F2 Alpha. Endocrinology. 149:219-231.
4. Jinyoung Kim, Gwonhwa Song, Haijun Gao, Jennifer L. Farmer, M. Carey Satterfield, Robert C. Burghardt, Guoyao Wu, Gregory A. Johnson, Thomas E. Spencer and Fuller W. Bazer (2008). Insulin-like Growth Factor 2 (IGF2) Activates PI3K-AKT1 and MAPK Cell Signaling Pathways and Stimulates Proliferation and Migration of Ovine Trophectoderm Cells. Endocrinology. 149:3085-3094.
5. Gwonhwa Song, Jinyoung Kim, M. Carey Satterfield, Fuller W. Bazer and Thomas E. Spencer. (2008). Complex Regulation of Gastrin-Releasing Peptide (GRP) in the Endometrial Glands of the Ovine Uterus. Biology of Reproduction. 79:376-386.

6. Craig A. Gifford, A. M. Assiri, M. Carey Satterfield, Thomas E. Spencer and Troy L. Ott. (2008). Receptor Transporter Protein 4 (RTP4) in Endometrium, Ovary, and Peripheral Blood Leukocytes of Pregnant and Cyclic Ewes. Biology of Reproduction. 79:518-24.
7. M. Carey Satterfield, Gwonhwa Song, Kanako Hayashi, Fuller W. Bazer and Thomas E. Spencer. (2008). Progesterone Regulation of Components of the WNT Signaling Cascade in the Ovine Uterus. Reproduction Fertility and Development 20(8):935-946.
8. M. Carey Satterfield, Kanako Hayashi, Gwonhwa Song, Sarah G. Black, Fuller W. Bazer and Thomas E. Spencer. (2008). Progesterone Regulates FGF10, MET, IGFBP1, and IGFBP3 in the Endometrium of the Ovine. Biology of Reproduction Dec;79(6):1226-36.
9. Arantzatzu Lassala, Fuller W. Bazer, Timothy A. Cudd, Xilong Li, M. Carey Satterfield, Thomas E. Spencer, and Guoyao Wu. (2009). Intravenous Administration of Citrulline to Pregnant Ewes Is More Effective than Arginine to Enhance Arginine Availability in the Fetus. Journal of Nutrition. Apr;139(4):660-5.
10. Gwonhwa Song[†], M. Carey Satterfield[†], Jinyoung Kim[†], Fuller W. Bazer and Thomas E. Spencer. (2009). Progesterone and Interferon Tau Regulation of LIFR and IL6ST During Early Pregnancy in the Ovine Uterus. Reproduction Mar;137(3):553-65.
11. M. Carey Satterfield, Gwonhwa Song, Kelli J. Kochan, Penny K. Riggs, Rebecca M. Simmons, Christine G. Elsik, David L. Adelson, Fuller W. Bazer, Huaijun Zhou, and Thomas E. Spencer. (2009). Endometrial Gene Expression Profiling in an Ovine Model of Progesterone Enhanced Blastocyst Development. Physiological Genomics Oct 7;39(2):85-99.
12. M. Carey Satterfield, Haijun Gao, Xilong Li, Guoyao Wu, Gregory A. Johnson[1], Thomas E. Spencer, and Fuller W. Bazer. (2010). Select Nutrients and their Associated Transporters are Increased in the Ovine Uterus Following Early Progesterone Administration. Biology of Reproduction Jan;82(1)224-31.
13. Rebecca M. Simmons, M. Carey Satterfield, Thomas H. Welsh, Jr., Fuller W. Bazer, and Thomas E. Spencer. (2010). HSD11B1, HSD11B2, PTGS2 and NR3C1 Expression in the Peri-implantation Ovine Uterus: Effects of Pregnancy, Progesterone and Interferon Tau. Biology of Reproduction Jan;82(1):35-43.
14. M. Carey Satterfield, Fuller W. Bazer, Thomas E. Spencer, and Guoyao Wu. (2010). Viagra (Sildenafil Citrate) Treatment Enhanced Fetal Growth in an Ovine Model of Intrauterine Growth Retardation. Journal of Nutrition Feb;140(2):251-258.
15. Arantzazu Lassala, Fuller W. Bazer, Timothy A. Cudd, Sujay Datta, Duane H. Keisler, M. Carey Satterfield, Thomas E. Spencer, and Guoyao Wu (2010). Parenteral Administration of L-arginine Prevents Fetal Growth Restriction in Undernourished Ewes. Journal of Nutrition Jul;140:1242-1248.
16. Sarah Black, Frederick Arnaud, Robert C. Burghardt, M. Carey Satterfield, Jo-Ann G.W. Fleming, Charles Long, Carol Hanna, Lita Murphy, Roman Biek, Massimo Palmarini, Thomas E. Spencer. (2010) Viral Particles of Endogenous Betaretroviruses (enJSRVs) are Released in the Sheep Uterus and Infect the Conceptus Trophectoderm in a Trans-species Embryo Transfer Model. Journal of Virology Sep;84:9078-9085.
17. M. Carey Satterfield and Thomas E. Spencer. (2011) Asynchronous Embryo Transfer in Sheep: Lack of Survival in Progestinized Recipient Ewes. Journal of Animal Science and Biotechnology Vol.2 No.1:9-13.
18. Arantzazu Lassala, Fuller W. Bazer, Timothy A. Cudd, Sujay Datta, Duane H. Keisler, M. Carey Satterfield, Thomas E. Spencer, and Guoyao Wu (2011). Parenteral L-arginine Administration Enhances Abundance of Fetal Brown Adipose Tissue in Sheep. Journal of Nutrition May; 141(5):849-855.
19. M. Carey Satterfield, Kathrin A. Dunlap, Duane H. Keisler, Fuller W. Bazer, and Guoyao Wu (2011). Arginine Nutrition and Fetal Brown Adipose Tissue Development in Nutrient-restricted Sheep. Amino Acids Dec 1; epub ahead of print.
20. M. Carey Satterfield, Kathrin A. Dunlap, Duane H. Keisler, Fuller W. Bazer, and Guoyao Wu (2012). Arginine Nutrition and Fetal Brown Adipose Tissue Development in Diet-induced, Obese Sheep. Amino Acids Feb 12; epub ahead of print.
21. Kenneth Cornetta, Kimberly Tessanne, Charles Long, Jing Yao, Carey Satterfield, and Mark Westhusin (2012). Transgenic Sheep Generated by Lentiviral Vectors: Safety and Integration Analysis of Surrogates and their Offspring. Transgenic Research Nov; epub ahead of print.

Invited Reviews in Refereed Journals

1. Guoyao Wu, Fuller W. Bazer, Sujay Datta., Gregory A. Johnson, Li Peng, M. Carey Satterfield and Thomas E. Spencer. (2008). Proline Metabolism in the Conceptus: Implications for Fetal Growth and Development. Amino Acids. 35:691-702.
2. Guoyao Wu, Fuller W. Bazer, Sujay Datta, Haijun Gao, Gregory A. Johnson, Arantzatzu Lassala, Peng Li, M. Carey Satterfield, and Thomas E. Spencer. (2008). Intrauterine Growth Retardation in Livestock: Implications, Mechanisms and Solutions. Archives in Animal Breeding, Special Issue, 51:4-10.
3. Guoyao Wu, Fuller W. Bazer, Teresa A. Davis, Sung Woo Kim, J. Marc Rhoads, M. Carey Satterfield, Stephen B. Smith, Thomas E. Spencer, and Yulong Yin. (2009). Arginine Metabolism and Nutrition in Growth, Health and Disease. Amino Acids May;37(1):153-68.
4. Xilong Li, Fuller W. Bazer, Haijun Gao, Wenjuan Jobgen, Gregory A. Johnson, Peng Li, Jason R. McKnight, M. Carey Satterfield, Thomas E. Spencer, Guoyao Wu. (2009). Amino Acids and Gaseous Signaling. Amino Acids May;37(1):65-78.
5. Guoyao Wu, Fuller W. Bazer, Robert C. Burghardt, Gregory A. Johnson, Sung W. Kim, Xilong Li, M. Carey Satterfield, and Thomas E. Spencer. (2010). Impacts of Amino Acid Nutrition on Pregnancy Outcome in Pigs: Mechanisms and Implications for Swine Production. Journal of Animal Science. 88(E. Suppl.):E195-204.
6. Jason R. McKnight, M. Carey Satterfield, W.S. Jobgen, Stephen B. Smith, Thomas E. Spencer, Cynthia J. Meininger, Catherine G. McNeal, and Guoyao Wu. (2010) Beneficial Effects of L-arginine on Reducing Obesity: Potential Mechanisms and Important Implications for Human Health. Amino Acids Jul;39:349-357.
7. Guoyao Wu, Fuller W. Bazer, Gregory A. Johnson, Sung Woo Kim, Darrell A. Knabe, Peng Li, Xilong Li, Jason R. McKnight, M. Carey Satterfield, and Thomas E. Spencer. (2010). Proline and Hydroxyproline: Biochemistry and Nutrition in Animals. Amino Acids Apr; 40(4):1053-1063.
8. M. Carey Satterfield, Josie A. Coverdale, and Guoyao Wu. (2010). A Review of Fetal Programming: Implications to Horse Health. Proceedings of the American Association of Equine Practitioners 56:207-214.
9. M. Carey Satterfield and Guoyao Wu. (2011). Brown Adipose Tissue Growth and Development: Significance and Nutritional Regulation. Frontiers in Biosciences Jan 1;16:1589-608.
10. Jason R. McKnight, M. Carey Satterfield, Xilong Li, Haijun Gao, Junjun Wang, Defa Li, and Guoyao Wu. (2011) Obesity in Pregnancy: Problems and Potential Solutions. Frontiers in Biosciences Jan 1;3:442-52.
11. Fuller W. Bazer, Gwonhwa Song, Jinyoung Kim, David W. Erikson, Greg A. Johnson, Robert C. Burghardt, Haijun Gao, M. Carey Satterfield, Thomas E. Spencer, and Guoyao Wu (2011). MTOR cell signaling: Effects of Select Nutrients and Secreted Phosphoprotein 1 on Development of Mammalian Conceptuses. Molecular and Cellular Endocrinology (In press).
12. Junjun Wang, Zhenlong Wu, Defa Li, Scott V. Dindot, M. Carey Satterfield, Fuller W. Bazer, and Guoyao Wu (2012). Nutrition, Epigenetics, and Metabolic Syndrome. Antioxidants and Redox Signaling July 15; 17(2):282-301
13. Fuller W. Bazer, Gwonhwa Song, Jinyoung Kim, Kathrin A. Dunlap, M. Carey Satterfield, Gregory A. Johnson, Robert C. Burghardt, and Guoyao Wu (2012) Uterine Biology in Pigs and Sheep. Journal of Animal Science and Biotechnology July 16;3(1):23
14. Zhaolai Dai, Zhenlong Wu, Ying Yang, Junjun Wang, M. Carey Satterfield, Cynthia Meininger, Fuller W. Bazer, and Guoyao Wu (2013). Nitric Oxide and Energy Metabolism in Mammals. Biofactors (epub ahead of print Mar 29)

Curriculum Vitae

Gunnar W. Schade

Associate Professor
Department of Atmospheric Sciences, Texas A&M University,
3150 TAMU, 1104 Eller O&M Building, College Station, TX 77843, USA
ph: (1) 979 845-0633, FAX: (1) 979 862-4466, e-mail: gws@geos.tamu.edu

• Qualifications

1997 Dr. *rer. nat.* (DSc) in Chemistry, *magna cum laude*, Johannes Gutenberg Universität, Mainz, Germany. Thesis title: "CO emissions from degrading plant litter" (in German).
Subfields: Inorganic & Analytical Chemistry, Physical Chemistry, Physical Geography
Advisors: P.J. Crutzen (MPI-C), W. Baumann (Chemistry), M. Domrös (Physical Geography)

1993 Diplom, University (MSc) degree in Chemistry, Johannes Gutenberg Universität, Mainz, Germany. Thesis title: "Emissions of volatile aliphatic amines from animal husbandry" (in German); Department of Physical Chemistry; overall grade: 1 (eqv. to an A).

• Positions and Professional Experience

2012-2013 Researcher, Kjemisk Institutt, Universitetet i Oslo
2012-present Associate Professor, Texas A&M University, Department of Atmospheric Sciences
2005-2012 Assistant Professor, Texas A&M University, Department of Atmospheric Sciences
2003-2005 *Emmy Noether Research Fellow*, University of Bremen, Germany
2001-2002 *Assistant Specialist*, University of California at Berkeley, Department of Environmental Science, Policy, and Management (ESPM)
1998-2001 *Post-doctoral Research Fellow*, University of California at Berkeley, ESPM

1997-1998 *Post-doctoral Researcher* at the Max-Planck-Institute of Chemistry, Air Chemistry Department, Mainz, Germany
1994-1997 *Post-Graduate Research Assistant* (Doktorstudent) at the Max-Planck-Institute of Chemistry, Air Chemistry Department
1993-1994 *Graduate Research Assistant* (diploma/masters student) at the Max-Planck-Institute of Chemistry, Air Chemistry Department

• Main Research Interests

Boundary Layer Atmospheric Chemistry and Biogeochemical Cycles, Analytical Chemistry. The development of instrumentation and methods to measure atmospheric trace gases and their fluxes between the biosphere and the atmosphere to improve our understanding of the underlying biogeochemical cycling and their impacts on and feedbacks with atmospheric chemistry and climate, including how anthropogenic disturbances have altered these.

• Awards and Funding

Past
1999 DAAD: Postdoctoral Research Grant (NATO Program): 1 year (salary only)
2003-2005 DFG: Emmy Noether Program Research Grant: 2 years including Research Group complete salary support for myself (PI), graduate student, and postdoctoral researcher; instruments for €250k plus consumables at approx. €200k

2005 BLE/BMVEL[1]: Exploratory research grant on animal husbandry VOC emissions (PI); no salary support; consumables at €9k (in Germany)

2005-2007 DFG: Laboratory and field measurements of methanol fluxes (Co-I with John P. Burrows; in Germany); salary support for graduate student; consumables at approx. €20k

2006-2008 USDA: Physical and chemical characterization of particulate matter emissions from Concentrated Animal Feeding Operations, CAFOs (Co-I with Dr. Sarah Brooks); $499k/3 yrs total including one month summer salary support; Contact at USDA: Dr. Ray Knighton, ph. 202-401-6417; award number 2006-35112-16636

2006-2009 Texas Air Research Center (TARC): Urban turbulence and trace gas fluxes from a tall lattice tower near downtown Houston, TX (PI); two independent funds (~$14k/yr + $59k/2yr) for graduate student salary, travel, and consumables; contact: George Talbert, Lamar University, ph. 409-880-2183; award numbers 066TAM0070A & 077TAM0981A

2009 DAAD[2]: Group Study Visit to Germany (~$5k); taking ten ATMO463 students for a study abroad trip over spring break (co-sponsored by ATMO and College of Geosciences)

2007-2010 Characterization of East Texas Air Quality (Co-I; joint project between TAMU and University of Houston researchers); $48.6k/2 yrs; award number R-07-0157

2009-2010 NSF: ARRA-EAGER: Mixing ratio and flux measurements of Volatile Organic Compounds during BEARPEX 2009 using a portable, self-sufficient REA-GC-FID system (PI); ~$85,000, award-# ATM-0934345

Present

2010-2015 NSF-CAREER – Using an urban-to-rural gradient as a proxy for global change effects on selected biosphere-atmosphere trace gas exchanges (PI); ~$600,000, award-# 0955438

2010-2013 EPA-STAR: Improving emission inventories using direct flux measurements and modeling (PI); ~$500,000; award-# RD834556

2010-2012 NOAA-GCC: Anthropogenic and biogenic carbon fluxes from typical urban land uses in Houston, TX (PI); ~$250,000; award #NA10OAR4310089

• Supervised Students

pre-TAMU:
Dr. Gabrielle Dreyfus (Undergraduate at UC Berkeley with Dr. Allen Goldstein): 1999-2001
Dr. Sheena Juliet Solomon (Dr. *rer. nat.* at University of Bremen): 2003-2007 (May 2007)
Dr. Ngwa Martin Ngwabie (MSc at University of Bremen): 2004-2005 (Aug 2005)

Faculty Advisor (Advisory Committee Chair):

Changhyoun Park (PhD, ATMO): 2005-2010
Ian Boedeker (MSc candidate ATMO): 2006-2011
Jonathan Gramann (MSc candidate ATMO): 2010-
Lijun Zhou (MSc ATMO): 2006-2010
Nicolas Werner (MSc ATMO): 2010-2012
Marty Hale (MSc candidate ATMO): 2011-

Siraj Khan (UG assistant, College of Geosciences): 2006-2007
Jerald Meadows (UG assistant, Dept. of Atmos. Sci.): 2007-2008
Seth Adams (UG assistant, Spatial Sciences Program, College of Geosciences): 2007-2008
Katie Suter (UG assistant, Dept. of Atmospheric Sciences): Fall 2008
Brian Haines (UG assistant, Dept. of Atmospheric Sciences): Fall 2009
Ayrton Bryan (UG assistant, Dept. of Atmospheric Sciences): 2010-2011
Donald Vierling (UG assistant, Dept. of Atmospheric Sciences): 2010
Ben Stewart (UG assistant, College of Geosciences Environmental Studies Program): 2012-
Laura Hempel (REU student, Dartmouth College): summer 2011

[1] The agricultural branch of the Ministry (BM) of Consumer Protection (V), Nutrition (E), and Agriculture (L)

[2] **D**eutscher **A**kademischer **A**ustausch**d**ienst (German Academic Exchange Service)

Anna Phohl (REU student, Pacific Lutheran University): 2011

Member of Advisory Committee:
Naruki Hiranuma (PhD, ATMO): 2005-2010
Lindsey Visser (MSc, OCNG): 2008-2009
Lei Hu (PhD, OCNG): 2008-2012
Yina Liu (PhD, OCNG): 2008-2013

• Courses Taught

At the IUP in Bremen:
Measurement Methods Practical (Lab), co-taught, University of Bremen, 2003 – 2004
Trace Gas Biogeochemistry, Dept. Environmental Physics, University of Bremen, Fall 2003
Tropospheric Chemistry, Dept. Environmental Physics, University of Bremen, Spring 2004

At Texas A&M University:
ATMO201: *Atmospheric Sciences*, Summers 2009 and 2010 (approx. 30 students each)
GEOS489/ATMO689: *Global Biogeochemical Cycles*, Fall Sem.2005 (8 students: 5 UG/3 G)
I designed this course new for the College and Department in 2005, then went through the admission procedure to make it a writing-intensive (GEOS489-900) in 2006
ATMO613: *Advanced Atmospheric Chemistry*, Spring Sem. 2006, 2010, 2011 (8, 3, and 5 students)
ATMO689: *Introduction to Atmospheric Chemistry*, Fall Sem.2006, 2007, 2008 (6, 8, and 8 students)
I designed extensive online notes that have been recognized beyond Texas A&M
ATMO463: *Air Pollution Meteorology*, Spring Sem. 2007, 2008, 2009 (5, 10, and 15 students)
I redesigned this course to include both Atmospheric Dynamics and Chemistry topics; I also designed the course to be taught through the online Blackboard Vista system

ATMO485: directed studies
ATMO491: undergraduate research
ATMO691: Research
guest-taught in Fall Sem. 2007 and 2008 in IPY course by Chuck Kennicutt (GEOS489)
UGST181-503: *Science Denialism*, freshman undergraduate seminar, Fall 2011 (18 students)

• Service

Departmental/College Service:
- Department of Atmospheric Sciences Undergraduate Committee: Member since 2005
- Department of Atmospheric Sciences Qualifying Exam Committee: Member since 2007
- College Undergraduate Curriculum Committee: Member 2007-2009

Outside Service:
- American Geophysical Union (AGU) member since 1997
- Air &Waste Management Association (AWMA) member since 2006
- Proposal Reviewer for NSF, NOAA, DFG, and European Science Foundation (ESF)
- Review Panel member for ESF
- Journal reviewer for
    - Atmospheric Environment
    - Journal of Geophysical Research - Atmospheres
    - Atmospheric Chemistry and Physics
    - Global Biogeochemical Cycles
    - Tellus B
    - Geophysical Research Letters (AGU)
    - Journal of Environmental Quality

    - Canadian Journal of Forest Research
  - Plant Biology
  - European Journal of Soil Science
  - Biogeosciences (EGU)
  - Journal of Geophysical Research –Biogeosciences
  - Biogeochemistry
  - Agricultural and Forest Meteorology
  - Field Crops Research
  - Environmental Chemistry

- **Publications**

Published or in press in the peer-reviewed literature (last 5 years, advised students in *italic*)**:**

35. Haofei Zhang, David R. Worton, Michael Lewandowski, John Ortega, Caitlin L. Rubitschun, Jeong-Hoo Park, Kasper Kristensen, Pedro Campuzano-Jost, Douglas A. Day, Jose L. Jimenez, Mohammed Jaoui, John H. Offenberg, Tadeusz E. Kleindienst, Jessica Gilman, William C. Kuster, Joost de Gouw, *Changhyoun Park*, **Gunnar W. Schade**, Amanda A. Frossard, Lynn Russell, Lisa Kaser, Werner Jud, Armin Hansel, Luca Cappellin, Thomas Karl, Marianne Glasius, Alex Guenther, Allen H. Goldstein, John H. Seinfeld, Avram Gold, Richard M. Kamens, and Jason D. Surratt, Organosulfates as Tracers for Secondary Organic Aerosol (SOA) Formation from 2-Methyl-3-Buten-2-ol (MBO) in the Atmosphere, Environmental Science and Technolology, 46 (17), 9437–9446, doi: 10.1021/es301648z, 2012.

34. N. C. Bouvier-Brown. **G.W. Schade**, L. Misson, A. Lee, M. McKay, and A.H. Goldstein, Contributions of biogenic volatile organic compounds to net ecosystem carbon flux in a ponderosa pine plantation, *Atmospheric Environment* 60, 527–533, 2012.

33. Mao, J., X. Ren, L. Zhang, D. M. Van Duin, R. C. Cohen, J.-H. Park, A. H. Goldstein, F. Paulot, M. R. Beaver, J. D. Crounse, P. O. Wennberg, J. P. DiGangi, S. B. Henry, F. N. Keutsch, *C. Park*, **G. W. Schade**, G. M. Wolfe, J. A. Thornton, and W. H. Brune, Insights into hydroxyl measurements and atmospheric oxidation in a California forest, Atmospheric Chemistry and Physics, 12, 8009-8020, 2012

32. Beaver, M. R.; St Clair, J. M.; Paulot, F.; Spencer, K. M.; Crounse, J. D.; LaFranchi, B. W.; Min, K. E.; Pusede, S. E.; Wooldridge, P. J.; **Schade, G. W**.; *Park, C*.; Cohen, R. C.; Wennberg, P. O., Importance of biogenic precursors to the budget of organic nitrates: observations of multifunctional organic nitrates by CIMS and TD-LIF during BEARPEX 2009. *Atmospheric Chemistry and Physics*, 12 (13), 5773-5785, 2012.

31. *Park, C*., **G.W. Schade**, and *I. Boedeker*, Correction to "Characteristics of the flux of isoprene and its oxidation products in an urban area", *JGR-Atmospheres*, 117, D01304, doi 10.1029/2011jd017254, 2012

30. **Schade, G.W**., *S. Khan, C. Park,* and *I. Boedeker*, Rural southeast Texas air quality measurements during the 2006 Texas Air Quality Study, *Journal of the Air and Waste Management Association*, 61, 1070-1081, 2011

29. *Park, C*., **G.W. Schade**, and *I. Boedeker*, Characteristics of the flux of isoprene and its oxidation products in an urban area, *JGR-Atmospheres*, 116, D21303, doi 10.1029/2011jd015856, 2011

28. **G. W. Schade**, *S. J. Solomon*, E. Dellwik, K. Pilegaard, A. Ladstätter-Weissenmayer, Methanol and other VOC fluxes from a Danish beech forest during springtime, *Biogeochemistry*,106(3), 337-355, 2011

27. C. Park, **G.W. Schade**, I. Boedeker, Flux Measurements of Volatile Organic Compounds by the Relaxed Eddy Accumulation method combined with a GC-FID system north of downtown Houston, Texas, *Atmospheric Environment*, 44, 2605-2614, 2010

26. **G. W. Schade**, and B. Rappenglück, Unique Meteorological Measurements during hurricane Ike's passage over Houston, *EOS*, 90(25), 215-216, 2009.

25. Apel, E. C., Brauers, R. Koppmann, R. Tillmann, C. Holzke, R. Wegener, J. Boßmeyer, A. Brunner, T. Ruuskanen, M. Jocher, C. Spirig, R. Steinbrecher, R. Meier, D. Steigner, E. Gomez Alvarez, K. Müller, *S.J. Solomon*, **G. Schade**, D. Young, P. Simmonds, J.R. Hopkins, A.C. Lewis, G. Legreid, A. Wisthaler, A. Hansel, R. Blake, K. Wyche, A. Ellis, P.S. Monks, Intercomparison of oxygenated volatile organic compound measurements at the SAPHIR atmosphere simulation chamber, *J. Geophys. Res.*, 113, D20307, doi:10.1029/2008JD009865, 2008

24. *Solomon, S. J.*, **Schade, G. W**., Ladstätter-Weissenmayer, A., and Burrows J., VOC concentrations in an indoor workplace environment of a university building, *Indoor and Built Environment*, 17(4), 260-268, 2008

23. Steiner, A.L., Cohen, R.C., Harley, R.A., Tonse, S., Goldstein, A.H., Millet, D.B., and **Schade, G.W.**, VOC reactivity in central California: Comparing an air quality model to ground based measurements, *Atmos. Chem. Phys., 8*, 351–368, 2008

22. *Ngwabie, N.M.*, **Schade, G.W**., Custer, T.G., Linke, S., Hinz, T., Abundances and flux estimates of VOCs from a dairy cowshed in Germany, *Journal of Environmental Quality*, 37, 565-573, 2008

21. H. J. Hellebrand and **G. W. Schade**, Carbon monoxide from composting due to thermal oxidation of biomass, *Journal of Environmental Quality*, 37, 592-598, 2008

Non peer-reviewed publications:

Book Chapters

G.W. Schade, Meteorological Characteristics of Hurricane Ike During its Passage over Houston, Texas, in: *Hurricane Research*, edited by Kieran Hickey, ISBN 980-953-307-559-9, 2012

Theses/Reports/Other

Schade, G., Abschlussbericht, DFG project BU688/12-1, *Laboratory and Field Measurements of Methanol Fluxes*, Bremen, Sep. 2008.

Ngwabie, N.M., **Schade, G.W.**, Custer, T.G., Linke, S. and Hinz, T., Volatile organic compound emission and other trace gases from selected animal buildings, *Landbauforschung Völkenrode,* 57, 273-284, 2007

Schade, G.W., 1997, *CO-Emissionen aus abgestorbener, pflanzlicher Biomasse*, **Doctoral thesis**, Johannes Gutenberg University, Mainz, Germany.

Schade, G.W., 1993, *Emissionen volatiler, aliphatischer Amine aus intensiver Viehhaltung*, **Diploma-thesis**, Institute of Physical Chemistry, Johannes Gutenberg University, Mainz, Germany.

CURRICULUM VITA

CLIFFORD SPIEGELMAN

Department of Statistics Blocker 459A TAMU 3143 Texas A&M University College Station, TX 77843-3143 Phone: 979-845-8887 Fax: 979-845-3144

EDUCATION:

1970 B.A., Economics, Math, Statistics, SUNY/ Buffalo.

1973 M.S., Managerial Economics, Northwestern University. 1976 Ph.D., Statistics/Applied Mathematics, Northwestern University.

ACADEMIC APPOINTMENTS:

1976 -1977 Assistant Professor of Statistics, Florida State University.

1978 -1987 Statistical Engineering Division, National Bureau of Standards, Gaithersburg, MD.

1982 -1983 Visiting Faculty Member, Department of Mathematics, Northwestern University. 1986 Visiting Faculty Member, Department of Math Sciences, Johns Hopkins University.

1987 – 1990 Associate Professor, Department of Statistics, Texas A&M University.

1990 -2009 Professor, Department of Statistics, Texas A&M University.

1993 -1996 Adjunct Professor of Chemistry, Lamar University. 2004 -Senior Research Scientist, TTI.

2005 -2008 Adjunct Investigator, Biostatistics Branch, Division of Cancer Epidemiology and Genetics National Cancer Institute.
2005- NCI Proteomics Program Consultant.
2009- Distinguished Professor of Statistics, Texas A&M University.

MAJOR RESEARCH INTERESTS:

Receptor modeling, calibration curves, nonparametric curve fitting, applications of statistics particularly to chemistry, proteomics, the environment and transportation.

RESEARCH FUNDING:

(PI) NSF, "Renewal of Development of Calibration Curve Methods and an Investigation of their Properties", August 1991, $45,000.00. (PI) NSF, "Mathematical Sciences: Renewal of Development of Calibration Curve Methods and an Investigation of their Properties", August 1992 – July 1995, $45,000.00.

(PI) TNRCC, "Texas National Resources Conservation Commission", October 1, 1993 – August 15, 1994,

$90,000.00. (PI) DOC-NIST, "Support for the Conference on Environmental Chemometrics and Chemometrics", September 27, 1994 – September 13, 1995, $4,000.00.

(PI) Texas A&M Research Foundation, "Further Source Profile Development Using Multivariate

Techniques, Transfer of the Technology to the TNRCC", January 27, 1995 – August 31, 1996, $120,000.00.
(PI) NSF, "Establishing Chemometric and Statistical Foundations of Receptor Models", May 1, 1996 – April 30, 2000, $140,000.00.

(PI) NSF, "Robust Receptor Modeling", 1997 -2001, $80,000.00.

(PI) Amarillo National Resource Center for Plutonium, "Improving Spectroscopy Calibration and Limit of Detection", January 16, 1998 – January 15, 1999, $119,796.00. (PI) Bureau of Transportation Statistics, "System-Level Quality Control for the Date Collections and

Archiving", May 17, 2001 – December 31, 2002, $95,000.00.

(Co-PI) Texas Department of Transportation, "Asphalt Quality Assurance", September 1, 2001 – August 31, 2002, $115,656.00. (Co-PI) Texas Department of Transportation, "Stat Services for Materials and Pavements", January 7, 2002 –

August 31, 2002, $225,000.00.

(PI) Texas Department of Transportation, "Statistical Support", January 27, 2003 – August 31, 2003, $45,000.00. (PI) Texas Commission on Environmental Quality, "TCEQ Notice to Proceed work order 582-03-58881-05",

July 1, 2004 – August 31, 2004, $19,517.00.

(PI) Texas Commission on Environmental Quality, "Estimation of Nox Emissions from Compressor Engines", June 10, 2005 – August 31,2005, $140,000.00. (PI) State of Texas, "Writing a Statistics Text for Transportation Students", September 1, 2005 – August 31,

2006, $45,000.00.

(PI) Capital Consulting Corporation, "CCC-NCI-Clinical Proteomic Technical INI", September 1, 2005 – November 30, 2006, $244,346.00. (PI) NCI, "NCI-IPA-Spiegelman", January 1, 2006 – December 31, 2009, $119,421.54.

(PI) SAIC-Frederick, Inc., "SAIC-Frederick-NCI-Proteomic Technology", April 3, 2006 – December 31, 2008, $1,806,780.68.
(PI) Southwest Region University Transportation Center, January 1 – August 31, 2008, for textbook, $62,437.00.

From 1997 – Present, Texas Transportation Institute guarantees five months support each calendar year.

(TTI) UTCM for mobility prediction, 2010

(TTI, Co PI) HEI for health effects of air pollution, 2010-2011

(TTI, CO PI) Predicting oil change intervals for TxDOT, 2010-2011

(TTI) South West University Transportation Center , $30,000.00, 2011

TAMU-Weizmann grant $88,000, 2012-2014

SELECTED PROFESSIONAL ACTIVITIES:

***National* Committees:**

1987 International Chemometric Society Representative to the ASA.

1987 -1991 Head ASA Committee on Statistics in Chemistry.

1987 -1991 Executive board ASA Section on Physical and Engineering Sciences.

1987 -1991 Head of Conference on Mathematics in Chemistry.

1990 -1991 President, South East Texas Chapter of the American Statistical Association.

1991 -1992 Past President, South East Texas Chapter of the American Statistical Association.

1994 Member, Federal Advisory Committee ACT Committee to EPA.

1994 – 1996 Member ASA Committee on International standards, Head of Committee, 1996.

2002-2003 Head and Co-organizer of Transportation Interest Group with the ASA Editorial.

2003 NRC committee for the FBI Bullet Lead Analysis.

2007 Managing Board Member, Institute for Studies in Science and Law

2008 -2013 Board of Trustees, National Institute of Statistical Sciences (2nd and Final Term)

2001 -2011 Member, Committee on Statistical Methodology and Statistical Computer Software in Transportation Research, Transportation Research Board, Division of NRC. (Term Limited)

2012-2013 President, South East Texas Chapter of the American Statistical Association.

2012-Member Technical Advisory Forensic Group for the city of Houston, Texas

Department of Statistics Committees:

1987 - Director of the Laboratory for Statistical Science in Chemistry
1987 -1988 Library Committee
1995 Graduate Program Committee Recruiting Committee
1988 -1990 Colloquium Chair
2004 - TAMU Representative to NISS
2004 – 2005 Promotion and Tenure Committee
2009 -2010

Selected Editorial:

1985 Guest Editor of the *NBS Journal of Research*, November-December 1985 issue containing the Chemometrics Research Conference Proceedings.

1986 - Editor of *Chemometrics and Intelligent Laboratory Systems*.
1986 -1999 Editorial Board *The Journal of Chemometrics*.
1988 -1994 Associate Editor of *Journal of the American Statistical Association.*
1988 Acting Editor of *Journal of the American Statistical Association*, Theory and Methods Section, July.
1988 Invited Contributing Scholar for *Chemtracts-Analytical and Physical Chemistry*.
2002 - Associate Editor for *Journal of Environmetrics.*
2001 -2006 Editorial Board of the *Journal of Transportation and Statistics.*
2006 - Member, Editorial Advisory Board for the *Journal of Proteome Research*.

HONORS AND AWARDS:

1990 *Fellow*, *Institute of Mathematical Statistics*. This award recognizes candidates who have demonstrated distinction in research in statistics probability, by publication of independent work of merit.

1991 *W. J. Youden Award given by the American Statistical Association for the best paper on Interlaboratory Comparisons*. Selection Criteria: Interlaboratory tests constitute a broad field of statistical activity in commercial, regulatory, and industrial practice. They are used in many disciplines for comparing results produced in different laboratories, for determining consensus

values, and for assessing and developing test methods. Such studies are often interactive, with the goal to reduce discrepancies among results obtained in the participating laboratories.

1992 *Fellow, American Statistical Association*. This award recognizes full members of established reputation who have made outstanding contributions in some aspect of statistical work. This award is of great honor as it is limited to no more than 1/3 of 1% of the ASA membership

1993 *Ordinary Member, International Statistical Institute*. This membership is elected by virtue of his distinguished contributions to the development or application of statistical methods, or to the administration of statistical services, or the development and improvement of statistical education.

1994 *Distinguished Achievement Award, ASA Section on the Environment*. Received award in recognition of the outstanding contributions to the development of methods, issues, concepts, and applications of environmental statistics.

2002 *Statistics in Chemistry Award for Best Paper*. Criteria to receive this award includes: the innovative use of statistics to solve a problem in chemistry, and the impact of the solution on the problem. Only work published in refereed statistics, chemistry or chemometrics journals are considered.

2005 ASA Invited *Chance* Lecturer.

2007 *Jerome Sacks Award for Cross-Disciplinary Research*. This award is given to an individual whose work is cross-disciplinary and encompasses innovation in the statistical sciences. Preference will be given to work that creates new research relationships or substantially buttresses extant relationships.

2008 *The 2008 JSM Statistics in Chemistry Award*. This award is for or the innovative use of statistics to solve a problem in chemistry and the impact of the solution on the problem. "Chemical and forensic analysis of JFK assassination bullet lots: Is a second shooter possible?" *The Annals of Applied Statistics*, (2007), Vol. 1, No. 2, 287-301.

2008 *The 2008 RFK Memorial Journalism Award for domestic television*. This award was given to 60 Minutes for the segment, "Evidence of Injustice" where I was a contributor of background information regarding CBLA misuse.

SUPERVISORY DUTIES:

1978 -1986 Supervised three Statistical Engineering Division Research Contracts.

1978 -1987 Supervised junior level statisticians on consulting projects.

1980 -1985 Head of the National Bureau of Standards, Center for Applied Mathematics, Expository Seminar Series.

CONFERENCES ORGANIZED:

1985 A Principal co-organizer of Chemometrics Research Conference, Gaithersburg, MD.

1989 A Principal co-organizer of Mathematics in Chemistry Conference, College Station, TX.

1995 A Principal co-organizer of Third International Conference on Environmetrics and Chemometrics Conference, Las Vegas, NV.

2000 A Principal co-organizer of the Fourth International Conference on Environmetrics and Chemometrics, Las Vegas, NV.

2008 A Principal co-organizer of the AAAS Data Exploration Workshop, Washington, DC.

PH. D. STUDENTS:

1991 Chyon-Hwa Yeh (Chair)

1997 Eun Sug Park (Chair)

2000 Byron Gajewski (Chair)

2001 Jacqueline Kiffe (Co-Chair)

2002 Naijun Sha (Co-Chair)

PUBLICATIONS:

Refereed Publications (last 5 years)

2008 Park, E. S., Smith, R., Freeman, T., and **Spiegelman, C. H.** (2008), "A Bayesian Approach for Improved Pavement Performance Prediction," *Journal of Applied Statistics*, 35, 1219-1238..

2008 Park, E. S., Rilett, L. R., and **Spiegelman, C. H.** (2008), "A Markov Chain Monte Carlo-Based Origin Destination Matrix Estimator that is Robust to Imperfect Intelligent Transportation Systems Data ," *Journal of Intelligent Transportation Systems*, 12, 139-155.

2009 Nagyvary, Joseph, Guillemette, Ray, and **Spiegelman, Clifford** (2009). "Mineral Preservatives in the Wood of Stradivari and Guarneri", *PLoS ONE*, http://dx.plos.org/10.1371/journal.pone.0004245

2009 Paulovich, A., Billheimer D., Ham, A.L., Vega-Montoto, L., Rudnick, P., Tabb, D., Wang, P., Blackman, R., Bunk, D., Cardasis, H., Clauser, K., Kinsinger, C., Schilling, B., Tegeler, T., Variyath, A., Wang, M., Whiteaker, J., Zimmerman, L., Fenyo, D., Carr, S., Fisher, S., Gibson, B., Mesri, M., Neubert, T., Regnier, F., Rodriguez, H., **Spiegelman, C.**, Stein, S., Tempst, P., Liebler, D. (2009). "A CPTAC Inter-laboratory Study Characterizing a Yeast Performance Standard for Benchmarking LC-MS Platform Performance", *MCP Papers in Press,* http://www.mcponline.org/cgi/reprint/M900222-MCP200v1

2009 Rudnick, P., Clauser, K., Kilpatrick, L., Tchekhovskoi, D., Neta, P., Blonder, N., Billheimer, D., Blackman, R., Bunk, D., Cardasis, H., Ham, A.J., Jaffe, J., Kinsinger, C., Mesri, M., Neubert, T., Schilling, B., Tabb, D., Tegeler, T., Vega-Montoto, L., Variyath, A., Wan, M., Wang, P., Whiteaker, J., Zimmerman, L., Carr, S., Fisher, S., Gibson, B., Paulovich, A., Regnier, F., Rodriguez, H., **Spiegelman, C**., Tempst, P., Liebler, D., and Stein, S. (2009). "Performance Metrics for Liquid Chromatography-Tandem Mass Spectrometry Systems in Proteomic Analyses and Evaluation by the CPTAC Network", *MCP Papers in Press, http://www.mcponline.org/cgi/reprint/M900223-MCP200v2*

2009 Addona, T., Abbatiello, S., Schilling, B., Skates, S., Mani, D., Bunk, D., **Spiegelman, C**., Zimmerman, L., Ham, A.J., Keshishian, H., Hall, S., Allen, S., Blackman, R., Borchers, C., Buck, C., Cardasis, H., Cusack, M., Dodder, N., Gibson, B., Held, J., Hiltke, T., Jackson, A., Johansen, E., Kinsinger, C., Li, J., Mesri, M., Neubert, T., Niles, R., Pulsipher, T., Ransohoff, D., Rodriguez, H., Rudnick, P., Smith, D., Tabb, D., Tegeler, T., Variyath, A., Vega-Montoto,

L., Wahlander, A., Waldemarson, S., Wang, M., Whiteaker, J., Zhao, L., Anderson, N., Fisher, S., Liebler, D., Paulovich, A., Regnier, F., Tempst, P., Carr, S. (2009). "Multi-site assessment of the precision and reproducibility of multiple reaction monitoring–based measurements of proteins in plasma", *Nature Biotechnology***,** 27, 633 – 641.

2009 Tabb, D., Vega-Montoto, L., Rudnick, Paul., Variyath, A., Ham, A.J., Bunk, D., Kilpatrick, L., Billheimer, D., Blackman, R., Cardasis, H., Carr, S., Clauser, K., Jaffe, J., Kowalski, K., Neubert, T., Regnier, F., Schilling, B., Tegeler, T., Wang, M., Wang, P,. Whiteaker, J., Zimmerman, L., Fisher, S., Gibson, B., Kinsinger, C., Mesri, M., Rodriguez, H., Stein, S., Tempst, P., Paulovich, A., Liebler, D., **Spiegelman, C.H.** (2009). "Repeatability and Reproducibility in Proteomic Identifications by Liquid Chromatography-Tandem Mass Spectrometry". *Journal of Proteome Research*

2010 Tabb, D., Vega-Montoto, L., Rudnick, Paul., Variyath, A., Ham, A.J., Bunk, D., Kilpatrick, L., Billheimer, D., Blackman, R., Cardasis, H., Carr, S., Clauser, K., Jaffe, J., Kowalski., Neubert, T., Regnier, F., Schilling, B., Tegeler, T., Wang, M., Wand, P., Whiteaker, J., Zimmerman, L., Fisher, S., Gibson, B., Kinsinger, C., Mesri, M., Rodriguez, H., Stein, S., Tempst, P., Paulovich, A., Liebler, D., **Spiegelman, C.H. (Communicating Author)** "Repeatability and Reproducibility in Proteomic Identifications by Liquid Chromatography-Tandem Mass Spectrometry". Journal of Proteome Research,9, 761-776

2010 Nell Sedransk, Linda J. Young, Katrina L. Kelner, Robert A. Moffitt, Ani Thakar, Jordan Raddick, Edward J. Ungvarsky, Richard W. Carlson, Rolf Apweiler, Lawrence H. Cox, Deborah Nolan, Keith Soper and **Cliff Spiegelman** "Make Research Data Public?-Not Always so Simple": A Dialogue for Statisticians and Science Editors; Statist. Volume 25, Number 1 (2010), 41-50.

2010 Rudnick, P.A., Clauser, K.R., Kilpatrick, L.E., Tchekhovskoi, D.V., Neta, P., Blonder, N., Billheimer, D.D., Blackman, R.K., Bunk, D.M., Cardasis, H.L., Ham, A.J., Jaffe, J.D., Kinsinger, C.R., Mesri, M., Neubert, T.A., Schilling, B., Tabb, D.L., Tegeler, T.J., Vega-Montoto, L., Variyath, A.M., Wang, M., Wang, P., Whiteaker, J.R., Zimmerman, L.J., Carr, S.A., Fisher, S.J., Gibson, B.W., Paulovich, A.G., Regnier, F.E., Rodriguez, H., Spiegelman, C., Tempst, P., Liebler, D.C., Stein, S.E., Performance Metrics for Liquid Chromatography-Tandem Mass Spectrometry Systems in Proteomics Analyses, Mol. Cell Proteomics, 2010 Feb., 9(2), pp. 225-241.

2011 Population and Temperature Effects on Lucilia Sericata (Diptera: Calliphoridea) Body Size and Minimum Development Time

2011 A Nonparametric Approach Based on a Markov like Property for Classification-Review Article Chemometrics and Intelligent Laboratory Systems, Volume 108, Issue 2, 15 October 2011, Pages 87-92 Eun Sug Park, Clifford Spiegelman, Jeongyuon Ahn

2011 Tarone, A. M.; Picard, C. J.; **Spiegelman, C.;** et al. (2011). Population and Temperature Effects on Lucilia sericata (Diptera: Calliphoridae) Body Size and Minimum Development Time. *Journal Of Medical Entomology (48) 5,1062-1068, DOI: 10.1603/ME11004*

2012 **Spiegelman C.H.**, Tobin, W.A. (2012). Analysis of experiments in forensic firearms/toolmarks practice offered as support for low rates of practice error and claims of inferential certainty. *Law, Probability, and Risk*, *(2012) 0, 1–19 doi:10.1093/lpr/mgs028 To appear in hard copy*.

2012 Lahiri, S. N., **Spiegelman, C**., Appiah, J., and Rilett. L. Gap Bootstrap Methods For Massive Data Sets With An Application To Transportation Engineering. The Annals of Applied Statistics Vol. 6, No. 4, 1552–1587.

Not Refereed Publications

Columns:

2010 **Spiegelman, C**., Weak Forensic Science Has High Cost" and "Probability Statements Should Be Introduced into Scientific Testimony, AMSTATNEWS March Issue

2011 **Spiegelman, C.,** Schwartz, A., and Philpott, K., Putting the Science in Forensic Science**,** AMSTATNEWS, August Issue

2012 **Spiegelman, C., and** Tobin W. A.**,** Forensic evidence lacks science, Dec. 30 Austin American Statesman, cover of insight and book review section.

2013 Tobin W. A. **and Spiegelman, C.** Gun evidence often wide of scientific mark, March 3 Austin American Statesman, cover of insight and book review section.

Selected Books and Book Chapters

1990 Massart, D.L., Brereton, R.G., Dessy, R.E., Hopke, P.K., **Spiegelman, C.H.**, & Wegscheider, W. (Eds.). (1990). Chemometric Tutorials. Elsevier, Amsterdam.

1992 Brereton, R.G., Scott, D.R., Massart, D.L., Dessy, R.E., Hopke, P.K., **Spiegelman, C.H.**, & Wegscheider, W. (Eds.). (1992). Chemometric Tutorials II. Elsevier, Amsterdam.

2008 Tauler, R., Paatero, P., Henry, R.C., **Spiegelman, C**., Park, E.S., Poirot, R.L., Viana, M., Querol, X., and Hopke, P.K. (2008). Identification, Resolution and Apportionment of Contamination Sources, Environmental Modeling, Software and Decision Support. 269-284. (Book chapter)

2011 Transportation Statistics and Microsimulation, by **Spiegelman C.,** Park E.S., and Rilett L., CRC

Conference Proceedings' Papers

1979 **Spiegelman, C.H.** (1979). Estimating the Effect of a Large Scale Pretest Posttest Social Program. (Summary of main results from Ph.D. Thesis). *ASA Proceedings of the Social Statistics Section*; 370-373.

1980 Trochim, W.M.K. & **Spiegelman, C.H.** (1980). The Relative Assignment Variable Approach To Selection Bias In Pretest-Posttest Group Designs. *ASA Proceedings of the Section of Survey Research Methods*, 376-381.

Editorials

1986 **Spiegelman, C.H.** (1986), Editorial. *Chemometrics and Intelligent Laboratory Systems 1*(1), 3.

1988 **Spiegelman, C.H.** (1988). Collaborative Work. C*hemometrics and Intelligent Laboratory Systems, 4*, 265.

1991 **Spiegelman, C.H**. (1991). Organizer's Summary. *Chemometrics and Intelligent Laboratory Systems 10*(1-2), 11-12.

1997 **Spiegelman, C.H.** (1997). Erratum: Papers Presented at the Third International

Conference On Environmetrics and Chemometrics in Las Vegas, NV, September 11-13, 1995. *Chemometrics and Intelligent Laboratory Systems, 38*(2), 245. 208-209.

2002 Nocerino, J., Singh, A., & **Spiegelman, C.H.** (2002). Special Issue: Fourth International Conference on Envirometrics and Chemometrics: Preface. *Chemometrics and Intelligent Laboratory Systems 60* (1-2), pp. 1-3.

2005 Hopke, P.K. & **Spiegelman, C.H**. (2005). Editorial. *Chemometrics and Intelligent Laboratory Systems*, *77*(1), 1-2.

2006 **Spiegelman, C.H.**, Pfeiffer, R., & Gail, M. (2006). Using Chemometrics and Statistics To Improve Proteomics Biomarker Discovery. *Journal of Proteome Research,* 5(3), 461-462.

2007 **Spiegelman, C.H.** (2007). Editorial. *Chemometrics and Intelligent Laboratory Systems* (85)2, 157-158.

Reviews

1989 **Spiegelman, C.H.** (1987). Systat. *Chemometrics and Intelligent Laboratory Systems, 6*(2), 89.

1990 **Spiegelman**, **C.H.** (1990). Statistical Software Packages For The Macintosh. *Chemometrics and Intelligent Laboratory Systems,* 9(2), 115-117.

1991 **Spiegelman, C.H.** (1991). StatView II and superANOVA. *Chemometrics and Intelligent Laboratory Systems, 11*(2), 198-199.

1991 Hardin, J.W. & **Spiegelman, C.H.** (1991). Mathematica. *Chemometrics and Intelligent Laboratory Systems, 11*(2), 199-200.

1991 **Spiegelman, C.H.** (1991). JMP®, JMP IN®, and JMP Serve™. *Chemometrics and Intelligent Laboratory Systems, 11*(3), 255.

1992 **Spiegelman, C.H.** (1992). SYSTAT 5.0 and MINITAB release 8. *Chemometrics and Intelligent Laboratory Systems, 12*(3), 299-300.

1992 **Spiegelman, C.H.** (1992). BBN/Catalyst Version 1.4. *Chemometrics and Intelligent Laboratory Systems*, *14*(1-3), 429-430.

1993 **Spiegelman, C.H.** (1993). MATLAB and the MATLAP Optimization Toolbok (MacIntosh Version). *Chemometrics and Intelligent Laboratory Systems, 19*(1), 128.

1994 **Spiegelman, C. H.** (1994). Review of MacIntosh Computer Products: Editor's Choices. *Chemometrics and Intelligent Laboratory Systems*, *22*(2), 279-282.

1995 **Spiegelman, C.H.** (1995). Soft Windows, Mathematica and Data Desk for the Macintosh PC. *Chemometrics and Intelligent Laboratory Systems, 28* (1), 208-209.

2010 Gap bootstrap methods for massive data sets by Lahiri, S.N., **Spiegelman, C.,** Appiah J., and Rilett, L. (Submitted to Annals of Applied Statistics)

Letters

2009 Krane, D., E., Bahn, V., Balding, D., Barlow, B., Cash, H., Desportes, B., L., D'eustachio, P., Devlin, K., Doom, T., E., Dror, I., Ford, S., Funk, C., Gilder, J., Hampikian, G., Inman, K., Jamieson, A., Kent, P., E., Koppl, R., Kornfield, I., Krimsky, S., Mnookin, J., Mueller,

L., Murphy, E., Paoletti, D., R., Petrov, D., A., Raymer, M., Risinger, D., M., Roth, A., Rudin, N., Shields, W., Siegel, J., A., Slatkin, M., Song, Y., S., Speed, T., **Spiegelman, C.,** Sullivan, P., Swienton, A., R., Tarpey, T., Thompson, W., C., Ungvarsky, E., and Zabell, S., (2009). Time for DNA Disclosure. *Science*, 326, 16311632.

INVITED PRESENTATIONS:

Presentations at Meetings and Conferences since 2001

2001 'Receptor Modeling', American Statistics Meeting, Atlanta, GA Transportation Research Board, Washington, D.C. National Institute of Standards of Technology, Gaithersburg, MD Canadian Statistical Society, Montreal, Canada 'Density Estimation', The International Environmetric Society, Portland, Maine

2002 Panel Discussion of the role of Transportation Statistics, Transportation Research Board (NRC) Homeland Security Luncheon, JSM 'Density Estimation', Canadian Statistical Society 'Calibration', Chemometric and Analytical Chemistry Meeting, Seattle, WA

2003 'Bayesian OD Estimation', Transportation Research Board (NRC) 'History of Chemometrics and Environmetrics', The ISI International Conference on Environmental Statistics and Health, Santiago de Compostela, Spain

2004 Forensics Session, JSM

2005 Bullet Lead American Statistics Association *Chance* Lecturer, JSM Bullet Lead Lecture at Washington Statistical Society

2006 Summit on Environmental Modeling – Receptor Modeling, Burlington, VT

'JFK Talk', Joint Statistical Meeting, Seattle, WA

'JFK Talk', Nanotechnology Colloquium, Austin, TX

Multivariate Methods in Environments – Receptor Modeling, Chicago, IL

2007 U.S. Environmental Protection Agency, Las Vegas, NV "JFL Talk"

U. S. Environmental Protection Agency, Las Vegas, NV "JFK Talk" ICSMRA, Lisbon, Portugal "Statistical Considerations on the Process of Discovering and Validating Biomarker Candidates Using MS Platforms." Army Conference, Houston, TX "JFK Bullet Talk" Eastern Analytical Symposium, Somerset, NJ "Two Conservative Approaches to Receptor-Modeling Uncertainty" November in Dallas Conference, "JFK Talk"

2010 USC on the Gapped Bootstrap (May) JSM on the Gapped Bootstrap (May)

Presentations at Universities

Ben-Gurion University of the Negev
Brigham Young University
Case Western Reserve University
Central Queensland University-
Rockhampton Clarkson University
Colorado State University George
Washington University

Harvard University/Dana Farber
Hebrew University-Jerusalem
Johns Hopkins University
McMaster University, Toronto, Canada
North Carolina State University
Northwestern University
Princeton University
Purdue University
Queens College – London
Rice University
Southern Methodist University
Stanford University
State University of New York at Albany
Texas Tech University, Lubbock, TX
University of California – Berkley
University of California – Los Angeles
University of California—San Diego
University of Central Florida
University of Colorado at Denver
University of Illinois – Champagne
University of Kent at Canterbury
University of Liverpool
University of Maryland
University of Missouri
University of North Carolina
University of South Carolina
University of Southern California
University of Texas
University of Washington
University of Waterloo
University of Wisconsin – Madison

CURRICULUM VITAE

PERSONAL INFORMATION

Name: Anne Mellody Sweeney

Business Address: Texas A&M Health Science Center
School of Rural Public Health
Department of Epidemiology and Biostatistics
TAMU 1266
College Station, TX 77843-1266

Business Phone: (979) 862-8168
Fax Number: (979) 458-1878
Email: sweeney@srph.tamhsc.edu

EDUCATION

Undergraduate: Marywood College
Scranton, PA
B.S. (Dietetics), 1975

Dietetic Internship: Hines VA Hospital
Hines, Illinois
1975-1976

Graduate: University of Pittsburgh
Pittsburgh, PA
M.P.H. (Epidemiology) 1988
Ph.D. (Epidemiology) 1991

PROFESSIONAL EMPLOYMENT

August 2009 – present: Professor (Tenured)
Epidemiology
Texas A&M Health Science Center
School of Rural Public Health

November 2012 – present: Joint appointment, Professor, Department of Humanities,
Texas A&M Health Science Center College of Medicine

January 2008-July 2009: Professor (Tenured)
Epidemiology
The Commonwealth Medical College

September 2002-December 2008: Associate Professor (Tenured)
Epidemiology
Texas A&M Health Science Center

	School of Rural Public Health
September 2001- August 2002	Associate Professor (Tenured) Epidemiology University of Texas - Houston School of Public Health
September 1993 - August 2001	Assistant Professor Epidemiology (Tenure Track) University of Texas - Houston School of Public Health
December 1990 - August 1993	Assistant Professor Program in Epidemiology/ (Non-tenure Track) Michigan State University
April 1979 - April 1985	Clinical Dietitian United Hospital Center Clarksburg, W.VA
August 1976 - February 1979	Clinical Dietitian Georgetown University Hospital Washington, DC

HONORS AND ACADEMIC COMMITTEES

2012-present	Member, Institute of Medicine Roundtable on Environmental Health Sciences, Research, and Medicine
2011-present	Chair, Texas A&M University System School of Rural Public Health Appointment, Promotion and Tenure Committee
2011-present	Chair, Texas A&M University System School of Rural Public Health Faculty Council
2011-present	Member, Texas A&M University Health Science Center CAFFERT Committee
2011-present	Member, Texas A&M University Health Science Center Health Appointment, Promotion and Tenure Committee
2011-present	Member, Scholarly Thread Committee, TAMHSC College of Medicine
2011-present	Member, International Education Scholarship Committee Director, SRPH Program in Reproductive and Child Health
2010	Member, Nominations Committee, Texas A&M University System School of Rural Public Health
2010	Chair, Texas A&M University System School of Rural Public Health, Department of Epidemiology and Biostatistics Epidemiology Faculty Search Committee

2009-present	Program Director, Program on Reproductive and Children's Health, Texas A&M University System School of Rural Public Health
2009-2010	Chair, Texas A&M University System School of Rural Public Health, Department of Epidemiology and Biostatistics Appointment, Promotion and Tenure Committee
2008	Chair, Promotions and Tenure Committee, The Commonwealth Medical College
2008	Chair, Faculty Council, The Commonwealth Medical College
2008	Member of the Diversity Council, The Commonwealth Medical College
2008	Faculty Representative on the Leadership Council, The Commonwealth Medical College
2007-present	Member, Curriculum Advisory Committee, The Commonwealth Medical College
2007	Member, Research Committee, Texas A&M University System School of Rural Public Health Appointment
2006-2007	Member, Texas A&M University System School of Rural Public Health Appointment, Promotion and Tenure Committee
2006-2007	Chair, Personnel and Welfare Committee, Texas A&M Health Science Center Faculty Senate
2005-2007	Program Director, Program on Reproductive and Children's Health, Texas A&M University System School of Rural Public Health
2004-2007	School of Rural Public Health Faculty Senator, Texas A&M Health Science Center Faculty Senate
2003-present	Member, Alpha Tau Chapter of Delta Omega, Texas A&M University System School of Rural Public Health
2003-2007	Member, Ad Hoc Committee on Post Tenure review, Texas A&M University System School of Rural Public Health
2002-2006	Department of Epidemiology/Biostatistics Representative on the Appointment, Promotion and Tenure Committee, Texas A&M University System School of Rural Public Health
2002-2004	Member, Curriculum Committee, Texas A&M University System School of Rural Public Health
2002-2007	Department of Epidemiology/Biostatistics Representative on the Graduate School of Biological Sciences Curriculum and Academic Standards Committee Texas A&M University System
2001-2002	Convener, Occupational and Environmental Health Module, University of Texas-Houston School of Public Health

2001-2002	Member, Academic Affairs Committee, University of Texas School of Public Health
1999-2002	Member of the Research Council, University of Texas-Houston Health Science Center standing committee
1998	Member, Southern Association of Colleges and Schools (SACS) institutional self-study project for the University of Texas-Houston Health Science Center
1997-1998	Chair, Committee on the Status of Women, University of Texas-Houston Health Science Center standing committee
1994-1996	Admissions Committee, University of Texas-Houston School of Public Health
1989	Student Representative, Search Committee for Dean of the Graduate School of Public Health, University of Pittsburgh
1988	Inducted into the Omicron Chapter of Delta Omega
1987	Selected for the Society for Epidemiological Research Student Workshop
1975	Marywood College, B.S., Cum Laude Honor Societies: Kappa Omicron Phi, Kappa Gamma Pi, Delta Epsilon Sigma

PROFESSIONAL AFFILIATIONS

Society for Epidemiologic Research
International Society of Environmental Epidemiology
American College of Epidemiology

RESEARCH GRANTS

Current Projects
Prevalence of Spontaneous Abortion and Chromosomal Abnormalities in Bryan/College Station. TAMHSC Research Development Awards Program; 9/1/11-05/31/13. $40,000; Principal Investigator; 10% contributed effort.

Previously funded grants (last 5 years)

Validation of Retrospectively Reported Time-to-Pregnancy Data EMMES Corp. (Subcontract) 9/1/11-8/31/2012. $17,082; Principal Investigator; 20% effort.

Air Pollution and Ovarian Function. EMMES Corp.(Subcontract). 9/1/11-12/31/11;$9865; Principal Investigator; 5% effort.

Determinants of Male and Female Fecundity and Fertility. NICHD contract; 10/01/03-06/30/10. $5,820,671; Principal Investigator; 25% effort.

Effects of Aspirin in Gestation and Reproduction Clinical Trial. University at Buffalo subcontract: 05/01/08-04/30/11. $533,705; Principal Investigator; 10%. (Remained at The Commonwealth Medical

College).

Pending Proposals

The Study of Children's Health and Longitudinal Exposures (SCALES). NIEHS 7/1/12-8/31/15 Principal Investigator; 25%.

STUDY SECTIONS

2011	Member, National Institute of Child Health and Human Development review panel, Biomedical Analysis of Human Biospecimens, for the Division of Epidemiology, Statistics and Prevention Research
2011	Member, National Institute of Child Health and Human Development review panel, on Analysis of Human Biospecimens for Environmental Chemicals for the Division of Epidemiology, Statistics and Prevention Research
2005-2006	Ad-hoc Member, Pediatric Subcommittee, reviewer for T32 applications in response to PA-05-130. Washington, D.C.
2006	Member, Study Section for the National Institute of Child Health and Human Development review: "The Effects of Aspirin in Gestation and Reproduction (EAGR) Trial: Clinical Sites." Washington, D.C., July 16-17, 2006
2002	Chair, National Institute of Child Health and Human Development Concept Review: Determinants of Male and Female Fecundability. Telephone conference, July, 2002.
2000	Member, National Institute of Environmental Health Sciences site visit team. (1 P30 ES10126-01A1). University of North Carolina at Chapel Hill, May 31-June 2, 2000
2000	Member, Study Section for the U.S. EPA: Biomarkers for the Assessment of Exposure and Toxicity in Children. Silver Spring, Maryland, June 29-30, 2000
1998-2000	Ad-hoc review for the NIH's Alcohol and Toxicology 3 Study Section
1998	Ad-hoc reviewer for the U.S. EPA; "Reproductive Effects of Disinfection By Products in Drinking Water"; August 1998
1998	Member, National Institute for Environmental Health Sciences Study Section, RFA 97-004: Centers for Children's Environmental Health and Disease Prevention Research. Raleigh-Durham, North Carolina, March 22-25, 1998
1997	Member, National Institute of Environmental Health Sciences site visit team. Proposal to establish a Center for Environmental Health Research at Texas A&M University, College Station, Texas, May 5-7, 1997
1996	Member of the National Institute for Environmental Health Sciences study section for RFA ES-96-004: Linking of Environmental Agents and Disease, Raleigh-Durham, North Carolina, July 1-3, 1996

1995	Chair, National Institute for Occupational Safety and Heath Special Emphasis Panel for Proposals to Assess Injuries in the Construction Industry; Cincinnati, Ohio
1991	Ad-hoc proposal reviewer, National Institute of Neurological Disorders and Stroke Neurology Branch

PEER REVIEW PANELS AND WORKSHOPS

2010	Developed Training Modules for the Health Sector, World Health Organization on "Reproductive Health and the Environment".
2010	Member, Dioxin Review Panel, U.S. Environmental Protection Agency
2009-present	Member, Carbon Monoxide Review Panel, U.S. Environmental Protection Agency
2008	Member, Acrylamide Review Panel, U.S. Environmental Protection Agency
2008	Member, Northeast Regional Cancer Institute's Research Planning Committee
2006	Member, Ethylene Oxide Human Health Risk Assessment Review Panel (PFOA Review Panel), U.S. Environmental Protection Agency
2005	Member, Perfluorooctanoic Acid Human Health Risk Assessment Review Panel (PFOA Review Panel), U.S. Environmental Protection Agency
2005	Member of the mid-cycle peer review panel to evaluate the Human Studies Division,National Health and Environmental Effects, Office of Research and Development, U.S. EPA, Research Triangle Park, N.C.
2004	Member, Peer Review Panel to evaluate the U.S. EPA's Staff Risk Assessment Document
2003	Member of the Peer Review Panel to evaluate the Human Studies Division, National Health and Environmental Effects, Office of Research and Development, U.S. EPA, Research Triangle Park, N.C.
2003	Panel member, Supplemental Guidance to Assess Cancer Susceptibility, U.S. EPA, Washington, D.C.
2002-2008	Member, Science Advisory Board, U.S. Environmental Protection Agency, Environmental Health Committee
2001-2002	Member of the Institute of Medicine's Gulf War and Health Study Committee, serving on the expert panel on the health effects of pesticides
2001-2002	Member of the Fertility Committee, assigned to the National Longitudinal Cohort Study Planning Committee. Sponsored by the National Institute of Child Health and Human Development, the National Institute for Environmental Health Sciences, the Centers for Disease Control and Prevention, and the U.S. EPA.

1997	Invited participant at the U.S. EPA Workshop "Health Effects in Children along the U.S. - Mexico Border Due to Pesticide Exposure", El Paso, Texas; December 7-10, 1997
1997	Invited participant at the National Cancer Institute workshop "Assessing the Health of Migrant Farmworkers", San Antonio, Texas; February 23-25, 1997
1996-1997	Member of the Steering Committee for the research project: "Reproductive Health and Post- Traumatic Stress Disorder Related to Military Experience in Women Veterans." Principal Investigator Deborah del Junco, Ph.D. Department of Veterans Affairs Medical Center, Houston, TX
1993-1994	Member, U.S. EPA Dioxin Peer Review Panel; Washington, DC
1993	Invited participant, Workshop on Perinatal Exposure to Dioxin-Like Compounds, sponsored by the California Public Health Foundation, U.S. EPA and NIEHS; Berkeley, California
1992	Panel member, Developmental Neurotoxic Effects and PCBs Workshop, sponsored by the U.S. EPA; Washington, DC
1991	Invited participant, Workshop on Planning Phase III Studies for the Great Lakes Health Effects Cohort Study, Health and Welfare Canada, Health Protection Branch, Ottawa
	Reviewer for the *American Journal of Epidemiology, Epidemiology, American Journal of Public Health, Environmental Health Perspectives, Human Reproduction, Environmental Toxicology and Pharmacology, Environmental Research, Journal Toxicology Environmental Health, Reproductive Toxicology*

PUBLICATIONS

Refereed Journals (last 5 years)

*Kornosky JL, Peck JD, **Sweeney AM**, Adelson PL, Schantz SL. Reproductive Characteristics of Southeast Asian Immigrants Pre and Post Migration. J Immigr Minor Health. 2008;10(2):135-43.

Peck JD, **Sweeney AM**, Symanski E, Gardiner J, Silva MJ, Calafat AM, Schantz SL. Intra- and Inter-Individual Variability of Urinary Phthalate Metabolite Concentrations in Hmong Women of Reproductive Age. J Expo Science Environ Epidemiol 2010;20(1):90-100.

Schantz SL, Gardiner JC, Aguiar A, Tang X, Gasior DM, **Sweeney AM**, Peck JD, Gillard D, Kostyniak P. Contaminant profiles in Southeast Asian immigrants consuming fish from polluted waters in northeastern Wisconsin. Environ Res. 2010;110(1):33-9.

Britton Trabert B, Sigurdson AJ, Sweeney AM, Strom SS, McGlynn KA. Marijuana use and testicular germ cell tumors. Cancer 2011 Feb 15;117(4):848-53.

Trabert B, Sigurdson A, Sweeney A, Amato R, Strom S, McGlynn K. Baldness, acne and testicular germ cell tumors. Int J Androl. 2011 Aug;34(4 Pt 2):e59-67.

Louis GMB, Schisterman EF, Sweeney AM, Wilcosky TC, Gore-Langton RE, Lynch CD, Barr DB, Schrader SM, Kim S, Chen Z, Sundaram R, on behalf of the LIFE Study. Designing Prospective Cohort Studies for Assessing Reproductive and Developmental Toxicity during Sensitive Windows of Human Reproduction and Development – the LIFE Study. Paediatr Perinat Epidemiol. 2011 Sep;25(5):413-24.

Louis GMB, Sundaram R, Schisterman EF, Sweeney AM, Lynch CD, Gore-Langton RE, Chen Z, Kim S, Caldwell KL, Barr DB. Heavy metals and couple fecundity, the LIFE Study. Chemosphere. 2012 Jun;87(11):1201-7.

Louis GM, Sundaram R, Schisterman EF, Sweeney AM, Lynch CD, Gore-Langton RE, Maisog J, Kim S, Chen Z, Barr DB. Persistent Environmental Pollutants and Couple Fecundity: The LIFE Study. Environ Health Perspect. 2013 Feb;121(2):231-6. doi: 10.1289/ehp.1205301. Epub 2012 Oct 3.

Non-peer Reviewed Publications

del Junco D, Kadlubar F, Vernon S, Stancel G, **Sweeney A**, Wu X, Lang N, Schecter A, *Garzon A, Wheeler T. Detecting an association between prostate cancer occurrence and TCDD exposure in the U.S. Vietnam veteran population. Organohalogen Compounds 2000 48:95-98.

*Garzon AM, **Sweeney A**, del Junco D, Albanese RA. A case-control study of birth defects and cancer. Organohalogen Compounds 2000 48:167-170.

Letters/Commentaries

Waller DK, **Sweeney AM**. Pregnancy and the Timing of Intercourse New Engl. J Med. 1996;334:1266. (Letter to the Editor)

Sweeney AM, Symanski E, del Junco D. Commentary: Our response to Terrell et al.'s, comments. Env Res 2008 Sep;108(1):117-20.

* *Indicates graduate student advisee*

Book Chapters

Sweeney AM. The Reproductive Epidemiology of Dioxins. In: Dioxins and Health, A. Schecter, ed. Plenum Press: New York, N.Y.;1994; pp. 549-85.

Selevan S, **Sweeney AM**, Sweeney MH. The Reproductive Epidemiology of Dioxins. In: Dioxins and Health, A. Schecter, ed. Plenum Press: New York, N.Y.; 2003.

Sweeney A, del Junco D. Disorders of reproduction. In: Rothman N, Hainaut P, Schulte P, Smith M, Boffetta P, Perera F. Molecular epidemiology: principles and practices. Lyon: IARC Scientific Publication; 2011.

Sweeney AM, del Junco DJ, Warner M, Eskenazi B. Reproductive and Developmental Epidemiology of Dioxins. In: Dioxins and Health. Wiley; Schecter A ed.; 2012.

Reports

Sweeney MH, **Sweeney AM**. Epidemiology/Human Data. 2,3,7,8-tetrachlorodibenzo-p-dioxin and reproductive effects. In: Health Assessment Document for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) and Related Compounds. U.S. EPA; September 2000.

Mendola P, Bradman A, Dutton RJ, Hern S, Llorente A, Lugo A, **Sweeney A**. Developmental Workgroup Report in "Assessment of Health Effects of Pesticide Exposure in Young Children." EPA Report/600/R-99/086; May, 2000.

Cech I, Roberts BW, Harlass FE, **Sweeney AM**, Allen SD, Gerba CP, Englund J. A pilot study to investigate reasons for a cluster of neural tube defects near the Texas-Mexico border. Submitted to the Texas Department of Health, Austin, Texas; December 30, 1996.

Cooper S, Burau K, Hanis C, Smith MA, **Sweeney AM**, Vernon S, Wun C, Henry J, MacNaughton N, Robison T. NCI migrant farmworker questionnaire pretest in Starr County, Texas. Final report submitted to the National Cancer Institute (NCI Contract PO# 263-MQ-540170); October 1, 1996.

Cooper S, Burau K, Hanis C, Smith MA, **Sweeney AM**, Vernon S, Wun C, Henry J, MacNaughton N, Robison T. Tracing migrant farmworkers in Starr County, Texas. Final report submitted to the National Cancer Institute (NCI Contract PO# 263-MQ-528251); August 8, 1996.

INVITED PRESENTATIONS (last 5 years)

2012 Chemical Exposures Among Vietnam Veterans and Reproductive and Child Health:Still Unanswered Questions. Presented at the Vietnam Veterans of America meeting, Dallas, Texas, August 11, 2012.

2009 Environmental Contaminants and Reproductive Health. Presentation at the Mid-Atlantic Center for Children's Health and the Environment 7th Annual Conference, Baltimore, MD, September 10-11, 2009.

2009 Co-developed a workshop on "Communicating Epidemiology Research Results Effectively to Intended Audiences". December 7-8, 2009, Tampa, Florida. Sponsored by the Association of Maternal and Child Health Programs with the CDC.

2009 The Effects of Aspirin in Gestation and Reproduction (EAGeR) Trial. Presented at the Moses Taylor Hospital Grand Rounds, Scranton, Pennsylvania. January 21, 2009.

2008 The Heightening Controversy: Reproductive Effects of Endocrine Active Compounds. Presented at the Department of Epidemiology Seminar series. Michigan State University, East Lansing, Michigan. February 14, 2008.

2008 Reproductive Effects of Endocrine Active Compounds. Presented at the Mercy Hospital Noon Conference series. Mercy Hospital, Scranton, Pennsylvania. January 11, 2008.

Daniel Conrad Ogilvie Thornton

Daniel C. O. Thornton,
Associate Professor
Department of Oceanography,
Texas A & M University,
College Station,
TX 77843-3146

Phone: 979-845-4092
Fax: 979-845-6331
dthornton@ocean.tamu.edu

RESEARCH INTERESTS

Marine microbial ecology, biogeochemistry, and Earth-system science

Specific topics include: Ecology and physiology of microphytobenthos and phytoplankton; Production of exopolymers (EPS) by microorganisms; Formation and ecology of transparent exopolymer particles (TEP); Aggregate formation by phytoplankton (marine snow); Diatoms and climate change; Microbial biofilms and mats; Nitrogen cycling; Biogenic marine aerosol and cloud formation; Trace gas biogeochemistry.

PROFESSIONAL PREPARATION

1992-1995	Queen Mary, University of London, UK Ph.D. awarded in April 1996.
Thesis:	Growth, mucilage production and aggregation of *Skeletonema costatum*.
1988-1991	Queen Mary, University of London, UK B.Sc. (Hons) Marine and Freshwater Biology First class
Thesis:	Carbon acquisition by *Pavlova lutheri*

APPOINTMENTS

2010-present	Associate Professor, Department of Oceanography, Texas A&M University, College Station, TX, USA
2004- 2010	Assistant Professor, Department of Oceanography, Texas A&M University, College Station, TX, USA
2003	Research Fellow, Wrigley Institute for Environmental Sciences, University of Southern California, Los Angeles, CA, USA
2000-2002	Research Fellow in Biological Sciences, University of Sunderland, Sunderland, UK
1996-1999	Senior Research Officer, Department of Biological Sciences, University of Essex, Colchester, UK

AWARDS

2008	Texas A&M Association of Former Students - College Level Teaching Award
2007	Visiting Scientist Award – Baruch Marine Field Laboratory

AFFILIATIONS

Faculty of Ecology & Evolutionary Biology (TAMU)	2005- present
Faculty of the Interdisciplinary Program in Marine Biology (TAMU)	2008 – present
Center for Atmospheric Chemistry and the Environment (TAMU)	2010 - present

PROFESSIONAL SOCIETIES

British Phycological Society (member)	1999- present
Association for the Sciences of Limnology and Oceanography (member)	2004- present
Phycological Society of America (member)	2004- present
Coastal and Estuarine Research Federation (member)	2006- present

FUNDING

CURRENT:

National Science Foundation – Geosciences-EAR- 1240161
'Collaborative Research: The role of priming in microbial utilization of terrestrially-derived dissolved organic carbon: A proof of concept'. Thomas Bianchi (PI), Daniel C. O. Thornton (co-PI), Shari Yvon-Lewis. $111,435 total ($18,169 to DCOT). 15 September 2012 – 14 September 2013

Texas Sea Grant
'Evaluation of Laser *In Situ* Scattering and Transmissometry (LISST) as a tool to monitor for harmful algal blooms (HABs) in Texas coastal waters.' Daniel C. O. Thornton (PI) $49,000 total ($49,000 to DCOT). 1 February 2010 – 30 September 2013

College of Geosciences, Texas A&M University
'High Impact Research Experiences (HIRE) for undergraduates.'
Daniel C. O. Thornton (PI). $36,000 total. 2012-2014
(Grant to support undergraduate research in the Department of Oceanography)

College of Geosciences, Texas A&M University
'STUDENTS AT SEA: Maximizing graduate student opportunities for participation in research cruises'
Daniel C. O. Thornton (PI). $18,000 total. 2012-2014
(Grant to support graduate research in the Department of Oceanography)

PREVIOUSLY FUNDED:

National Science Foundation - Geosciences – OCE – Biological Oceanography. (OCE 0726369)
'Effect of temperature on extracellular polymeric substance (EPS) production by diatoms'
Daniel C. O. Thornton (PI). $364,718 total. ($364,718 to DCOT). 1 September 2007 – 31 August 2012.

National Science Foundation – Geosciences – ATG– Physical and Dynamic Meteorology (ATG 1026804). 'EAGER: Marine Biogenic Aerosols as Cloud Condensation Nuclei over the Pacific Ocean.' Sarah D. Brooks (PI), Daniel C. O. Thornton (co-PI), $142,465 total ($60,000 to DCOT). 1 March 2010 – 31 August 2012.

'Ecophysiology of the microphytobenthos on East Beach, Galveston Bay'. Daniel C. O. Thornton (PI). Texas Institute of Oceanography (2004-2005) ($1,000 to DCOT)

VPR/OGS Texas A & M University 'Pathways to the Doctorate Research Assistantship Award'. Daniel C. O. Thornton (PI). ($30,000 to support graduate student). Fall 2006 – Fall 2007

Baruch Marine Field Laboratory – Visiting Science Award 2007
'Processes affecting EPS production in photosynthetic biofilms.' Daniel C. O. Thornton (PI). ($3,000 to DCOT plus field laboratory use and accommodation). 1 April – 1 November 2007.

PUBLICATIONS
PEER REVIEWED JOURNALS:

[§] indicates that the co-author was a Faculty or Research Scientist colleague at Texas A&M University. * indicates that the co-author was a Student at Texas A&M University.

1. Liu Y*, Yvon-Lewis SA[§], **Thornton DCO**, Campbell L[§], Bianchi TS[§] (2013) Spatial distribution of brominated very short-lived substances in the Eastern Pacific. *Journal of Geophysical Research: Oceans* 118: 1-11
2. Nunnally CC*, Gilbert RT[§], Quigg A[§], **Thornton DCO** (in press) Oxygen consumption and nutrient regeneration by sediments in the Northern Gulf of Mexico Hypoxic Zone. *Journal of Coastal Research* – special issue 63
3. Rzadkowolski CE*, **Thornton DCO** (2012) Using laser scattering to identify diatoms and conduct aggregation experiments. *European Journal of Phycology* 47(1): 30-41

1. Tice MM[§], **Thornton DCO**, Pope MC[§], Olszewski TD[§], Gong J* (2011) Archean microbial mat communities. *Annual review of Earth and Planetary Sciences* 39: 297-319
2. **Thornton DCO**, Kopac SM, Long RA (2010) Production and enzymatic hydrolysis of carbohydrates in intertidal sediment. *Aquatic Microbial Ecology* 60: 109-125
3. Hiranuma N*, Brooks SD[§], **Thornton DCO**, Auvermann BW (2010) Atmospheric ammonia mixing ratios at an open-air cattle feeding facility. *Journal of the Air & Waste Management Association* 60: 210-218
4. **Thornton DCO** (2009) Spatiotemporal distribution of dissolved acidic polysaccharides (dAPS) in a tidal estuary. *Limnology and Oceanography* 54: 1449-1460
5. **Thornton DCO** (2009) Effect of low pH on carbohydrate production by a marine planktonic diatom (*Chaetoceros muelleri*). *Research Letters in Ecology*, Article ID 105901, doi:10.1155/2009/105901
6. **Thornton DCO**, Visser LA* (2009) Measurement of acid polysaccharides (APS) associated with microphytobenthos in salt marsh sediments. *Aquatic Microbial Ecol*ogy 54: 185-198
7. **Thornton DCO**, Fejes EM*, DiMarco SF[§], Clancy KM* (2007) Measurement of acid polysaccharides (APS) in marine and freshwater samples using alcian blue. *Limnology and Oceanography: Methods* 5: 73-87

8. **Thornton DCO**, Dong LF, Underwood GJC, Nedwell DB (2007) Sediment-water nutrient exchange and nitrogen budgets in the Colne Estuary. *Marine Ecology Progress Series* 337: 63-77
9. Patel D, Thake B, **Thornton DCO** (2005) Effect of light and turbulent mixing on the growth of *Skeletonema costatum* (Bacillariophyceae). *Marine Biology* 146: 633-644
10. **Thornton DCO** (2004) Formation of transparent exopolymeric particles (TEP) from macroalgal detritus. *Marine Ecology Progress Series* 282: 1-12
11. **Thornton DCO** (2002) Diatom aggregation in the sea: mechanisms and ecological implications. *European Journal of Phycology* 37:149-161
12. **Thornton DCO**, Dong LF, Underwood GJC, Nedwell DB (2002) Factors affecting microphytobenthic biomass, species composition and production in the Colne estuary (UK). *Aquatic Microbial Ecology* 27:285-300
13. Dong LF, Nedwell DB, Underwood GJC, **Thornton DCO**, Rusmuna I (2002) Nitrous oxide formation in estuaries: the central role of nitrite. *Applied and Environmental Microbiology* 68:1240-1249
14. **Thornton DCO** (2002) Individuals, clones or groups? Phytoplankton behaviour and units of selection. *Ethology, Ecology and Evolution* 14:165-173
15. Dong LF, **Thornton DCO**, Underwood GJC, Nedwell DB (2000) Denitrification in the sediments of the Colne estuary, England. *Marine Ecology Progress Series* 203: 109-122
16. **Thornton DCO**, Underwood GJC, Nedwell DB (1999) Effect of light and emersion period on the exchange of ammonium across the estuarine sediment-water interface. *Marine Ecology Progress Series* 184: 11-20
17. **Thornton DCO**, Santillo D, Thake B (1999) Prediction of sporadic mucilaginous algal blooms in the Northern Adriatic Sea. *Marine Pollution Bulletin* 38(10): 891-898
18. **Thornton DCO** (1999) Phytoplankton mucilage in coastal waters: A dispersal mechanism in a front dominated system? *Ethology Ecology and Evolution* 11(2): 179-185
19. **Thornton DCO**, Thake B (1998) Effect of temperature on the aggregation of *Skeletonema costatum* (Bacillariophyceae) and the implication for carbon flux in coastal waters. *Marine Ecology Progress Series* 174: 223-237

BOOKS & CHAPTERS:

1. **Thornton DCO** (2012) Primary production in the ocean. In: *Advances in Photosynthesis – Fundamental Aspects*. Edited by M. M. Najafpour. pp 563-588. Intech, Rijeka, Croatia
2. Dalsgaard T (Editor), Nielsen LP, Brotas V, Viaroli P, Underwood G, Nedwell DB, Sundbäck K, Rysgaard S, Miles A, Bartoli M, Dong LF, **Thornton DCO**, Ottosen LDM, Castaldelli G, Risgaard-Petersen N. (2000) *Protocol handbook for NICE - Nitrogen Cycling in Estuaries: a project under the EU research programme: Marine Science and Technology (MAST III)*. National Environmental Research Institute, Silkeborg, Denmark. 62pp

3. Chiappori A, Balostro R, Thake B, Santillo D, **Thornton D,** Patel D, (1995). The Adriatic Sea and coastal resources; a management and pollution control study. In: *Coastal Ocean Space Utilization III*. Edited by N. D. Croce, S. Connell and R. Abel. pp 331-344. E & FN Spon, Chapman and Hall, London

PUBLISHED ABSTRACTS:

1. Chen J*, **Thornton DC** (2011) The effect of temperature and growth rate of TEP production by *Thalassiosira weissflogii*. *Journal of Phycology* 47: S64

2. Railey LD*, **Thornton D** (2011) Laser *in situ* scattering and transmissometry as a tool to detect harmful algal blooms. *Journal of Phycology* 47: S82

TECHNICAL REPORTS:

1. **Thornton DCO**, Underwood GJC, Nedwell DB (1999) Influence of algal biofilms on nutrient fluxes across the sediment-water interface. Final report. 59 pp. DETR Contract EPG 1/9/76

2. Ansaldo Industria S.p.A., **Queen Mary and Westfield College**, Mott MacDonald Group and Compa (1994). An ecosystem approach to understanding pollutant inputs, algal bloom and mucilage problems in the Adriatic Sea. EC STEP CT 90 0061. Commission of the European Community

PRESENTATIONS

§ indicates that the co-author is a faculty or research Scientist colleague at Texas A&M University.
* indicates that the co-author was a student at Texas A&M University.
Bold type indicates the person who presented the work

INVITED TALKS:

2012 OUC/TAMU Collaborative Workshop, Texas A&M University, College Station, USA
Thornton DCO, Talk: *Exopolymers in the ocean*

2010 Center for Atmospheric Chemistry and the Environment (CACE), Texas A & M University, TX, USA
Thornton DCO, Brooks SD§, Yvon-Lewis S§, Viduarre G§, Hu L*, Liu Y*
Talk: *Air-sea exchange in the Pacific Ocean*

2009 Department of Oceanography, Texas A & M University, TX, USA
Thornton DCO
Talk: *Biogeochemistry of diatom exopolymers*

2007 Baruch Marine Field Laboratory, University of South Carolina, USA
Thornton DCO
Talk: *Effect of the microphytobenthos on carbon and nitrogen cycling*

2005 Texas A&M University at Galveston, TX, USA
Thornton DCO

Talk: *Nitrogen and carbon fluxes through coastal environments*

2004 Department of Wildlife and Fisheries Sciences, Texas A & M University, TX, USA
Thornton DCO
Talk: *Nitrogen and carbon fluxes through coastal environments*

2003 Department of Oceanography, Texas A & M University, TX, USA
Thornton DCO
Talk: *Microbes, Mud and Mucilage*

2002 Wrigley Institute for Environmental Studies, University of Southern California, USA
Thornton DCO
Talk: *Effect of sediment microbiology on nitrogen fluxes through North Sea Estuaries*

WORKSHOPS ATTENDED:
NSF sponsored workshop: 'Coastal Benthic exchange dynamics (CBED)', a Coastal Ocean Processes (CoOP) workshop, St. Petersberg (Florida) 5-7 April 2004.

NSF sponsored workshop: 'Early Career Faculty in the Geosciences: Teaching, Research, and Managing Your Career.' College of William and Mary (Virginia), 8 – 13 June 2005.

NSF sponsored workshop: 'Climate change and Coastal Oceans Workshop', Qingdao, China, 23 – 28 October 2008. I moderated a discussion session during this workshop.

NSF sponsored workshop: 'UNOLS Chief Scientist Training Cruise', Newport, OR, 6-15 July 2011.

ACADEMICS

STUDENT ADVISING: GRADUATE STUDENTS

Committee chair or co-chair:

Lauren Drake Railey	M.S. candidate	OCNG	graduated December 2012
Jie Chen (Cherry)	Ph.D. candidate	OCNG	2009 - present
Yina Liu	Ph.D. candidate (co-chair)	OCNG	2008 – present
Charles Rzadkowolski	M.S. candidate	OCNG	graduated August 2010
Carolyn Wilson	M.S. candidate	OCNG	graduated August 2009
Lindsey Visser	M.S. candidate	OCNG	graduated August 2009
Alyce Lee	Ph.D. (co-chair)	OCNG	graduated May 2009
Shelli Meyer	M.S. (co-chair)	OCNG	graduated May 2007

Committee member:

Jonathan Sneed	M.S. candidate	GEOL	2012- present
Darcie Ryan	Ph.D. candidate	OCNG	2012 - present
Michael Gore	M.S. candidate	MARB	2011 - present
Rika Muhl	Ph.D. candidate	WLFS	2011 - present
Michael Shields	Ph.D. candidate	OCNG	2011 - present

Allyson Burgess	Ph.D. candidate	OCNG	2011 - present
Yan Zhao	Ph.D. candidate	OCNG	2011 - present
Jian Gong	Ph. D. candidate	GEOL	2011 – present
David Schirm	M.S. candidate	GEOL	2010- present
Amanda Palomo	M.S. candidate	GEOL	2010- present
Li Shen	M.S. candidate	OCNG	graduated August 2012
Alicia Shepard	Ph.D. candidate	OCNG	2010 - present
Xinxin Li	Ph.D. candidate	OCNG	(temporary member)
Lei Hu	Ph.D. candidate	OCNG	(temporary member)
Kung-Jen Liu	Ph.D. candidate	WLFS	2009 – 2011 (left program)
Christopher Klug	Ph. D. candidate	GEOL	2008 – 2009 (left program)
Haibin Su	Ph. D. candidate	GEOG	2008 – 2010 (left program)
Clifton Nunnally	Ph.D.	OCNG	graduated May 2012
Cheryl Gilpin	M.S.	OCNG	graduated May 2012
Songgang Gu	Ph.D. candidate	GEOG	2007 (left program)
Carlton Rauschenberg	M.S.	OCNG	graduated
Stephanie Gudman	M.S.	OCNG	graduated
Erin Anitsakis	M.S.	OCNG	graduated
Adam Marchand	M.S.	OCNG	graduated
Amanda Rinehart	M.S.	OCNG	graduated
Chilin Wei	M.S.	OCNG	graduated
Susan Baez-Cazull	Ph.D.	GEOL	graduated
Mary Anderson	M.S.	OCEN	graduated July 2010
Brett Gonzalez	M.S.	MARS	graduated Dec 2010
Chilin Wei	Ph.D.	OCNG	graduated May 2011

STUDENT ADVISING: UNDERGRADUATE RESEARCH (OCNG 491)

Amanda Bennett	B.S. candidate	GEOG	2006
Dietrich Gaitz	B.S. candidate	ENST	2004 – 2006
Michael Pohlen	B.S. candidate	BMCB	2011
Matthew McMahon	B.S. candidate	ENGS	2011
Audra Hinson	B.S. candidate	ENGS	2012 - 2013

UNDERGRADUATE RESEARCH ASSISTANTS (SUPPORTED$^{\Delta}$ AND VOLUNTEERS)

Kristen Clancy$^{\Delta}$	B.S. candidate	BSEN	2005 - 2006
Elizabeth Fejes$^{\Delta}$	M.S. graduate	WFSC	2004
Jennifer Williams$^{\Delta}$	B.S. candidate	BIMS	2008 - 2009
Alexandra Vietti$^{\Delta}$	B.S. candidate	ENST	2009 – 2010
Zachery Radcliff	B.S. candidate	BIOL	2010
Timothy Shane$^{\Delta}$	B.S. candidate	GEOL	2010 – 2011
Peter Bruns	B.S. candidate	ENGS	2011-2013

THESES/DISSERTATIONS FOR WHICH I SERVED AS CHAIR OR CO-CHAIR

Meyer S (2007) *Vibrio vulnificus* dynamics in a South Texas Bay. M.S. thesis, Texas A&M University, College Station, TX.

Lee AB (2009) Response of benthic microalgal community composition at East Beach, Galveston Bay, Texas to changes in salinity and nutrients. Ph.D. dissertation, Texas A&M University, College Station, TX.

Wilson CE (2009) Factors affecting carbohydrate production and loss in salt marsh sediments of Galveston Bay. M.S. thesis, Texas A&M University, College Station, TX.

Visser LA (2009) Nitrous oxide production in the Gulf of Mexico hypoxic zone. M.S. thesis, Texas A&M University, College Station, TX.

Rzadkowolski CE (2010) Laser Scattering as a tool to determine the effect of temperature on diatom aggregation. M.S. thesis, Texas A&M University, College Station, TX.

Railey LD (2012) LISST instruments as a tool in phytoplankton ecology. M.S. thesis, Texas A&M University, College Station, TX.

Liu Y (2013) Global distributions and natural sources of brominated very short-lived substances. Ph.D. dissertation, Texas A&M University, College Station, TX.

COURSES:
OCNG 251 Oceanography
OCNG 251 Oceanography (honors)
Undergraduate lecture-based course introducing oceanography to non-science majors.

OCNG 420 Biological Oceanography
Advanced undergraduate lecture and inquiry-based learning course.

OCNG 425 Microbial Oceanography
Advanced writing-intensive undergraduate course. This course was proposed and designed by me.

OCNG 622 Analysis of Benthic Communities
Advanced graduate course on the community ecology of marine benthos.

OCNG 627 Ecology of the Continental Shelf
Advanced graduate level course examining the structure, function and interactions between ecosystems in coastal waters.

OCNG 652 Sedimentary Biogeochemistry
Advanced graduate level lecture and laboratory course on the biogeochemistry of marine sediments.

OCNG 681 Seminar

OCNG 685 Directed studies

OCNG 491 Undergraduate research

OCNG 691 Graduate research
Advising students as they undertake research projects towards their Masters or Ph.D. degrees.

Guest lecturer in OCNG 650 Aquatic Microbial Ecology and OCNG 401 Introduction to Oceanography. I have taught laboratory classes in OCNG 642 bio/chemistry laboratory. I have guest lectured and participated in a fieldtrip with students from OCNG 620 Biological Oceanography.

SERVICE
DEPARTMENT OF OCEANOGRAPHY SERVICE
Graduate advisor for Biological Oceanography (2006 – 2008)
Member of the Recruitment and Academic Advisor Committee (served as acting Chair when the Chair was at sea; 2006 – 2008)
Member of the Department Research Committee (2006 – 2007)
Member of the search committee for the Microbial Biogeochemistry ODASES position (2007)
Member of *ad hoc* committee charged with producing the final draft of the Department's strategic plan (2005)
Department Library Representative (2004 – present)
Fifth floor proctor in the Eller O & M Building (2006 – present)
Department of Oceanography website liaison (2008- present)
Member of the Instruction and Graduate Program Enhancement and Equipment Fund (IGPEEF) (2009-2011)
Faculty Advisor for the Minor in Oceanography degree program (2010-2011)
Department of Oceanography Ship Committee (2010 – present)
Member of the Department of Oceanography curriculum committee (2010 – 2011)
Chair of the Department of Oceanography curriculum committee (2011 – present)
Department of Oceanography Executive Committee (2011 – present)
Department of Oceanography Awards Committee (2011 - present)

COLLEGE OF GEOSCIENCES SERVICE
Member search committee for the Director of Texas Sea Grant (2011)
Represent the Department of Oceanography on GFAC (2011-2012)
Selection committee for GeoX students (2011-present)
Member of College of Geosciences Graduate Committee (2011-present)
Member of College of Geosciences Undergraduate Committee (2011-present)
Member of College of Geosciences academic assessment Committee (2011-2012)

TEXAS A&M UNIVERSITY SERVICE
Member of the Executive Committee of the Interdisciplinary Program in Marine Biology (2008 – present)

ENGAGEMENT AND OUTREACH
- State Supervisor for Oceanography and the Dynamic Planet events at the Texas Science Olympiad (2006, 2007, 2008, 2009, 2010).

- Science Judge for the National Ocean Science Bowl competition for high school students (2005, 2007).
- Reviewed for Texas Junior Sciences and Humanities Symposium (2005, 2007, 2009).
- Judge for Student Research Week at Texas A & M University (2006, 2007, 2008)
- Science Judge for the Harmony Science Academy (Bryan-College Station) Science Fair in 2008.

PEER REVIEW

Reviewed for the following grant awarding agencies:

National Science Foundation (NSF); Maryland Sea Grant; Hudson River Foundation; National Environmental Research Council (NERC, United Kingdom); Geo Mission

Reviewed for the following international journals (25 different journals):

Aquatic Ecology; *Aquatic Microbial Ecology*; *Biogeosciences*; *Bioresource Technology*; *Chinese Journal of Oceanology and Limnology*; *Deep-Sea Research II*; *Estuarine, Coastal and Shelf Science*;
Ethology, Ecology and Evolution; *European Journal of Phycology*; *Estuaries and Coasts*; *Fresenius Environmental Bulletin*; *Fundamental and Applied Limnology*; *Geophysical Research Letters*; *Journal of Applied Phycology*; *Journal of Ecology*; *Journal of Environmental Management*; *Journal of Experimental Marine Biology and Ecology*; *Journal of Geophysical Research – Oceans*; *Journal of Marine Research*; *Journal of the Ocean University of China*; *Limnology & Oceanography*; *Limnology & Oceanography: Methods*; *Marine Ecology*; *Marine Environmental Research*; *Organic Geochemistry*

Peer reviewed web pages for *Starting Point*, an NSF sponsored National Science Digital Library program.

FIELD EXPERIENCE

Northern Adriatic Sea (1992-1993).
English and Welsh estuaries (1996-1999).
Limfjorden in Denmark (1996).
Science Officer on an expedition to survey coral reefs using SCUBA divers in Sulawesi, Indonesia (1999).
Rocky shores in the UK (2000-2002).
Mangrove ecosystems in Belize (2003).
Galveston Bay, TX (2004-2010)
Watch Leader aboard the *RV Gyre* in the Gulf of Mexico (May 2005).
North Inlet-Winyah Bay National Estuary Research Reserve (2007)
Science party aboard *RV Wecoma* in the Pacific (July 2011)

GRADUATE AND POSTDOCTORAL ADVISORS

Brenda Thake (Ph.D)	Queen Mary, University of London, UK
Graham Underwood & David Nedwell	University of Essex, UK (Postdoctoral)
Myrna Jacobson (Postdoctoral)	University of Southern California

COLLABORATORS

Dr. Thomas Bianchi (Texas A&M), Dr. Sarah Brooks (Texas A&M), Dr. Gary King (LSU), Dr. Richard Long (University of South Carolina), Dr. Mike Tice (Texas A&M), Dr. Mike Pope (Texas A&M), Dr. Thomas Olszewski (Texas A&M), Dr. Shari Yvon-Lewis (Texas A&M).

CURRICULUM VITAE

ARNOLD VEDLITZ

PERSONAL INFORMATION

Office Address
Institute for Science, Technology and Public Policy
Bush School of Government and Public Service
Texas A&M University
College Station, TX 77843-4350
(979) 845-2929

ACADEMIC POSITIONS

2000 to present	Bob Bullock Chair in Government and Public Policy, Bush School of Government and Public Service, Texas A&M University
1996 to present	Professor of Public Policy, Bush School of Government and Public Service, Texas A&M University
1992 to 2002	Research Professor of Health Policy, Texas A&M Health Sciences Center, Texas A&M University System
1987 to 2000	Professor, Department of Political Science, Texas A&M University
1979-1987	Associate Professor, Department of Political Science, Texas A&M University
1975-1979	Assistant Professor, Department of Political Science, Texas A&M University
1973-1975	Instructor, Department of Political Science, Texas A&M University

ADMINISTRATIVE POSITIONS

2000 to present	Director, Institute for Science, Technology and Public Policy, Bush School of Government and Public Service, Texas A&M University
2001 to present	Division Head, Technology and Policy Division, Texas Engineering Experiment Station, Texas A&M University System
2003 to present	Division Head, Science, Technology and Policy Division, Texas Transportation Institute, Texas A&M University System
1999-2004	Executive Associate Dean, Bush School of Government and Public Service, Texas A&M University
1999-2002	Director, George Bush International Fellowship Program, Texas A&M University
1993-2000	Director, Center for Public Leadership Studies, Bush School of Government and Public Service, Texas A&M University
1993-1998	Director, Eisenhower Leadership Development Program, Texas A&M University
1989 -1993	Director, Public Affairs Research Program, Department of Political Science, Texas A&M University
1988-1989	Associate Provost for External Affairs, Texas A&M University
1988	Assistant to the President for External Affairs, Texas A&M University

1983-1984	Director, Public Policy Resources Laboratory, Texas A&M University
1982-1988	Director, Technology and Society Research Division, Texas Engineering Experiment Station, Texas A&M University System
1981-1988	Associate Dean for Administration and Research (now called Executive Associate Dean), College of Liberal Arts, Texas A&M University
1980-1981	Senior Associate Analyst, Office of Service Delivery Assessment, U.S. Department of Health and Human Services (on Intergovernmental Personnel Act Transfer from Texas A&M University to DHHS)
1979-1980	Graduate Advisor, Department of Political Science, Texas A&M University
1977-1979	Undergraduate Advisor, Department of Political Science, Texas A&M University

TEACHING AND RESEARCH FIELDS

Public Policy
Science and Technology Policy
Environmental Politics and Policy
Intergroup Conflict
Minority Politics
American Political Behavior
Urban Politics
Political Psychology

EDUCATION

Ph.D.	University of Houston, Political Science, 1975
M.A.	Louisiana State University, Government, 1970
B.A.	Louisiana State University, Government, 1968

AWARDS

Texas A&M University Faculty Distinguished Achievement Award in Teaching, 1980.

PUBLICATIONS

Books

Conservative Mythology and Public Policy in America, New York: Praeger, November, 1988.

Swimming Upstream: Collaborative Approaches to Watershed Management, Cambridge: MIT Press, 2005 (edited with Paul Sabatier, et al.).

Articles (last 5 years)

"Climate Hazards and Risk Status: Explaining Climate Risk Assessment, Behavior, and Policy Support," forthcoming, *Sociological Spectrum* (with H.S. Park).

"Citizens, Nonprofits and Climate Change Policy," forthcoming, *Nonprofit Policy Forum* (with A. Bies, D. Lee, C. Lindsey and J. Stoutenborough).

"Explaining Popular Trust in the Department of Homeland Security," forthcoming, *Journal of Public Administration Research and Theory* (with S. Robinson, X. Liu and J. Stoutenborough).

"Beyond the Left-Right Cleavage: Exploring American Political Choice Space," forthcoming, *Journal of Theoretical Politics* (with M. Hinich, X. Liu and C. Lindsey).

"Public Support for the Department of Homeland Security, Journal of Homeland Security and Emergency Management, Vol. 8, 1, 2011, (with S. Robinson and X. Liu).

"Explaining Media and Congressional Attention to Global Climate Change, 1969-2005: An empirical Test of Agenda Setting Theory," Political Research Quarterly, Vol. 64, 2, pp: 405-419, 2011 (with X. Liu and E. Lindquist).

"Climate Change: A Profile of U.S. Climate Scientists' Perspectives," in Climatic Change, Vol. 101, issue 3-4, pp. 311-329, 2010 (with S. Rosenberg, D. Cowman and S. Zahran).

"Non-Linear Incentives, Plan Design, and Flood Mitigation: The Case of the Federal Emergency Management Agency's Community Rating System, in the Journal of Environmental Planning and Management, Vol. 53, 2, pp. 219-239, 2010 (with S. Brody, S. Zahran and W. Highfield.

"Understanding Local Policy Making: Policy Elites' Perceptions of Local Agenda Setting and Alternative Policy Selection," in Policy Studies Journal, 38 (1), pp. 69-91, 2010 (with X. Liu, E. Lindquist and K. Vincent).

"Policy Learning for Flood Mitigation: A Longitudinal Assessment of the Community Rating System in Florida," in Risk Analysis, Vol. 29, 6, pp. 912-929, 2009 (with S. Brody, S. Zahran, W. Highfield and S. Bernhardt).

"Greening Local Energy: Explaining the Geographic Distribution of Household Solar Energy Use in the United States," in Journal of the American Planning Association, Vol. 74, 4, pp. 419-434, 2008 (with S. Zahran, S. Brody, M. Lacy and C. Schelly).

"Social Vulnerability and the Natural and Build Environment: A Model of Flood Casualties in Texas," in Disasters: The Journal of Disaster Studies, Policy and Management, Vol. 32, 4, pp. 537-560, December, 2008 (with S. Zahran, S. Brody and W. Peacock).

"A Spatial Analysis of Local Climate Change Policy in the United States: Risk, Stress, and Opportunity," in Landscape and Urban Planning, Vol. 87, 1, July, 2008, pp. 33-41 (with S. Brody, H. Grover and S. Zahran).

"Vulnerability and Capacity: Explaining Local Commitment to Climate Change Policy," Environment and Planning C-Government and Policy, Vol. 26, 3, 2008, pp. 544-562 (with S. Zahran and S. Brody).

"Regional News Portrayals of Global Warming and Climate Change," Environmental Science and Policy, 2008, 11 (5): 379-93 (with X. Liu and L. Alston).

"Innovation and Implementation in the Public Sector: An examination of Public Entrepreneurship," Review of Policy Research, Vol. 25, 3, May 2008, pp: 233-252 (with W.R. Mack and D. Green).

"Identifying the Impact of the Built Environment on Flood Damage in Texas, Disasters: The Journal of Disaster Studies, Policy and Management, Vol. 32, 1, March 2008, pp: 1-18 (with S. Brody, S. Zahran and W. Highfield).

"Risk, Stress and Capacity: Explaining Metropolitan Commitment to Climate Protection," Urban Affairs Review, Vol. 43, 4, March 2008, pp: 447-474 (with S. Zahran, H. Grover and S. Brody).

"Personal Efficacy, the Information Environment, and Attitudes toward Global Warming and Climate Change," Risk Analysis, Vol. 28, 1, February 2008, pp: 113-126 (with P. Kellstedt and S. Zahran).

"Examining the Relationship between Physical Vulnerability and Public Perceptions of Global Climate Change", Environment and Behavior, vol. 40, 1, January 2008, pp. 72-95 (with S. Brody, S. Zahran and H. Grover).

Chapters in Books

"Collaborative Approaches to Watershed Management." In Swimming Upstream: Collaborative Approaches to Watershed Management, edited by P. Sabatier, et al. Cambridge: MIT Press, 2005, pp. 3-21. (with M. Lubell, P. Sabatier, W. Focht, Z. Trachtenberg and M. Matlock)

"Citizen Participation and Representation in Collaborative Engagement Processes." In Swimming Upstream: Collaborative Approaches to Watershed Management, edited by P. Sabatier, et al. Cambridge: MIT Press, 2005, pp. 138-169. (with C. Samuelson, G. Whitten, M. Matlock, L. Alston, T. Peterson, and S. Gilbertz)

"Conclusions and Recommendations." In Swimming Upstream: Collaborative Approaches to Watershed Management, edited by P. Sabatier, et al. Cambridge: MIT Press, 2005, pp. 261-296. (with M. Lubell, P. Sabatier, W. Focht, Z. Trachtenberg and M. Matlock)

"Party Identification and Public Opinion, 1984-1994: Toward a More Competitive Two Party System," The Norton Texas Reader, edited by A. Champagne and E. J. Harpan. New York: W.W. Norton, 1997, pp. 113-128. (with J. Dyer and J. Leighley)

"Higher Education, Business Creation, and Economic Growth in the American States," in W. Becker and D. Lewis (eds.), Higher Education and Economic Development, Boston: Kenwer Academic Publishing, 1993, pp. 163-176, (with B. Jones).

"The Changing Texas Voter," in David Brodsky and Robert Swansborough (eds.), The South's New Politics (Columbia: University of South Carolina Press, 1988), pp. 38-53. (with J. Dyer and D. Hill)

"Welfare Terminations and Benefit Reductions: What Program Recipients Can Tell Policy Planners," in Applied Poverty Research, edited by S. Sachs and R. Goldstein, Rowman and Allanheld, 1984, pp. 138-147. (with J. Alston)

"The State as an Investor in Growth: The Role of Public Expenditure for Higher Education," in Science and Technology Indicators for Texas 1988, ed. by D. Haynes and Jean Kellough, College Station: Texas A&M University, pp. 42-54, with B. Jones and D. Haynes.

"Higher Education and the New American Economy," in The New Texas, ed. by Fred Williams, Austin: The University of Texas, 1987, with B. Jones and M. Beardsley.

Research in Process

"The Effect of Persuasive Messages on Policy Problem Recognition," (with Doug Oxley)
"Knowledge, Information and Views of Climate Change," (with Jim Stoutenborough)
"Current Weather Conditions and Public Assessments of Climate Change Risk, (with Jeremy Brooks, Doug Oxley and Charles Lindsey)

EXTERNAL RESEARCH GRANTS AND CONTRACTS

Grants (last 5 years)

National Science Foundation Industry University Cooperative Research Center on Plug-in Hybrid Electric Vehicles. 2010 – present. Co-PI.0

Texas Department of Transportation and Texas Commission on Environmental Quality, evaluation of the "Drive Clean across Texas Air Quality Education Program, 2010-2011. $105,000. PI.

National Science Foundation/Defense Nuclear Deterrence Office, A Framework for Developing Novel Detection Systems Focused on Interdicting Shielded HEU. 2007 – 2012. $7.2 million. Co-Principal Investigator.

U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service, Climate Change, Drought and Policy Making in the U.S. Southern Region, 2005-2008. $760,000. Principal Investigator.

Contracts

U.S. Department of Health, Education, and Welfare contract #R6-85,78, design, research, analysis, and training consultant for the nation-wide assessment of the Social Security Disability Program.

U.S. Department of Health, Education, and Welfare contract #R6-274-78, design, research, and analysis consultant for the nation-wide evaluation of the AFDC Program.

U.S. Department of Health, Education, and Welfare contract #140-79-006, design, research, and analysis consultant for the nation-wide study of Social Security services to the public.

U.S. Department of Health, Education, and Welfare contract #HEW-ASD-79-6, design and analysis consultant on the nation-wide study of the Post Secondary Vocational Education Program.

U.S. Department of Health, Education, and Welfare contract #R6-14-80, design, research, analysis, and training consultant for the nation-wide assessment of the Medicaid Program.

U.S. Department of Health, Education, and Welfare contract #RF-0093-SDA-80, design, research, analysis, and training consultant for the nation-wide evaluation of the enforcement efforts of the office of Civil Rights.

U.S. Department of Health and Human Services contract #6-23720-81, design, research, analysis and training consultant for the nation-wide assessment of governmental programs dealing with teenage alcohol abuse and related problems.

Additional research and consultative relationships with the Texas Lieutenant Governor's Office, the Texas Secretary of State's Office, the Texas Legislative Council, the Texas Department of Community Affairs, the Texas Commission on Economy and Efficiency in State Government, the Texas Municipal League, the Arkansas Department of Energy, numerous Texas cities and ICF.

OTHER RESEARCH RELATED EXPERIENCE

Gulf Universities Consortium on Air Pollution, 1973-1976

Research Associate, Department of Environmental Health, University of Texas School of Public Health, Summer1973.

PROFESSIONAL SERVICE ACTIVITIES

Editor, APSA Urban Section Newsletter. 1993-1996

Board Member, APSA Urban Section. 1993-1996

Manuscript Reviewer

American Political Science Review

American Journal of Political Science

Journal of Politics

Western Political Quarterly/Political Research Quarterly

Social Science Quarterly
Urban Affairs Quarterly/Urban Affairs Review
American Politics Quarterly/American Politics Review
Legislative Studies Quarterly
Administration and Society
Policy Studies Journal
Journal of Environmental Planning and Management
Risk Analysis
Rural Sociology
Nationalism and Ethnic Politics
Social Science Journal
Sociological Spectrum
Southeastern Political Review
International Journal of Engineering Education
Grant Reviewer for the National Oceanic and Atmospheric Administration
Grant Reviewer for the National Science Foundation
Grant Reviewer for the Environmental Protection Agency
Grant Reviewer for the National Endowment for the Humanities

Professional Memberships

Association for Public Policy Analysis and Management
American Political Science Association
Southern Political Science Association
International Society for Political Psychology
American Association for the Advancement of Science
Policy Studies Organization

NATIONAL, STATE, UNIVERSITY AND COMMUNITY SERVICE

2010-2011	Member, TAMUS Entrepreneurial Task Force
2009 to 2010	Member, Search Committee, Dean of Bush School
2009 to 2010	Member, Centers and Institutes Task Force, Texas A&M University
2008 to 2011	Member, Internal Advisory Committee, Scowcroft Institute for International Affairs
2008 to 2010	Member, Houston Galveston Area Council Foresight Panel on Environmental effects
2007 to 2011	Member, Governing Board, University Transportation Center for Mobility, Texas Transportation Institute, Texas A&M University System
2006 to present	Member, Advisory Council for the Center for Transportation Safety, Texas Transportation Institute, Texas A&M University System.
2006 to present	Member, Coastal Applied Research and Review Team, Texas A&M University (CARRT)
2006 to present	Member, Extended Education Advisory Committee, Bush School, Texas A&M University
2006 to 2007	Chair, Search Committee, Associate Professor and Associate Director ISTPP, Bush School, Texas A&M University

2006 to 2007	Chair, Evaluation Sub-Committee, P&T Committee, Bush School, Texas A&M University.
2006 to 2007	Member, Search Committee for Director, Texas Transportation Institute, Texas A&M University System
2005 to 2007	Senator, Texas A&M University Faculty Senate
2005 to 2007	Member, TAMU Faculty Senate Academic Affairs Committee
2005 to 2007	Member, TAMU Faculty Senate Research Committee
2005 to 2006	Member, Texas A&M University Task Force for Hurricane Assistance for Gulf Universities.
2004 to present	Member, Qatar Research Advisory Committee, Texas A&M University System
2004 to 2005	Member, Search Committee for Endowed Chair in Marine Policy, Harte Institute, Texas A&M University Corpus Christi
2004 to 2006	Member, Search Committee for professor in Marine Management and Policy, Texas A&M University Galveston
2004 to 2006	Member, Search Committee for Boone and Crocket Chair in Natural Resources Policy, College of Agriculture and Life Sciences Texas A&M University
2004 to 2005	Member, Council on Competitiveness, National Innovation Initiative, Public Sector Working Group, Washington DC
2003 to present	Member, Center for Atmospheric Chemistry and the Environment Advisory Board, Texas A&M University
2003 to present	Member, Homeland Security Advisory Council, Texas A&M University
2003 to 2004	Member, Integrated Center for Homeland Security Director Search Committee, Texas A&M University
2002 to 2004	Member, TAMU Campus Community Campaign Steering Committee
2002 to 2004	Member, Visiting Scholars Program Committee, Texas A&M University
2002 to 2008	Member, Race and Ethnic Studies Institute Board of Advisors. Texas A&M University.
2001 to 2002	Member, Presidential Search Committee, Texas A&M University
2001 to 2003	Member, Quality Enhancement Planning Committee, Texas A&M University (SACS re-accreditation review process)
2000 to present	Member, Advisory Council, William P. Hobby Center for Public Service, Southwest Texas State University
2000 to 2004	Member, Transportation Asset Management Task Force, U.S. Department of Transportation
1999 to 2003	TAMU Project Director, Education Cost Index Study, State of Texas
1999 to 2005	Member, University Research Committee, Texas A&M University
1999 to 2009	Member, Texas Sea Grant College Program Advisory Committee
1998 to 1999	Chair, Research Infrastructure Committee, Texas A&M University

1998	Member, Provost's Select Committee on University/Agency Research Administration and Indirect Cost Issues
1997 to 1998	Chair, Ad Hoc Committee to Study Texas A&M Research Foundation Issues, Texas A&M University
1997 to 2002	Member, Executive Committee, Science and Technology Policy Program, Texas A&M University
1997 to 2002	Member, Board of Advisors, Academy for Future International Leaders, Texas A&M University
1995 to 1996	Member, Executive Committee, Department of Political Science
1995	Member, Sea Grant Director Search Committee, Texas A&M University
1995	Member, Full Professor Promotion Committee, Department of Journalism
1993 to 1995	Chair, Search Committee, Director of School of Government and Public Service, Texas A&M University
1992 to 1993	Member, Research Appointment Policy Committee, Texas A&M University
1991 to 1993	Member, Council of Principal Investigators, Texas A&M University
1992 to 2004	Mentor, Leadership in Medicine Program, College of Medicine
1991-1992	Member, Organized Research Task Force, Texas Coordinating Board for Higher Education
1991-1994	Chair, Dean's Committee on Teaching, College of Liberal Arts, Texas A&M University
1991 to 1994	Chair and/or member, Teaching Committee, Department of Political Science
1991-1992	Vice-Chair, Council of Principal Investigators, Texas A&M University System
1991-1992	Member, President's Task Force on Research Administration, Texas A&M University
1991-1992	Member, Institutional Self-Study Committee on Fiscal Resources, Texas A&M University
1991 to 1993	Member, Arts Council of Brazos Valley, Children's Advisory Committee
1991-1992	Member, Executive Committee, Department of Political Science
1990-2011	Member, Advisory Council, Center for International Business Education and Research, Texas A&M University
1990-1991	Chair, Dean Search Committee, Brazos Valley School of Math and Science
1990-1991	Member, Organized Research Task Force, Texas Coordinating Board for Higher Education
1990 to 1991	Member, Enrollment Research Task Force, Texas A&M University
1989-1991	Member, Texas A&M-Bryan Independent School District Science and Math Magnet School Task Force
1989-1990	Chairman, Enrollment Research Task Force, Texas A&M University
1988 to 1991	Member, Board of Directors, Institute for Pacific Asia
1988-1989	Chairman, Texas A&M University, Dean of Education Search Committee

1988-1989	Member, Incentive and Initiative Program Task Force, Texas A&M University
1988 to 1990	Member, Advisory Board, Brazos Valley Business Job Training Alliance
1988	Member, Texas Legislative Task Force on Education and Industry
1987 to 1990	Member, Board of Advisors, Institute for Innovation and Design in Engineering
1987-1988	Chairman, Texas A&M University, Director of Educational Broadcasting Services Search Committee
1986-1988	Member, Board of Advisors, Knowledge-Based Systems Advisory Council, Texas A&M University
1983-1984	Vice-chairman, Texas A&M University Urban Affairs Study Committee
1983-1984	Member, Texas A&M University, ad hoc Committee on Patents and Publications
1983-1984	Member, Texas A&M University Associate Provost for Research Search Committee
1983-1984	Member and Project Director, Joint Texas A&M - Texas Tech Steering Committee for the State of Texas Satellite Communications Project
1983-1988	Member, Board of Advisors, Texas A&M University Center for Energy and Mineral Resources
1982-1983	Chairman, Research Committee, Texas A&M University Institutional Self Study
1982-1983	Chairman, Texas A&M University ad hoc Committee on Centers and Institutes
1981-1988	Member, Texas A&M University Research Council
1977-1985	Member, Texas A&M University, Human Resources Research Advisory Committee

TERRY L. WADE

Geochemical and Environmental Research Group (GERG)
College of Geosciences
Texas A&M University
833 Graham Road
College Station, TX 77845

Date of Birth: June 14, 1949
Married: 3 Children
Email: terry@gerg.tamu.edu
Phone: 979-862-2323 ex 134

EDUCATION:

Ph.D. University of Rhode Island, Kingston, Rhode Island, 1978 (Chemical Oceanography)
M.S. University of Rhode Island, Kingston, Rhode Island, 1974 (Chemical Oceanography)
B.A. Hartwick College, Oneonta, New York, 1971 (Chemistry)

EXPERIENCE:

1998-Present	Deputy Director of Environmental Sciences, GERG, Texas A&M University
2010-2013	Interim Director of Geochemical and Environmental Research Group, College of Geosciences, Texas A&M University
2001-Present	Adjunct Professor, Department of Oceanography, Texas A&M University
1993-1998	Associate Director of Environmental Sciences, GERG, College of Geosciences, Texas A&M University
1992-Present	Research Scientist, GERG, College of Geosciences, Texas A&M University
1986-1992	Associate Research Scientist, GERG, Texas A&M University
1984-Present	Member, Graduate Faculty, Texas A&M University
1984-l986	Assistant Research Scientist, GERG, Dept. of Oceanography, Texas A&M University
1984-1986	Adjunct Assistant Professor, Dept. of Oceanography, Old Dominion University, Norfolk, VA
1982	NASA-ASEE Summer Faculty Fellowship Program, NASA Langley Research Center, Hampton, VA
1979-1984	Joint Appointment, Dept. of Chemical Science, Old Dominion University, Norfolk, VA
1978-1984	Assistant Professor of Oceanography, Dept. of Oceanography, Old Dominion University, Norfolk, VA
1971-1978	Research Assistant and Graduate Student, Graduate School of Oceanography, University of Rhode Island, Kingston, RI
1970	National Science Foundation Summer Research Assistant, Hamilton College, Clinton, NY

PROFESSIONAL INTERESTS:

Environmental Chemistry	Chlorinated Hydrocarbons	Butyltins
Marine Organic Geochemistry	Atmospheric Deposition	Contaminant Metabolites
Oil Pollution	Sea Surface Microlayer	Bioavailability
Dioxins/Furans	Marine Mammals	Trace Elements
"Mussel Watch"	Nutrients	Cellular Biomarkers

PROFESSIONAL ASSOCIATIONS:

American Chemical Society (ACS)
Association for Environmental Studies and Sciences (AESS)
Society of Environmental Toxicology and Chemistry (SETAC)

PROFESSIONAL ACTIVITIES:

1. Expert Witness: Videotaped Deposition July 16, 1996 for Doty Sandpit Venture on coprostanol as a tracer of sewage, Doty Sandpit Venture vs. City of Houston. 152ND Judicial District, District Court of Harris County, TX

2. Expert Witness: Deposition December 15, 1999 for NOAA in United States of America, et al. V. Montrose Chemical Corporation of California, et al., No. CV 90-3122-AAH (Jrx) (C.D. Cal.)

3. US EPA Gulf of Mexico Research Subcommittee-Toxic Substances Expert Panel

4. Represented USA in Yokosuka, Japan (March 20 to 24, 2000) as part of the Coastal Environmental Science and Technology (CEST) Panel of the United States-Japan Cooperative Program in Natural Resources (UJNR).

5. Represented USA at a workshop on the Establishment for the Asia Pacific Economic Cooperation (APEC), of a Marine Environmental Training and Education Center (AMETEC) (April 20 to 21, 2000) Cheju Island, Korea.

6. Invited Expert at an EPA workshop, Air Deposition in the Gulf of Mexico: Understanding the Impact on Water Quality, New Orleans LA, October 10 and 11 2002.

7. Keynote Presentation: Overview of Past and Present PCB Analysis Methods Using Gas Chromatography/Electron Capture Detection. EPA Scientist–to-Scientist meeting on Methods for Characterizing and Utilizing PCB Congeners in Risk Assessment and Risk Management. Chicago, IL, December 4, 2002.

8. TAMU Galveston Organic Geochemistry Faculty Search Committee 2003

9. College of Geosciences Distinguished Achievement Award selection Committee 2003

10. Chair of the External Review Team for the University of Maine Environmental Chemistry Laboratory, February 25-28, 2003. Submitted Review Team final reports.

11. Invited speaker and panel member, National Academies, North Pacific Research Board, Workshop on a Science Plan, March 28-29, 2003, Panel #4 Health and Contaminants.

12. Invited expert to give lectures and supervise field and laboratory experiments. Asia Pacific Economic Cooperation (APEC) Training Workshop, Oil in the Marine Environment, Korean

Research and Development Institute (KORDI), South Sea Institute, Geoje, Korea June 30 to July 5, 2003.

13. Invited expert to give seminar on "Mussel Watch" concept and to provide advice on analytical and quality assurance/quality control for laboratories of the Peoples Republic of China, National Marine Environmental Monitoring Center, State Oceanic Administration Dalian, P.R. China August 31 to September 7, 2003.

14. Member of Dean of Geosciences Search Committee 2004

15. Member of College of Geosciences Academic Advisory Committee 2004-2006

16. Member of the Science Review team for NOAA Mussel Watch project. February 8 and 9, 2005 Rocky Gap, MD.

17. Final Proposal Panelist for the Cooperative Institute for Coastal and Estuarine Technology's 2005 Environmental Technology Development solicitation. University of New Hampshire, Durham. April 28, 2005.

18. Resident Scientist McMurdo Station Antarctica November 16 to December 11, 2006. Collected samples to determine footprint of human activities at McMurdo Station.

19. Expert Witness Abbott, Simses, Kuchler, Representing DuPont, Three depositions from 2005 to 2008.

20. Invited Participant and final report reviewer for Coastal Response Center (http://www.crrc.unh.edu) Deepwater Horizon Dispersant Use Meeting May 26 to 27, 2010. Cook Center, LSU, Baton Rouge, LA

21. Invited Participant Sub-Sea and Sub-Surface Oil and Dispersant Detection Sampling and Monitoring Strategy. Unified Command, Federal Agencies and Academic Partners Meeting. September 2, 2010. Roger Memorial Chapel, Tulane University, New Orleans, LA

22. Member of Independent Evaluation Team to review proposals for $5,000,000 from the BP Oil Spill for the State of Alabama. October 19 to 20 2010. Dauphin Island Sea Lab, Dauphin Island, AL.

23. Invited by the University of New Hampshire, Coastal Response Research Center, Durham, NH to review "Oil Budget Calculator Deepwater Horizon" a technical document prepared for the National Incident Command. October 2010.

24. Member of Independent Evaluation Team to review proposals for $4,000,000 from the BP Oil Spill for the Northern Gulf Institute Second Round-Gulf Initiative. January 9 to 10, 2011. New Orleans LA

25. Member of the planning committee for a workshop on Coordinating R&D on Oil Spill Response in the Wake of the Deepwater Horizon. Organized by the University of New Hampshire, Coastal Response Research Center, Durham, NH March 22-24 2011 Louisiana State University, Baton Rouge, LA

26. Invited presenter and workshop participant. Brazil-Texas A&M University Science and Education Internationalization. Porto de Galinhas, Pernambuco, Brazil March 26-29, 2012.

27. Invited Participant for American Petroleum Institute Deep Sea Oil Spill Fate and Effects Workshop. Houston TX October 3-5, 2012.

HONORS AND AWARDS:

1971 ACS Student Chemistry Award, Binghamton ACS Section, Hartwick College, Oneonta NY

1998 Academic Recognition, Texas A&M University, College Station TX

2001 Leadership Institute (successfully completed), Human Resources Department, Texas A&M University, College Station, TX

2001 Distinguished Achievement Award: Research Scientist, College of Geosciences, Texas A&M University, College Station, TX

2002 Certificate of Appreciation, Division of Environmental Chemistry, American Chemical Society for organizing a Symposium "Biogeochemistry of Organic Contaminants in Aquatic Ecosystems: Honoring Dr. James G. Quinn" Held at the 224th ACS National Meeting in Boston, MA, August, 2002.

2003 Certificate of Appreciation, Korean Ocean Research & Development Institute (KORDI), Korean International Cooperation Agency (KOICA), Asia Pacific Economic Cooperation (APAC) and Ministry of Maritime Affairs & Fisheries (MOMAF) for contributions to conducting the course on Marine Environmental Protection: Oil in the Marine Environment.

PUBLICATIONS (last 5 years): **H factor = 40** (from 1972 to 2013)**, Total citations 5070 i10Index 96.**

194. Kim, Y., Powell, E.N., Wade, T.L. and Presley, B.J. 2008 Relationship of Parasites and Pathologies to Contaminant Body Burden in Sentinel Bivalves: NOAA Status and Trends "Mussel Watch" Program, Marine Environmental Research 65 101-127.

195. Wade, T.L., S.T. Sweet and A. G. Klein. 2008 Assessment of Sediment Contamination in Casco Bay, Maine. Environmental Pollution 152: 505-521.

196. Wade T. L. and Sweet, S. T. 2008 Galveston Bay Atmospheric Deposition Studies, Proceedings of the Eighth Biennial State of The Bay Symposium, Galveston Bay Estuaries Program, Galveston, Texas, January 23 to 25, 2007 http://gbic.tamug.edu/gbeppubs/sobviii/sobviii_rpr.htm 8pp.

197. Hwang, H.-M. and Wade, T.L.. 2008. Aerial distribution, temperature-dependant seasonal variation, and source of polycyclic aromatic hydrocarbons (PAH) in Pine Needles from the Houston metropolitan Area, Texas, USA. Journal of Environmental Health and Science Part A 43, 1243-1251.

198. Hwang, H.-M.,. Wade T.L. and Sericano J.L. 2008. Residue-response relationship of lysosomal destabilization and PAHs body burdens and their toxicokinetics in eastern oysters (Crassostrea virginica). Environmental Health and Science Part A 43, 1373-1380.

199. Soliman, Y.S. and Wade T.L. 2008. Estimates of PAHs burdens in a population of ampeliscid amphiod at the head of the Mississippi Canyon (N. Gulf of Mexico). Deep Sea Research II 55: 2577-2584.

200. Wade, T.L, Soliman, Y.S., Sweet S.T., Wolff, G.A. and Presley B.J. 2008. DGoMB Trace Elements and Polycyclic Aromatic Hydrocarbons (PAH). Deep Sea Research II 55: 2585-2593

201. Bissett, W.,Jr., Adams, L.G., Field, R., Moyer, W., Phillips, T., Scott, H.M., Wade, T.L., Sweet, S.T. and Thompson, J.A. 2008. Bayesian Modeling of Lavaca Bay Pollutants. Marine Pollution Bulletin 56. 1781-1787.

202. Bissett, W., Jr., Smith R., Adams, L.G., Field, R., Moyer, W., Phillips, T., Scott, H.M., Wade, T.L., Sweet, S.T. and Thompson, J.A. 2009. An Evaluation of the Health Status of the Lavaca Bay, Texas Ecosystem Using *Crassostrea virginica* as the Sentinel Species. Marine Pollution Bulletin 58. 280-286.

203. Mostafa, A.R., Wade T.L., Sweet S.T., Abdel Kawi A. Al-Alimi, and Barakat A.O., 2009. Distribution and characteristics of polycyclic aromatic hydrocarbons (PAHs) in Sediments of Hadramount coastal Area, Gulf of Aden, Yemen. Journal of Marine Systems 78: 1-8.

204. Louchouarn, P., Kuo, L-J., Wade T. L. and Schantz, M. 2009 Determination of levoglucosan and its isomers in size fractions of aerosol standard reference materials. Atmospheric Environment 43: 5630-5636.

205. Sartori, F. Wade, T.L. Sericano, J.L. Mohanty, B.P. and Smith K.A. 2010 Polycyclic Aromatic Hydrocarbons in Soil of a Canadian River Floodplain Oklahoma, United States. Journal of Environmental Quality 39: 1-12.

206. Diercks, A. R., R. C. Highsmith, V. L. Asper, D. Joung, Z. Zhou, L. Guo, A. M. Shiller, S. B. Joye, A. P. Teske, N. L. Guinasso Jr., T. L. Wade, and S. E. Lohrenz 2010, Characterization of Subsurface Polycyclic Aromatic Hydrocarbons at the Deepwater Horizon Site, Geophys. Res. Lett., doi:10.1029/2010GL045046, L20602 37: 1-6.

207. Kennicutt II, M.C., Klein, A.G., Montagna, P. Sweet, S.T., Wade T.L., Palmer, T.A., Sericano J.L. and Denoux, G. 2010 Temporal and Spatial Patterns of Anthropogenic Disturbances at McMurdo Station, Antarctica, Environmental Research Letters 5. 1-10

208. Kuo, L-J., Louchouarn, P., Herbert, B.E., Brandenberger, J.M., Wade T. L. and Crecelius, E. 2011 Combustion-derived substances in deep basins of Puget Sound: Historical inputs from fossil Fuel and biomass combustion. Environmental Pollution 159. 983-990.

209. Barakat, A.O., Mostafa, A.R. Wade T.L., Sweet S.T and El Sayed, N.B. 2011 Spatial Distribution and Temporal Trends of Polycyclic Aromatic Hydrocarbons in Sediments from Lake Maryut, Alexandria, Egypt. Water, Air and Soil Pollution 218 63-80. (Available on line DOI 10.1007/s11270-010-0624-5)

210. Sericano, J.L. and Wade T.L. 2011. Contamination profiles and temporal trends of persistent organic pollutants on oysters from the Gulf of Mexico. In: *Global Contamination Trends of Persistent Organic Chemicals*, Eds. Loganathan, B.G. & Lam, P.K.S., CRC Press, 431-467

211. Barakat, A.O., Mostafa, A.R. Wade T.L., Sweet S.T and El Sayed, N.B. 2011 Distribution and Characteristics of PAHs in Sediments from the Mediterranean Coastal Environment of Egypt. Marine Pollution Bulletin 62 1969-1978.

212. Kahairy, M.A., Barakat, A.O., Mostafa, A.R. and Wade T.L. 2011 An Environmental Pollution and Risk Assessment Study from Multi element Analyses of Road Dust Samples in Delta Region, Egypt. Microchemical Journal 97 234-242.

213. Wade, T.L., Sweet S.T., Sericano, J.L., N.L. Guinasso Jr., Diercks, A.-R., Highsmith, R.C., Asper, V.L., Joung, D., Shiller, A.M., Lohrenz, S.E. and Joye, S.B. 2011, Analyses of Water Samples from the Deepwater Horizon Oil Spill: Documentation of the Sub-Surface Plume. in Monitoring and Modeling the Deepwater Horizon Oil Spill: A Record-Breaking Enterprise, Geophysical Monograph Series, vol. 195, edited by Y. Liu et al., pp. 77–82, AGU, Washington, D. C., doi:10.1029/2011GM001103

214. Wade, T.L., Sweet S.T., Walpert, J.N., Sericano, J.L., Singer J.J. and N.L. Guinasso Jr. 2011 Evaluation of Possible Inputs of Oil from the Deepwater Horizon Spill to the Loop Current and Associated Eddies in the Gulf of Mexico. in Monitoring and Modeling the Deepwater Horizon Oil Spill: A Record-Breaking Enterprise, Geophysical Monograph Series., vol. 195, edited by Y. Liu et al., pp. 83–90, AGU, Washington, D. C., doi:10.1029/2011GM001095.

215. Barakat, A.O., Mostafa, A Wade T.L., Sweet S.T and El Sayed, N.B. 2012 Spatial distribution and temporal trends of persistent organochlorine pollutants in sediments from Lake Maryut, Alexandria, Egypt,, Marine Pollution Bulletin 64 395-404.

216. Barakat, A.O., Mostafa, A Wade T.L., Sweet S.T and El Sayed, N.B. 2012 Assessment of persistent organochlorine pollutants in sediments from Lake Manzala, Egypt. Marine Pollution Bulletin 64 1713-1720.

217. Klein, A.G., Sweet S.T., Wade T.L., Sericano, J.L. and Kennicutt II, M.C. 2012 Spatial Patterns of Total Petroleum Hydrocarbons (TPH) in the Terrestrial Environment at McMurdo Station, Antarctica, Antarctic Science doi:10.1017/S0954102012000429. 24: 450-466.

218. Barakat, A.O., Mostafa, A., El Sayed, N.B Wade T.L. and Sweet S.T. 2013 Polycyclic Aromatic Hydrocarbons (PAHs) in Surface Sediments of Lake Manzala, Egypt. Soil and Sediment Contamination 22 315-331.

219. Wade, T.L., Sweet, S.T., Sericano, J.L., DeFreitas, D.A. and Lauenstein, G.G. 2013 Polychlorinated Dibenzo-P-Dioxins and Dibenzofurans in Bivalve Samples from the NOAA National Status and Trends Project. Marine Pollution Bulletin (submitted).

220. Sartori, F. Sericano, J.L. Mohanty, B.P. and Wade, T.L. 2013. Mobilization of Polycyclic Aromatic Hydrocarbons in Water-Methanol Systems under Unsaturated Transient Flow Conditions. Journal of Environmental Quality. (in preparation)

221. Klein, A.G., Sweet S.T., Wade T.L. and Kennicutt II, M.C. 2013 Spatial Patterns of Selected Metals in the Terrestrial Environment at McMurdo Station, Antarctica, Antarctic Science (in preparation)

TECHNICAL REPORTS:

1. Quinn, J.G. and T.L. Wade. 1974. Hydrocarbon analyses of IDOE intercalibration samples of cod liver oil and tuna meal. University of Rhode Island Marine Memorandum Series Number 33, 8 pp.

2. Wade, T.L. and J.G. Quinn. 1977. Analyzing tar in the Sargasso Sea. Maritimes, 21: 1-2.

3. Oertel, G.F. and T.L. Wade. 1981. The relationship among sea surface roughness variations, oceanographic analyses, and airborne remote sensing analyses. Department of Oceanography Technical Report No. 81-2, 289 pp.

4. Butt, A., J. Ludwick, R. Johnson, T. Wade, D. Feigenbau, D. Lundberg, E. Stern, K. McCormick. 1983. Annotated bibliography of lower Chesapeake Bay: Current literature of Biological, Chemical, Geological and Physical studies. Department of Oceanography, Old Dominion University, 87 pp.

5. Brooks, J.M., T.L. Wade, E.L. Atlas, M.C. Kennicutt II, B.J. Presley, R.R. Fay, E.N. Powell, and G. Wolff. 1987. Analyses of bivalves and sediments for organic chemicals and trace elements from Gulf of Mexico estuaries. Annual Report, 618-pp.

6. Brooks, J.M., T.L. Wade, E.L. Atlas, M.C. Kennicutt II, B.J. Presley, R.R. Fay, E.N. Powell, and G. Wolff. 1988. Analyses of bivalves and sediments for organic chemicals and trace elements from Gulf of Mexico estuaries. Annual Report, 644 pp.

7. Brooks, J.M., T.L. Wade, E.L. Atlas, M.C. Kennicutt II, B.J. Presley, R.R. Fay, E.N. Powell, and G. Wolff. 1989. Analyses of bivalves and sediments for organic chemicals and trace elements from Gulf of Mexico estuaries. Annual Report, 678 pp.

8. Velinsky, D.J., C.H. Haywood, T.L. Wade, and E. Reinharz. 1992. Sediment Contamination Studies of the Potomac and Anacostia Rivers around the District of Columbia. ICPRB Publication 92-2, Interstate Commission on the Potomac River Basin, Rockville, MD.

9. Kennicutt II, M.C., T.L. Wade, and B.J. Presley 1992. Assessment of Sediment Contamination in Casco Bay. Casco Bay Estuary Project. Casco Bay Estuary Project. 113pp. and appendices.

10. Quinn, J.G., J.W. King, R.W. Carins, P.F. Gangemi, and T.L. Wade. 1994. Chemical contaminants in marine sediments from the former Drecktor shipyard site at Coddington Cove, Newport, Rhode Island. Final Report, U.S. Navy, 24 pp.

11. Wade, T.L., T.J. Jackson, L. Chambers, and P. Gardinali 1995. Assessment of Butyltins, PCDD/PCDF and Planar PCB in Sediment from Casco Bay. 44pp. and Data Appendices.

12. Golomb, D., D. Ryan, N. Eby, J. Underhill, T. Wade, and S. Zemba 1996. Atmospheric Deposition of Trace Metals and Polyaromatic Hydrocarbons onto Massachusetts Bay Final Report Massachusetts Bay Program (Fed Id No. 046-002-284). January 1996. 12 pp and Data Appendices.

13. Presley, B.J., T.L. Wade, P. Santschi, and M. Baskaran 1996. Historical Contamination of Mississippi River Delta, Temps Bay, and Galveston Bay Sediments. Final Report to NOAA, Award NA47OA245. Texas A&M University, Dept. of Oceanography, College Station TX. 65pp.

14. Wade, T.L. and S.T. Sweet 2005. Assessment of Sediment Contamination in Casco Bay, Casco Bay Estuaries Project. University of Southern Maine. GERG Technical Report 05-006. 50pp (plus appendixes)

15. Mostafa, A.E-D, Wade T.L., Sayed, N.B.E. and Sweet S.T. 2007. Assesment of Sources, Levels, Trends and Effects of Presistant Organic Pollutants (POPs) in the Mediteranian Coastal Environment of Egypt. Final Report U.S.-Egypt Science and Technology Program. US AID ENV07-003-003. 122 pg.

16. Wade, T.L. and S.T. Sweet 2008. Coastal Bend Bays and Estuaries Program (CBBEP): Atmospheric Deposition Study. Final Report, 45pp.

GRANTS AND CONTRACTS (last 5 years):

Funding from 2002 to 2009 at ~$1,000,000 per year from USFWS, Texas Department of Health Services, Philadelphia Academy of Natural Sciences, NSF McMurdo Station Environmental Studies, State of Maryland, Virginia TMDL studies, US AID Egypt Study, CBBNEP Atmospheric Deposition Studies and many others.

PROFESSIONAL SERVICE:

Specialist for "Center for International Environment Information" on Petroleum Hydrocarbons, 1982-1984.

Member of the Virginia State Air Pollution Control Board Committee on Acid Rain, 1982-1984.

Presentation to State Policy Advisory Committee, State Water Control Board, and The Office of Emergency and Energy on "*Value of Recycling Used Crankcase Oil*", April 21, 1982.
Specialist for IOC/UNESCO "Black Sea Mussel Watch Program", 1995-present.
Member GESRM (Group of Experts on Standards and Reference Materials) of IOC/UNESCO, 1992-present.
Member GEEP (Group of Experts on Environmental Pollution) of IOC/UNESCO, 1995-present.

UNIVERSITY SERVICE:

Member of College Executive Committee 2010 to present
Member of Oceanography Executive Committee 2010 to present
Member of College GERG Working Group 2010 to present
Member of College search Committee for Assistant Dean for Finance 2011
Member of Oceanography Strategic Committee 2009- present
Member of Oceanography Head Search Committee 2006-2007
Member of Oceanography Geological Faculty Search Committee 2006-2007
Member of Oceanography Research Committee 2006-2008
Member of College of Geosciences Committee on Research Professionals 2008
Chairman of Oceanography Research Committee sub-Committee on Research Professionals 2006-2008
Member Geochemistry of the Earth, Sea & Atmosphere (GESA) College of Geosciences Advisory Group 2005-2009
Member of College of Geosciences Academic Advisory Committee 2004-present
Member of Dean of Geosciences Search Committee 2004
Lecture to Marine Pollution Class (OCN 647), 1992, 1994, 1997, 1999, 2003, 2005
Lecture to Chemical Oceanography Class (OCN 640), 1984, 1985, 1986, 1998
Sea Grant Marine Education Symposium Exhibit, March 2, 1985
Career Day Exhibit, Nov. 17, 1984
Shop Committee, School of Sciences and Health Professions, 1979-1984
Department Writing Proficiency Officer, 1978-1984
Degrees and Curriculum Committee, 1978-1984
Faculty Senate, 1979-1980
Space Committee, Department of Oceanography, 1980
Technical Advisory Committee, Virginia Water Resources Research Center, 1979

CRUISE EXPERIENCE:

Ship	*Cruise*	*Location*	*Sponsor*	*Duration (days)*
R/V TRIDENT	123	N. Atlantic	NSF	17
R/V TRIDENT	143	N. Atlantic	NSF	10
DELAWARE II	Superflux II	N. Atlantic	NOAA	7
KELEZ	Superflux III	N. Atlantic	NOAA	10
R/V GYRE	84-G-4	Gulf of Mexico	ONR	6
R/V GYRE	85-G-5 II	Gulf of Mexico	ONR	10
R/V GYRE	86-G-2	Gulf of Mexico	NSF	10

R/V GYRE:NR-1	87-G-2	Gulf of Mexico	ONR	10
R/V GYRE *(Chief Scientist)	90-G-8*	Gulf of Mexico	TWC	3
R/V Mukhtabar Al-Bihar	Feb'11	Persian Gulf	Qatar	4

COURSES TAKEN:

1978 "Radiation Safety", given by Daniel J. Strom, Radiation Safety Officer, 11/7/78 to 11/20/78. (twenty contact hours and a final exam).

1983 "Computer Literacy", consisted of twenty contact hours plus use of mini computers and the DEC-10.

1985 "Gas Chromatography/Mass Spectroscopy 5987/96 User I", a week-long course at Hewlett-Packard, Analytical Training Center, New Orleans, La, CEU:4.0.

1999 "Improving Your Project Management Skills: The Basics for Success", a concentrated program of study in the field of professional management, American Management Association International, College Station, CEU: 1.8.

COURSES TAUGHT

Course No	*Title*	*Semesters Taught*	*Text**
OC 406	Oceanography	S+F-79,80,81,82,83	1
OC 610	Advanced Chemical Oceanography	F-80,81,82,83	2
OC 611	Chemical Oceanography Lab	S-79,80,81,82,83	3,5
OC 614	Environmental Chemistry of Ocean	S-78-80,82,84	4,5
OC 718/818	Organic Geochem. of Ocean	F-78,80,82	5
OC 732/832	Geochem. of Marine Sediments	F-79	5
OC 691/692	Seminar in Oceanography	F-83,84	

* 1 = *Ocean Science*, Stowe
2 = *Introduction to Marine Chemistry*, Riley and Chester
3 = *A Practical Handbook of Seawater Analysis*, Strickland and Parsons
4 = *Chemical Cycles and The Global Environment*, Garrett, Mackenzie and Hun
5 = Current literature and reference materials

MS and Ph.D.COMMITTEE MEMBERSHIP:		***University/Department***
1978-1979	Eric John Miller, Ph.D. Committee Member	ODU
1978-1979	Kazufumi Takayanagi, MS Committee Member	ODU
1978-1979	Gullaya Wattaykoun, Ph.D. Committee Member	ODU
1979-1980	Colin S. Moy, M.S. Committee Member	ODU
1979-1983	Kazufumi Takayanagi, Ph.D. Committee Member	ODU
1979-1982	Robert C. Brown, M.S. Chairman	ODU
1979-1984	James F. Todd, Ph.D. Committee Member	ODU
1979-1980	William Kornicker, M.S. (Non-Thesis) Advisor	ODU
1980-1982	Maylon White, M.S. Committee Member	ODU
1980-1982	David B. Webber, M.S. Chairman	ODU

1981-1982	David J. Velinsky, M.S. Chairman	ODU*
1981-1983	Charles T. Farmer, M.S. Chairman	ODU
1981-1983	Bonnie Barrows, M.S. Committee Member	ODU
1981-1983	Richard Lacouture, M.S. Committee Member	ODU
1982-1984	David J. Velinsky, Ph.D. Chairman	ODU*
1982-1983	Juanita Y. Grabarczyk, M.S. Committee Member	ODU
1982-1984	Elizabeth Merrill, M.S. Chairman	ODU
1983-1985	Ching-Hui Hsu, M.S. Committee Member	ODU
1983-1985	Robert A. Kravitz, M.S. Committee Member	ODU
1982-1984	Thomas J. Oatts, Ph.D. Committee Member	ODU
1984-1986	Jose L. Sericano, M.S. Committee Member	TAMU/OCNG
1984-1988	Richard J. Fox, M.S. Committee Member	TAMU/OCNG
1985-1989	Bernardo Garcia, M.S. Committee Member	TAMU/OCNG
1987-1993	Jose L. Sericano, Ph.D. Co-Chair (Brooks)	TAMU/OCNG
1989-1992	Georgianna L. Saunders, M.S. Committee Member	TAMU/OCNG
1991-1993	Gregory Salata, M.S. Chairman	TAMU/OCNG
1991-1994	Yanhui Yu, Ph.D. Co-Chairman (Brooks)	TAMU/OCNG
1989-1996	Bernardo Garcia, Ph.D. Chairman	TAMU/OCNG
1991-1996	Piero Gardinali, Ph.D. Chairman	TAMU/OCNG
1992-1995	Yung-Kul Kim, M.S. Committee Member	TAMU/OCNG
1993-1997	Lisl Shoda, Ph.D. Committee Member	TAMU/WFS
1993-Withdrew	Scott Champ, M.S. Committee Member	TAMU/CHEM
1993-1999	Gregory Salata, Ph.D. Committee Member	TAMU/OCNG
1995-2000	Junesoo Park, Ph.D. Chairman	TAMU/OCNG
1996-2001	Hyun-Min Hwang, Ph.D. Co-Chairman (Sericano)	TAMU/OCNG
2001-2007	Yousria Soliman, Ph.D. Co-Chairman (Rowe)	TAMU/OCNG
2003-2003	Yung-Kul Kim, Ph.D. Committee Member	Rutgers
2004-2009	Gilvan Yoqui, Ph.D. Committee Member	TAMU/OCNG
2004-2009	Li-Jung Kuo, Ph.D. Committee Member	TAMU/GELP
2007-2010	Clint M. Miller, M.S., Committee Member	TAMU/GEPL
2011-2013	Zeynep Dincer, MS, Committee Member	TAMU/GEPL
2012-	Dawei Shi, Ph.D., Committee Chair	TAMU/OCNG

* I left ODU (Old Dominion University) in 1984 and David Velinsky pursued his Ph.D with George Wong

Ph.D Dissertation Examiner:

2008	Abdel Kawi Abdullah Ahmed Al-Alimi	Alexandria U., Egypt

CURRICULUM VITAE OF GUOYAO WU

OFFICE:

Department of Animal Science
and Faculty of Nutrition
Texas A&M University
College Station, TX, USA 77843-2471
Tel (979) 845-1817; Fax (979) 845-6057

HOME:

4707 Shoal Creek Drive
College Station, TX
USA 77845-4410
Tel (979) 690-7216

CURRENT POSITION:

University Distinguished Professor
Texas AgriLife Senior Faculty Fellow
and University Faculty Fellow
Department of Animal Science
and Faculty of Nutrition
Texas A&M University
College Station, TX, USA

Joint Appointments with
Department of Medical Physiology
Texas A&M College of Medicine
1/1994 to present), and Department of
Veterinary Integrative Biosciences
Texas A&M University (1/1997 to present)

PROFESSIONAL EXPERIENCE:

Assistant Professor (10/1991 – 8/1996)	Department of Animal Science
Associate Professor (9/1996 – 8/2001)	and Faculty of Nutrition
Professor (9/2001 – 8/2012)	Texas A&M University
University Distinguished Professor (9/2012)	Texas A&M University

PERSONAL DATA:

Birth Date and Place:	July 28, 1962; Taishan, Guangdong, China.
Citizenship:	U.S.A.
Family:	Yan Chen (Wife); Children: Neil D. Wu and Jennifer M. Wu

EDUCATION:

B.Sc, Animal Science, 9/1978 - 7/1982	South China Agricultural University Guangzhou, Guangdong, China
M.Sc, Animal Nutrition, 9/1982 - 5/1984	Beijing Agricultural University, Beijing, China
M.Sc, Animal Biochemistry, 5/1984 - 8/1986	University of Alberta Edmonton, Alberta, Canada
Ph.D., Animal Biochemistry, 9/1986 - 7/1989	University of Alberta, Alberta, Canada
Postdoc, Nutrition & Diabetes, 7/1989 - 7/1991	McGill University Medical School Montreal, Quebec, Canada
Postdoc, Biochemistry, 7/1991 - 10/1991	Memorial University Medical School St. John's, Newfoundland, Canada

RESEARCH EXPERIENCE:

Research Interests	Biochemistry, Nutrition and Physiology of Amino Acids and Protein; Nutritional Biochemistry and Physiology; Comparative Nutrition; Growth and Development of Animals; Biology and Pathobiology of Nitric Oxide and Polyamines; Diabetes, Obesity and Cardiovascular Complications; Fetal Nutrition and Metabolism; and Animal Models of Human Diseases.
B.Sc Research (1/1982 - 7/1982)	Supervisor: Prof. Yong-Lu Li and Prof. Gang Han Lactating and reproductive performance of cows in heat stress. South China Agricultural University, Guangzhou, China
M.Sc Research (9/1982 - 5/1984)	Supervisor: Prof. Sheng Yang Ileal amino acid digestibility in growing pigs. Beijing Agricultural University, Beijing, China
M.Sc Research (5/1984 - 8/1986)	Supervisor: James R. Thompson, Ph.D. Leucine degradation in chick skeletal muscle. University of Alberta, Edmonton, Alberta, Canada
Ph.D. Research (9/1986 - 7/1989)	Supervisor: James R. Thompson, Ph.D. Protein and amino acid metabolism in skeletal muscle. University of Alberta, Edmonton, Alberta, Canada
Postdoctoral (8/1989 - 7/1991)	Supervisor: Errol B. Marliss, M.D. The BB rat as an animal model of type I diabetes. McGill Nutrition Center and Department of Medicine Royal Victoria Hospital, Montreal, Quebec, Canada
Postdoctoral (7/1991 - 10/1991)	Supervisor: John T. Brosnan, Ph.D. Arginine metabolism in macrophages. Department of Biochemistry Memorial University; St. John's, Newfoundland, Canada
Further Training (8/1992)	Advisor: Malcolm Watford, Ph.D. Measurement of glutaminase mRNA levels in chick tissues. Department of Nutritional Sciences, Rutgers University New Brunswick, New Jersey, USA
Further Training (11/1993)	Advisor: Michael L. McDaniel, Ph.D. Isolation of rat pancreatic islets. Department of Pathology, School of Medicine Washington University, St. Louis, Missouri, USA
Further Training Sabbatical Leave (1/2005 – 6/2005)	Advisor: Susan K. Fried, Ph.D. Fat Biochemistry and Nutrition University of Maryland School of Medicine, Baltimore, MD, USA
Principal Investigator & Director (10/1991 - present)	Laboratory of Amino Acid & Protein Biochemistry and Nutrition Department of Animal Science and Faculty of Nutrition Cross-appointments with Department of Medical Physiology and Department of Veterinary Integrative Biosciences Texas A&M University, College Station, TX, USA

TEACHING OF UNDERGRADUATE AND GRADUATE COURSES:

Teaching Assistant (9/1985 - 4/1988)	ANSC 311: Animal Physiology ANSC 460: Animal Nutrition ANSC 491: Animal Biochemistry University of Alberta, Edmonton, Alberta, Canada
Faculty member Texas A&M Univ. (10/1991 – present)	ANSC/NUTR 601: General Animal Nutrition (Fall, 1992-1995; 2003) ANSC/NUTR 603: Experimental Nutrition (Fall, 1992 - 1994) ANSC/NUTR 613: Protein Metabolism (Spring, 1995 - present) ANSC 685: Problems in Animal Science (1993 - present) ANSC/NUTR 689: Protein Metabolism (Spring, 1992 - 1994) ANSC/NUTR 689: Physiological Chemistry (Fall 1995) ANSC/NUTR 691: Research (1992 to present) NUTR 641: Nutritional Biochemistry (Fall, 1996 - present) NUTR 681: Nutrition Seminar (1992-1993; 2002 - present) NUTR 685: Problems in Nutrition (1994 - present) ANSC 485: Problems in Animal Science (1996 to present) BICH 485: Problems in Biochemistry (Spring, 1992; 2005-2006) NUTR 485: Problems in Nutrition (1992 to present) NUTR 685: Fundamentals of Space Life Science (Team-taught, 2007-)

DIRECTION OF GRADUATE STUDENTS:

Chair:	Bremer, Cami (M.S. in Nutrition, 9/1994 to 5/1997) Chen, Jinyun (Ph.D. in Nutrition, 1/2001 to 6/2001) Dasgupta, Mou (M.S. in Nutrition, 9/2001 – 12/2004) Davis, Paula K. (M.S. in Nutrition, 9/1993 to 11/1996) Dillon, E. Lichar (M.S. in Nutrition, 9/1997 to 5/1999) Flynn, Nick. E. (Ph.D. in Nutrition, 1/1994 to 5/1997) Haynes, Tony E. (M.S. in Nutrition, Part-time; 9/1998 to 9/2005) Jia, Sichao (Ph.D. in Animal Science, 8/2012-Present) Jobgen, Wenjuan (Ph.D. in Nutrition, 9/2003 to 8/2007) Kohli, Ripla (M.S. in Nutrition, 9/2001 to 8/2003) Li, Hui (Ph.D. in Nutrition, 9/1997 to 8/2001) Li, Xilong (Ph.D. in Nutrition, 9/2007 to Present) McKnight, Jason R. (M.S. in Nutrition, 9/2008 to 8/2010) Rezaei, Reza (M.S. in Nutrition, 5/2008 to 12/2010) Rezaei, Reza (Ph.D. in Nutrition, 1/2011 to Present) Wilson, Natalie A. (M.S. in Nutrition, 5/2000 to 5/2002) Zhang, Souwei (Ph.D. in Nutrition, 9/1998 to 8/1999)
Co-Chair:	Borbolla, Arturo G. (Ph.D. in Nutrition, 9/1992 to 8/1995) Gao, Haijun (Ph.D. in Reproductive Physiology, 1/2005-5/2009) Kwon, Hyuk-Jung (M.S. in Reproductive Physiology, 9/2001-9/2003) Li, Xin (M.S. in Food Science, 5/1996 to 11/1999) Meier, Sabina A., M.S. in Nutrition (5/1992 to 8/1995) Simon, Robin (M.S. in Nutrition, 9/1998 to 5/1999) Wang, Xiaoqiu (Ph.D. in Nutrition, 1/2011 to Present)
Committee Member:	Adhikari, Sean (M.S. in Genetics, 9/2004 – 5/2006) Barker, Rissa L. (M.S. in Toxicology, 9/1993 to 10/1995) Birch, Sharla M. (Ph.D. in Biomedical Sciences, 9/2010 – Present)

Brock, Amy A. (M.S. in Nutrition, 5/1993 to 9/1995)
Brooks, Matthew A. (M.S. in Nutrition, 9/2005 to 5/2008)
Buentello-Garcia, J. Alejandro (Ph.D. in Nutrition, 1/1996 - 12/1999)
Chamberlin, Amy (M.S. in Nutrition, 9/2007 – 8/2009)
Cole, Casey E. (Ms. in Nutrition, 1/1998 to 5/2000)
Dado, Joana (Ph.D. in Medical Sciences, 9/2003 to 8/2006)
Dekaney, Christopher M. (Ph.D. in Vet. Anatomy, 1/1998 to 8/2001)
Dresser, Beth (Ph.D. in Nutrition, 1/1997 to 9/1998)
Ford, Anne (Ph.D. in Nutrition, 9/2006 to 12/2010)
Go, Gwang Woong (Ph.D. in Nutrition; 9/2007 – 12/2010)
Greff, Sorin (M.S. in Reproductive Physiology, 1/2010 to 5/2011)
Ha, Chen-Xiang (M.S. in Nutrition, 9/1992 to 10/1994)
Hall, Jennifer (M.S. in Nutrition, 9/2006 – 5/2008)
He, Qinghua (Ph.D. in Animal Nutrition, Chinese Academy of Sciences, China; 7/2006 – 8/2009)
Ji, Fei (Ph.D. in Animal Nutrition, Texas Tech, 9/2001 to 12/2004)
Kang, Dong-Hyun (M.S. in Animal Science, 5/1998 to 5/1999)
Keith, Ashley B. (M.S. in Animal Science, 9/2011 to present)
Kim, Jin-Young (Ph.D. in Reproductive Physiology, 9/2007- 5/2010)
Kirk, James M. (M.S. in Nutrition, 9/1993 to 10/1995)
Lassala, Arantza (PhD in Reproductive Physiology, 9/2005-12/2008)
Lu, Wei (M.S. in Nutrition, 9/1995 to 5/1997)
Majumdar, Sudeep (Ph.D. in Nutrition, 9/1993 to 12/2001)
Marinos, Rebeca S. (Ph.D. in Medical Sciences, 1/1997 to 5/2000)
Mateo, Ronald (Ph.D. in Animal Sci, Texas Tech University, 12/2007)
McClure, Melena K. (M.S. in Nutrition, 9/2005 – 5/2008)
McPherson, Rebecca L. (M.S., Texas Tech, 9/2001-12/2003)
Popovic, Natasa (M.S. in Nutrition, 9/2000 – 5/2003)
Price, Pamela T. (Ph.D. in Nutrition, 9/1995 - 12/1998, University of Texas at Austin, TX)
Ramirez, Maria A. (M.S. in Animal Science, 1/1992 to 12/1993)
Ren, Wenkai (M.S. in Animal Nutrition, Chinese Academy of Sciences, China; 7/2009 – Present)
Reynolds, Judith A. (Ph.D. in Animal Science, 9/1993 to 8/1996)
Sawant, Onkar (Ph.D. in Biomedical Sciences, 9/2010 to present)
Shipley, Susan (M.S. in Nutrition, 9/1994 to 5/1997)
Simon, Robin (M.S. in Nutrition, 9/1992 to 8/1995)
Stewart, Laura J. (Ph.D. in Nutrition, 5/1992 to 5/1995)
Wade, Laura (M.S. in Medical Sciences, 9/2004 – 5/2008)
Wilson, Shannon E. (Ph.D. in Biomedical Sciences, 9/2006 – 8/2010)
Wright, Tyler (M.S. in Veterinary Anatomy, 9/2003 – 12/2006)
Wu, Xin (Ph.D. in Animal Nutrition, Chinese Academy of Sciences, China; 7/2006 – 8/2009)
Yao, Kang (Ph.D. in Animal Nutrition, Chinese Academy of Sciences, China; 7/2006 – 8/2009)
Ying, Wei (Ph.D. in Reproductive Physiology, 1/2012 to Present)
Zhang, Jianhu (Ph.D. in Nutrition, 9/1993 to 5/1997)
Zhang, Xiaotong (M.S. in Nutrition, 9/1993 to 9/1996)
Zoran, Debra L. (Ph.D. in Nutrition, 9/1993 to 11/1997)

Graduate Council Representative for the Following Graduate Students:

Chen, Fun Diang, Ph.D. in Industrial Engineering (9/1992 to 10/1995)
Choi, Jaeyoung, Ph.D. in Geology (9/1997 to 8/2000)

Davis, Trina J., Ph.D. in Educational Curriculum and Instruction (2/2000 – 9/2004)
Rainer, Darrell R., Ph.D. in Chemistry (1/1992 to 4/1996)
Sinclair, John W., Ph.D. in Mechanical Engineering (2/1996 to 5/1999)

DIRECTION OF POSTDOCTORAL FELLOWS:

Bliznyuk, Nikolay (9/2009-5/2010; NIH Postdoc Fellow in Nutrition and Bioinformatics)
Datta, Sujay (8/2006 to 7/2008; NIH Postdoc Fellow in Nutrition and Bioinformatics)
Dugan, Michael E.R. (7/1993 to 10/1994)
Fu, Wenjiang (8/2003 to 7/2005; NIH Postdoc Fellow in Nutrition and Bioinformatics)
Li, Peng (9/2006 to 12/2008)
Satterfield, M. Carey (1/2008 to 11/2009)
Tekwe, Carmen D. (8/2010-12012; NIH Postdoc Fellow in Nutrition and Bioinformatics)
Wei, Jiawei (6/2010 to 7/2011; NIH Postdoc Fellow in Nutrition and Bioinformatics)
Zorych, Ivan (7/2008-8/2009; NIH Postdoc Fellow in Nutrition and Bioinformatics)

DIRECTION OF VISITING SCHOLARS:

Barber, Anjee (San Diego State University, 10/2011; USA)
Bergeron, Nadia (9/2010 - 11/2010; Laval University, Quebec, Canada)
Chen, Alex F. (10/1995; Southern Illinois University School of Medicine, USA)
Chen, Lixiang (10/2005 to 10/2006; China)
Chen, Yue (2/2007 to 6/2007; China)
Dai, Zhaolai (2/2009 to 3/2010; China)
Fu, Chenxing (10/2011 to present; China)
Kong, Xiangfeng (2/2008 to 1/2009; China)
Lei, Jian (4/2010 – 5/2-11; China)
Lin, Gang (9/2012 - present; China)
Mahata, Maria Endo (10/2011 – 11/2011, Indonesia)
Rizal, Yose (9/2009 – 11/2009; Indonesia)
Ruan, Zheng (10/2012 - present; China)
Tan, Bie (2/2008 to 1/2009; China)
Wang, Junjun (11/2005 to 12/2006; 10/2009 to 11/2010; China)
Wang, Xiuqui (2/2012 to present; China)
Wu, Zhenlong (1/2012 to 3/2012; China)
Xi, Pengbin (4/2009 to 5/2010; China)
Yang, Haipeng (2/2011 - 6/2011; China)
Yang, Ying (11/2011 - present; China)
Yao, Kang (5/2009 to Present; China)
Yin, Yu-Long (10/2006 to 2/2007; China)
Zhu, Cui (12/2012 to present, China)

UNDERGRADUATE STUDENTS WORKING IN MY LABORATORY:

Douglas Barstow, Dustin Burke, Warren Chambers, Brittan Clark, Jennifer Clegg, Rhiannon Davidson, Ryan Farmer, Lisa Felder, Nick Flynn, Sean Flynn, Jocelyn Galland, Jennifer George, Amy Gonzales, Alan Haisler, Courtney Hale, Andy Hall, Abby Harris, Calie Jarvis, Tomi Kadir, Tety Leonardi, Nicole McDonald, Matthew Meininger, David Morrow, Anson Pond, Monica Palacios, Mary Park, Kristi Parker, Garrett Parsons, Jessica Ransonet, Elizabeth Riley, Sue Sinn, Felipe Trott, Melissa White, Linda Zang

COMMITTEE WORK AT TEXAS A&M UNIVERSITY:

Member: The Strategic Planning Task Force, Faculty of Nutrition (8/1993).

Chair: The Curriculum Committee, Faculty of Nutrition (11/1993-11/1996; 2008-).

Ex officio: Executive Committee, Faculty of Nutrition (5/1994 to 11/1996).

Chair: Faculty of Nutrition Seminar Committee (1992-1993; 2002-2003).

Member: Executive Committee, Faculty of Nutrition (2/2003 to 2/2006).

Member: Texas A&M University Laboratory Animal Care Committee (9/1996 to 9/1998).

Coordinator: Kleberg Animal Facilities, College of Agriculture and Life Sciences, Texas A&M University (9/1996 to 1/2005).

Member: Grant Review Panel, Texas A&M University Interdisciplinary Research Initiatives Program (11/1998 to 5/2000).

Member: Implementation Team for Establishing a New Department of Nutrition and Food Sciences at Texas A&M University (9/2001 to 10/2002).

Member: Selection Committee for TAES Faculty Fellows, Texas A&M University (2004 and 2005)

Member: Committee for Mentoring New Faculty Members, Department of Animal Science, Texas A&M University (2005 – Present)

Member: Executive Committee, Faculty of Nutrition (2/2008 to 1/2012).

Member: Executive Committee, Faculty of Reproductive Biology (8/2008 to present).

Member: Implementation Team for Moving Faculty of Nutrition to Department of Nutrition and Food Sciences at Texas A&M University (9/2010 to 8/2011)

Member: Texas A&M University Transportation Service Committee (9/2012 to present)

Member: Selection Committee for Texas A&M University Faculty and Staff Distinguished Achievement Awards (2013)

PROFESSIONAL ACTIVITIES:

Professional Society Memberships:

Member, American Association for the Advancement of Science (3/1994 to present; #20082329)
Member, American Diabetes Association (6/1994 to 5/1999)
Member, American Heart Association Vascular Biology Scientific Council (1998 to present; AHA membership # 100001515488)
Member, American Physiological Society (4/1995 to 2001)
Member, American Society of Nutrition (5/1992 to present)
Member, American Society of Animal Science (1/1993 to present)
Member, Biochemical Society (London, UK) (9/1992 to 12/2005)
Member, Canadian Society for Nutritional Sciences (7/1990 to 12/1996)

Member, Juvenile Diabetes Research Foundation (8/1992 to present)
Member, Society for the Study of Reproduction (11/1996 to present)

Editorial Boards:

Member, Editorial Advisory Board, The Biochemical Journal, London, UK (1/1993 – 12/2005).
Member, Editorial Board, The Journal of Nutrition, USA (6/1997 – 6/2003).
Member, Editorial Board, Asian-Australasian Journal of Animal Science (1/2003 – 12/2009).
Member, Editorial Board, Journal of Nutritional Biochemistry (1/2006 – present).
Member, Editorial Board, Diabetes and Lipid Research (1/2008 – present).
Editor, Amino Acids (3/2008 – present)
Editor, Journal of Amino Acids (12/2008 – present)
Managing Editor, Frontiers in Bioscience (11/2009 – present)
Editor, Springer Plus: Collections on Amino Acids (10/2012 – present)

Ad hoc Reviewer for Scientific Journals:

African Journal of Biotechnology, Amino Acids, American Journal of Clinical Nutrition, American Journal of Physiology, Analytical Biochemistry, Animal, Animal Biotechnology, Animal Science, Antioxidants and Redox Signaling, Asian-Australasian Journal of Animal Sciences, Australian Journal of Agricultural Research, Biochemical Journal, Biochimica et Biophysica Acta, Biological Research for Nursing, Biology of Reproduction, BioTechniques, British Journal of Nutrition, Canadian Journal of Physiology and Pharmacology, Clinical and Investigative Medicine, Clinical Biochemist Review, Clinical Nutrition, Clinical Science, Comparative Biochemistry and Physiology, Current Vascular Pharmacology, Diabetes, Diabetologia, Domestic Animal Endocrinology, Electrophoresis, European Journal of Biochemistry, Experimental Biology and Medicine, FASEB Journal, Food Chemistry, Frontiers of Bioscience, Gastroenterology, Gene, Hippocampus, Hormone and Metabolic Research, International Journal of Obesity, Journal of Agricultural and Food Chemistry, Journal of Animal Science, Journal of Animal Science and Biotechnology, Journal of Amino Acids, Journal of Applied Physiology, Journal of Cellular Physiology, Journal of Chromatography, Journal of Clinical Investigation, Journal of Dairy Research, Journal of Endocrinology, Journal of Molecular and Cellular Cardiology, Journal of Neurochemistry, Journal of Nutrition, Journal of Nutritional Biochemistry, Journal of Nutritional Science and Vitaminology, Journal of Physiology (London), Journal of Pineal Research, Journal of Proteome Research, Journal of Vascular Research, Life Sciences, Livestock Science, Metabolism, Nature Protocols, Neuroscience Letters, Nitric Oxide: Biology and Chemistry, Nutrition, Physiology & Behavior, PLoS One, Poultry Science, Proceedings of the National Academy of Sciences USA (PNAS), Regulatory Peptides, Reproduction, Reproduction-Nutrition-Development, and ScienceAsia

Ad hoc External Grant Reviewer:

Alberta Heritage Foundation For Medical Research, Alberta, Canada (11/2000); American Association for the Advancement of Science (1/2009); American Heart Association (2002-present); Austria Science Foundation (7/2003); Banting and Best Centre, University of Toronto, Canada (4/1995 and 6/2000); Biotechnology and Biological Science Research Council, U.K. (2007 and 2008); Canadian Diabetes Association, Ottawa, Canada (11/1993); International Foundation for Science, Sweden (4/2004 and 2006); Medical Research Council of Canada (11/1993); Israel National Science Foundation (5/2009), National Natural Science Foundation, China (2004-2008); National Science Foundation, USA (2003-2006); Natural Science and Engineering Research Council (NSERC), Ottawa, Canada (2003; 2006); The Hospital for Sick Children Foundation; USDA/NRI (Human Nutrition Program, 1996); The Michael Smith Foundation for Health Research, British Columbia, Canada (2/2004); The Ministry of Science and Technology of China's 973 Basic Research Program (2003); One-Thousand-People Talent

Program, the Central Government of China (5/2011); United States - Israel Binational Science Foundation (2nd Round Review, 9/2011); USDA/NRI (Animal Growth and Development Program, 2000-2008); USDA/NRI (Animal Reproduction Program, 2001-2008); USDA/ARS Human Nutrition NP-107 Program (9/2003).

Panel Member of National and International Grant Review Committee:

Member, Fulbright Senior Scholar Specialist Review Committee – Life Sciences, Council for International Exchange of Scholars, Washington, D.C. (2003 to 2005)

Panel Member, USDA/NRI, Animal Growth and Nutrient Utilization (2004, 2005, and 2006)

Panel Member, National Natural Science Foundation of China – The Key Research Program of Life Science (2006 and 2007)

Panel Member, National Natural Science Foundation of China – The General Research Program of Animal Science and Veterinary Medicine (2006 and 2007)

Panel Member, NIH Intramural Research, Site Visit Team for Evaluation of the National Cancer Institute-NIH Laboratory of Comparative Carcinogenesis, Frederick, MD (May 15-17, 2006).

Panel Member, NIH, Pregnancy and Neonatology Study Section (2007 and 2008).

Panel Member, American Heart Association National Research Program (2010 – present)

Panel Member, NIH, Conference Grants Review Committee (2010).

Panel Member, NIH, Special Study Section on Dietary Influence on Human Health (2011).

Activities of Scientific Societies:

Member, Steering Committee on Macronutrient and Energy Metabolism, American Society for Nutritional Sciences (5/2001 to 5/2003)

Elected Member, Nominating Committee, American Society for Nutritional Sciences (2004)

Member, Mead Johnson Award Jury, American Society for Nutrition (2005)

Member, Non-Ruminant Nutrition Award Jury, American Society of Animal Science (2005 to 2008)

Member, Omega Protein Innovative Research Award Jury, American Society of Animal Science (2006 to 2009)

Member, Predoctoral Fellowship Award Jury, The American Society for Nutrition (2006-2009).

Member, Judging Committee of Graduate Student Research Competition, The American Society for Nutrition (2006-2009).

Member, Dannon Institute Mentorship Award Jury, American Society for Nutrition (2006).

Member, Excellence in Teaching Award Jury, American Society for Nutrition (2006).

Organization of National and International Conferences

Co-Chair, Amino Acid Metabolism Symposium, Experimental Biology, American Society for Nutritional Sciences (April 2002)

Chair of the Metabolic and Other Lessons session, The BB Rat Symposium, Ottawa, Canada, December 2-4, 2004.

Co-Chair, Animal models of fetal growth and nutrition research, The Aspen Symposium, Aspen, CO, August 26-29, 2007.

Chair, Symposium on Amino Acids and Fetal Growth, 11th International Conference on Amino Acids, Vienna, Austria, August 3-7, 2009.

Co-Chair, Gentech International Nutrition Symposium, "Intestinal amino acid metabolism: thinking out of the box", Shanghai, China (October 13-15, 2010).

Chair, International Symposium on Maternal Nutrition and Fetal Growth, China Agricultural University, Beijing (May 20, 2011)

Chair, Symposium on Functional Amino Acids in Nutrition and Health, 12th International Conference on Amino Acids, Peptides, and Protein, Beijing, China, August 1-5, 2011.

Chair, Symposium on Recent Advances in Amino Acid Biochemistry and Nutrition, China Agricultural University, August 6, 2011.

Co-Chair, ASAS-Gentech Chinese Swine Nutrition Symposium, Shanghai, China (October 25-27, 2012).

Chair, Texas Human Nutrition Conference, College Station, TX, 2012 and 2013.

President, the 13th International Conference on Amino Acids, Peptides, and Protein (Galveston, Texas, October 5-7, 2013).

Chair, Animal Amino Acid Nutrition Symposium, the 11th World Congress of Animal Production (Beijing, China, October 15-20, 2013)

Invited Presentations (last 5 years):

University of Kentucky, "A path to the vascular NO pathway in diabetes and obesity", March 5, 2008.

The Ohio State University, "A Path to the arginine-synthetic pathway in neonatal pigs", May 16, 2008.

Canadian Animal Nutrition Conference (Guelph, Canada), "Maternal nutrition and fetal growth", May 22-24, 2008.

China Agricultural University (Beijing, China), "The vascular arginine-NO pathway in diabetes and obesity", July 15, 2008.

China Agricultural University (Beijing, China), "Role of the small intestine in neonatal nutrition", July 15, 2008.

Institute of Animal Sciences, The Guangdong Academy of Agricultural Sciences (Guangzhou, China), "Intestinal amino acid metabolism and nutrition", July 28, 2008.

Food Science Institute, Nanchang University (Nanchang, China), "Arginine nutrition in neonatal pigs", July 30, 2008.

Institute of Subtropical Agriculture, The Chinese Academy of Sciences (Changsha, China), "Utilization of amino acids in swine nutrition and production", August 1, 2008.

Wuhan Polytechnical University (Wuhan, China), "Role of the gut in neonatal nutrition", August 4, 2008.

Wuhan Polytechnical University (Wuhan, China), "Nutrition and immune response in animals", August 5, 2008.

University of New Mexico School of Medicine, "Arginine biochemistry and nutrition in neonatal pigs", October 2008.

China Ocean University (Qingdao, China), "Regulation of nitric oxide synthesis by dietary factors", August 12, 2008.

Sixth International Conference of Domestic Animal Endocrinology (Roanoke, Virginia), "Amino acids impact fetal growth", November 14-17, 2008.

III CONGRESO CLANA (Congress of Latin America Animal Nutrition) (Cancun, Mexico), "Intrauterine growth retardation in livestock: Implications, mechanisms, and solutions. November 18-21, 2008.

Baylor College of Medicine/Texas Medical Center (Houston, TX), "A path to citrulline- and arginine-synthetic pathways in neonatal enterocytes", February 26, 2009.

Oklahoma State University, Department of Biochemistry and Molecular Biology, "The Roger E. Koeppe Endowed Lecture: A Pathway from glutamine and glutamate to arginine: nutritional significance for neonates", April 10, 2009

The International Feed Science Conference, "Functional Amino Acids in Swine Nutrition and Production", Lelystad, The Netherlands, May 12, 2009

Iowa State University, Summer Lectureship on "Protein Metabolism", Ames, Iowa, June 1-5, 2009

China Agricultural University, Changjiang Scholar Lectureship on "Protein Metabolism", June 23-24, 2009

USDA-National Renderers Association (NRA) Swine Nutrition and Feed Safety Technical Seminars, "Recent Advances in Swine Amino Acid Nutrition", July 2, 2009, Beijing, China.

USDA-National Renderers Association (NRA) Swine Nutrition and Feed Safety Technical Seminars, "Proline and Hydroxyproline: Biochemistry and Nutrition in Animals", July 2, 2009, Beijing, China.

Chinese Academy of Sciences, Institute of Subtropical Agriculture, Symposium on Amino Acids and Carhohydrates in Animal Nutrition, "Development of Functional Amino Acids in Swine Nutrition", July 3. 2009, Changsha, China.

4th International Symposium on Animal Nutrition and Health, "Recent Advances on Swine Amino Acid Nutrition: Molecular and Functional Studies", July 4-5, 2009. Guangzhou, China.

South China Agricultural University, "Arginine Nutrition: From Milk to Development of Functional Amino Acids", July 4, 2009. Guangzhou, China.

USDA-National Renderers Association (NRA) Swine Nutrition and Feed Safety Technical Seminars, "Recent Advances in Swine Amino Acid Nutrition", July 6, 2009, Manila, Philippines.

USDA-National Renderers Association (NRA) Swine Nutrition and Feed Safety Technical Seminars, "Proline and Hydroxyproline: Biochemistry and Nutrition in Animals", July 6, 2009, Manila, Philippines.

USDA-National Renderers Association (NRA) Swine Nutrition and Feed Safety Technical Seminars, "Recent Advances in Swine Amino Acid Nutrition", July 8, 2009, Ho Chi Minh City, Vietnam.

USDA-National Renderers Association (NRA) Swine Nutrition and Feed Safety Technical Seminars, "Proline and Hydroxyproline: Biochemistry and Nutrition in Animals", July 8, 2009, Ho Chi Minh City, Vietnam.

American Society of Animal Science Annual Meeting, Triennial Symposium on Animal Reproduction, "The impact of amino acid nutrition on pregnancy outcome in pigs: mechanisms and implications for swine production", Montreal, Canada, July 12, 2009.

Sigma Xi Spring Symposium, "Keynote Lecture: Amino acid nutrition and fetal growth", Texas A&M University, College Station, TX, March 22, 2010.

Experimental Biology, Symposium on Animal Models for Nutritional Research, "Amino acid nutrition in fetal and neonatal growth: from animal studies to clinical applications", April 23-28, 2010 (Anaheim, CA)

International Glutamate Technical Committee, "Glutamate content in foods and utilization by the pig small intestine", April 29, 2010 (Santa Monica)

American Society of Animal Science Annual Meeting, Triennial Symposium on Animal Growth and Development, "Important roles for glutamine in swine nutrition and production", Denver, CO, July 11, 2010.

Inner Mongolia Academy of Agricultural Sciences, "Intestinal amino acid metabolism: significance in animal feeding", Hohhot, Inner Mongolia, China (August 4, 2010) (Supported by the Foreign Experts Bureau of China)

Inner Mongolia Academy of Agricultural Sciences, "Roles of amino acids in fetal growth and development", Hohhot, Inner Mongolia, China (August 5, 2010) (Supported by the Foreign Experts Bureau of China)

Inner Mongolia Agricultural University, "Glutamine as a functional amino acid in animal nutrition", Hohhot, Inner Mongolia, China (August 6, 2010)

Wuhan Polytechnical University, “Glutamine: a story for the development of functional amino acid in animal nutrition”, Wuhan, China (August 17, 2010)

Chinese Academy of Sciences, Institute of Subtropical Agriculture, “The arginine-NO pathway in diabetes and obesity”, Changsha, China (August 19, 2010)

The 3rd International Symposium on Energy and Protein Metabolism, Keynote Lecture “Biochemical and physiological limitations to efficiency of amino acid utilization for animal growth”, Parma, Italy (September 6-10, 2010)

The 31st Western Nutrition Conference, The J.M. Bell Memorial Lecture “Functional amino acids: new developments and important implications for animal nutrition”, Saskatoon, Canada (September 22, 2010)

The 31st Western Nutrition Conference, “Impacts of maternal nutrition on embryonic/fetal survival and development”, Saskatoon, Canada (September 23, 2010)

Gentech International Nutrition Symposium, “Intestinal amino acid metabolism: thinking out of the box”, Shanghai, China (October 13-15, 2010)

Third International Symposium on Proline, “Fetal programming of proline metabolism in the small intestine”, Lincoln, Nebraska, November 7-9, 2010.

Seoul National University (Seoul, Korea), “Amino acid nutrition and pregnancy outcomes”, May 16, 2011.

Wuhan Polytechnical University, “Regulation of intestinal protein turnover by glutamine", Wuhan, China (May 24, 2011).

Institute of Animal Sciences, The Guangdong Academy of Agricultural Sciences (Guangzhou, China), “Advances in swine amino acid nutrition”, May 26, 2011.

South China Agricultural University, “New developments in swine arginine nutrition”, May 26, 2011.

12th International Conference on Amino Acids, “Functional Amino Acids in Nutrition and Health”, Beijing, China, August 3, 2011.

Symposium on Recent Advances in Amino Acid Biochemistry and Nutrition, “New Aspects of Amino Acid Biochemistry and Nutrition”, China Agricultural University, August 6, 2011.

Inner Mongolia Academy of Agricultural Sciences, “Efficiency of amino acid utilization by animals: biochemical and physiological bases”, Hohhot, Inner Mongolia, China (August 8, 2011) (Supported by the Foreign Experts Bureau of China)

Wuhan Polytechnical University, “Regulation of intestinal protein turnover by glutamine", Wuhan, China (May 24, 2011).

12th International Conference on Amino Acids, “Functional Amino Acids in Nutrition and Health”, Beijing, China, August 3, 2011.

Symposium on Recent Advances in Amino Acid Biochemistry and Nutrition, “New Aspects of Amino Acid Biochemistry and Nutrition”, China Agricultural University, August 6, 2011.

Cargill Conference on Biological Modeling in Animal Nutrition, “Quantitative analysis of amino acid metabolism in the small intestine: Implications for nutrition and health”, Elk River, MN (August 23-25, 2011)

State Key Animal Nutrition Laboratory Conference, "Arginine nutrition in mammalian reproductive function", Beijing, China (January 5-7, 2012)

European Pediatric and Enteral Nutrition Conference, "Synthesis and catabolism of amino acids in the lactating mammary gland", Stockholm, Sweden (April 26-28, 2012)

Wuhan Polytechnical University, “Research advances in nutritionally nonessential amino acids in animal nutrition", Wuhan, China (June 16, 2012).

International Symposium on Animal Nutrition, Chinese Academy of Sciences, Institute of Subtropical Agriculture, “Dietary requirements of indispensable amino acids by swine”, Changsha, China (June 20, 2012)

Institute of Animal Sciences, The Guangdong Academy of Agricultural Sciences (Guangzhou, China), “Amino acid nutrition in lactation”, June 22, 2012.

South China Agricultural University, “Glutamine synthesis in lactating mammary tissue: pathways and nutritional significance”, June 22, 2012.

Feed Science and Technology Symposium, Sponsored by the U.S. National Renderer's Association (Asia Office), South China Agricultural University, “Amino acid nutrition: the past, present, and future", July 13, 2012.

Feed Science and Technology Symposium, Sponsored by the U.S. National Renderer's Association (Asia Office), South China Agricultural University, “Analysis of amino acids in feedstuffs", July 13, 2012.

Ministry of Agriculture Feed Industry Center, China Agricultural University (Beijing, China), “The use of arginine and N-carbamoylglutamate in improving reproductive performance of gestating swine”, July 19, 2012.

China Animal Nutrition Annual Meeting, “Amino acid nutrition: the past, present, and future", Changsha, China, October 23, 2012.

ASAS-Gentech China Swine Nutrition International Nutrition Symposium, “Arginine nutrition and reproductive performance in gestating sows”, Shanghai, China (October 25, 2012)

ASAS-Gentech China Swine Nutrition International Nutrition Symposium, “Dietary requirements of nutritionally nonessential amino acids”, Shanghai, China (October 26, 2012)

Gentech China Swine Nutrition Conference, “Dietary requirements of amino acids for lactating sows”, Shanghai, China (October 26, 2012)

Inner Mongolia Academy of Agricultural Sciences, “History of amino acid nutrition research (October 29, 2012) (Supported by the Foreign Experts Bureau of China)

Inner Mongolia Academy of Agricultural Sciences, “Synthesis of glutamine and glutamate by lactating sows (October 29, 2012) (Supported by the Foreign Experts Bureau of China)

HONORS AND AWARDS:

1. Outstanding Student Award, South China Agricultural University, Guangzhou, Guangdong, China (7/1982).

2. National Scholarship for Graduate Studies Abroad, The Ministry of Education, P.R. China (5/1984 - 5/1986).

3. Graduate Teaching Assistantship, University of Alberta, Edmonton, Alberta, Canada (9/1985 - 4/1988).

4. Graduate Research Assistantship, University of Alberta, Edmonton, Alberta, Canada (9/1986 - 4/1989).

5. Graduate Travel Award, University of Alberta, Edmonton, Alberta, Canada (5/1988).

6. Andrew Stewart Graduate Prize, University of Alberta, Edmonton, Alberta, Canada (4/1989).

7. Dissertation Fellowship, University of Alberta, Edmonton, Canada (5/1989 - 7/1989).

8. Research Institute Fellowship, Royal Victoria Hospital, McGill University, Montreal, Quebec, Canada (12/1988)

9. Diabetes Canada Fellowship, Canadian Diabetes Associations, Toronto, Canada (5/1989).

10. Medical Research Council of Canada Postdoctoral Fellowship, Medical Research Council of Canada, Ottawa, Canada (8/1989 - 10/1991).

11. Established Investigator, American Heart Association (1/1998 to 12/2001)**.**

12. TAES Faculty Fellow, College of Agriculture and Life Sciences, Texas A&M University (1/2001)**.**

13. University Faculty Fellow, Texas A&M University (4/2002).

14. Nonruminant Nutrition Research Award, American Society of Animal Science (4/2004)

15. Outstanding Overseas Scholar Award, The Chinese Academy of Sciences (1/2005).

16. Outstanding Overseas Young Investigator Award, National Natural Science Foundation of China (1/2006)

17. Vice Chancellor's Award for Excellence in Team Research, The Texas A&M University System (1/2006)

18. Changjiang Scholar, The Ministry of Education, P.R. China (3/2008).

19. Distinguished Research Achievement Award, Texas A&M University (4/2008)

20. Chutian Scholar, The Department of Education, Hubei Province, P.R. China (5/2008).

21. Vice Chancellor's Award for Excellence in Individual Research, The Texas A&M University

System Agriculture Program (1/2009)

22. Texas AgriLife Senior Research Fellow, The Texas A&M University System Agriculture Program (1/2009)

23. Dingying Scholar, South China Agricultural University, Guangzhou, China (7/2009)

24. FASS-AFIA New Frontiers in Animal Nutrition Research Award, Federation of Animal Science Societies and American Feed Industry Association (7/2009). This is the highest award for Animal Nutrition Research in the U.S.A. across the fields of Animal Science, Dairy Science, Poultry Science, and Companion Animals.

25. Thousand-People-Talent Award, The Central Government of China (4/2010).

26. The Samburu Collaboration Award, The International Association of Giraffe Care Professionals (4/2010). This award was given to the Giraffe Nutrition Workshop Team (May 25-26, 2005) whose work had saved hundreds of giraffe in zoos worldwide. Guoyao Wu was a key member of the team.

27. Vice Chancellor's Award for Excellence in Diversity, The Texas A&M University System Agriculture Program (3/2011)

28. Elected Fellow, American Association for the Advancement of Science (AAAS; 11/2012)

RESEARCH FUNDING (last 5 years):

As Principal Investigator (PI):

American Heart Association -TX, 7/2007 to 12/2009, "Glucosamine and insulin resistance in endothelial cells of diet-induced obese rats", $130,000 (Grant #0755024Y).

United States Department of Agriculture, 1/01/08-12/31/11, "Improving growth and survival of low-birth-weight piglets through targeted metabolic control", $350,000. (Grant #2008-35206-18764). (This USDA-NRI proposal ranked #2 in the outstanding category.)

United States Department of Agriculture, 1/01/08-12/31/10, "Mitochondrial biogenesis and adiposity in pigs", $180,000. (Grant # 2008-35206-18762; Joint PI with Dr. Steve B. Smith)

United States Department of Agriculture, 9/01/08-8/31/11, "Arginine nutrition, placental angiogenesis, and fetal growth in pigs", $350,000. (Grant #2008-35203-19120). (This USDA-NRI proposal ranked #1 in the outstanding category.)

6/01/2008-5/30/2009, "Role of dietary L-glutamine in gut development, muscle protein synthesis, and growth of broiler chickens", $30,000 (plus $20,000 Aminogut and glutamuine). (Grant #F028; Joint PI with Dr. Sungwoo Kim).

Gentech Inc., Shanghai, China, 5/2009 – 4/2012, "Citrulline nutrition in pigs", $100,000.

National Natural Science Foundation of China, 1/2010 –12/2011, "Regulation of N-acetylglutamate synthase gene expression in the pig small intestine", ¥200,000 (Grant #30928018)

AGROIN Baja Agro International, Mexico, "Effects of steroidal saponin from *Yucca schidigera* extract (BIOPOWDER) on tissue protein synthesis in young pigs", 2/2010 – 1/2011, "$45,640.

Ajinomoto Inc., Tokyo, Japan, 3/2010-2/2011, “Effects of dietary supplementation with branched-chain amino acids on concentrations of free and protein-bound glutamate in sow milk”, $46,750 (plus $35,000 for 200 kg amino acids, leucine, isoleucine, valine, and alanine).

American Heart Association - TX, 7/2010 to 6/2012, "Leucine and vascular insulin resistance in diet-induced obese rats", $140,000 (Grant #10GRNT4480020).

U.S. Poultry & Egg Harold E. Ford Foundation, 1/2011 – 12/2011, “Effects of dietary glutamate supplementation on intestinal morphology and growth performance in weanling pigs”, $53,780.

Ajinomoto Inc., Tokyo, Japan, 3/2011-12/2011, “Glutamate nutrition in lactating sows”, $25,000 plus 150 kg amino acids (glutamate and alanine; $30,000).

Ajinomoto Heartland Lysine, 8/2011, "Hematology and histology in glutamate-supplemented piglets", $16,000.

International Council of Amino Acid Science, "Safety of arginine supplementation to healthy adults", $250,000, 4/2012 to 3/2014.

National Natural Science Foundation of China, 1/2013 –12/2016, “Maternal arginine nutrition and fetal programming in swine", $150,000 (Grant #31272450)

As Co-PI:

American Heart Association – Ohio Valley Affiliate, 7/2007 to 12/2009, "Dietary salt and microvascular superoxide production", $130,000. (PI: Dr. Matthew Boegehold, University of West Virginia).

National Institutes of Health, 8/8/2008 – 8/7/2012, “Ovine model system for alcohol related birth defects”, $1,318,500 (PI: Dr. T.A. Cudd) Grant #, 2RO1AA010940-10.

Scott & White Hospital, 9/2008 – 8/2009, “Obesity and intrauterine growth retardation”, $15,000 (PI: Dr. C.J. Meininger).

United States Department of Agriculture, 1/01/09-12/31/11, “Arginine nutrition and brown fat development in the ovine fetus, $125,000. (Grant #2009-35206-05211). (This is a USDA-NRI postdoctoral fellowship for my Postdoctoral Research Associate, Dr. M. Carey Satterfield.)

National Natural Science Foundation of China, 1/2009-12/2011, “International major cooperation project: Proteomic analysis of placental growth and development in pigs”, ¥1,500,000 (PI: Dr. Defa Li, China Agricultural University) (#30810103902).

Department of Science and Technology, China, 1/2009 – 12/2012, “International major cooperation project: Development of strategies to feed sows and piglets”, ¥1,500,000 (PI: Dr. Zhongyong Jiang, Guangdong Institute of Animal Science).

National Institutes of Health, 7/1/2009 – 6/30/2011, “Treating endothelial dysfunction with targeted nanoparticle-based BH4 delivery. $395,500 (PI: Dr. C.J. Meininger) Grant # R21 HL094689).

The H. Patricia Link Quasi-Endowment Research Program, 9/1/2009 – 8/31/2011, “Influence of maternal overnutrition and arginine supplementation on mare and foal performance”, $87,524 (PI: Dr. Josie Coverdale, Department of Animal Science)

National Corn Growers Association, 6/1/2010 – 5/30/2012, “Aflatoxin analysis and animal evaluation of distillers dried grains with solubles”, $45,000 (PI: Dr. Joe B. Dixon, Department of Soil and Crop Sciences).

Indonesia Government, Foreign Research Cooperation and International Publication Program (DP2M DIKTI), 7/1/2010 – 6/30/2012, “Improving nutrient quality of carrot and fruit juice waste mixture for poultry diet”, $30,000 (PI: Dr. Yose Rizal, University of Andalas, Indonesia).

United States Department of Agriculture, 12/2010 - 11/2014, "Arginine and secreted phosphoprotein 1 mediate mTOR signaling for conceptus ", $500,000 (PI, Dr. F.W. Bazer). Grant #2011-67015-20028.

Scholarly & Creative Products grant program, Vice President of Research, Texas A&M University, 1/2011 – 12/2011, “Skeletal muscle atrophy during mechanical unloading as a unique muscular dystrophy: Altering the subsarcolemmal microenvironment”, $18,000 (PI, Dr. John Lawler, Department of Kinesiology).

American Heart Association, Texas Affiliate, 7/1/2011 – 6/30/2012, " Lymphatic delivery of tetrahydrobiopterin-loaded nanoparticles for vascular dysfunction in diabetes", $70,000 (PI: Dr. C.J. Meininger). Grant # 11GRNT7930004.

National Corn Growers Association, 8/1/2011 – 7/30/2012, “Optimization of quantity and incorporation methods of bentonites in animal feeds”, $45,000 (PI: Dr. Joe B. Dixon, Department of Soil and Crop Sciences).

National Corn Growers Association, 8/1/2012 – 7/30/2013, “Selection of mineral clays against aflatoxins in animal feedstuffs”, $50,000 (PI: Dr. Youjun Yang, Department of Soil and Crop Sciences).

Scott & White Hospital, 8/2012 – 7/2013, “The Effects of L-arginine on human metabolism", $50,000 (PI: Dr. Deepika Reddy)

China Postdoctoral Science Foundation, 7/2012 - 6/2013, "Utilization of amino acids by intestinal bacteria", (PI: Dr. Zhaolai Dai), Grant # 2012T50163.

As Collaborator:

National Science Foundation of China, 1/2007 - 12/2009, “Proteomics and intrauterine growth restriction in pigs”, ¥250,000. PI: Dr. Junjun Wang (China Agricultural University) (#30671517).

United States Department of Agriculture NRI Program, 12/2008 – 11/2011, “Influence of metabolizable protein supplementation in late pregnancy on offspring feed efficiency”, $350,000 (PI: Dr. Kimberly Vonnahme, North Dakota State University)

National Institutes of Health, 7/2009 - 6/2013, "Role of arginase in macrophage function”, $1,000,000 (PI: Dr. Sidney Morris, Department of Surgery, University of Pittsburgh).

United States Department of Agriculture NRI Program, 8/2009 – 7/2012, “Integrin signaling in the ovine conceptus”, $350,000 (PIs: Dr. K. Bayliss and Dr. G.A. Johnson)

Scott & White Hospital, 7/1/2011 – 6/30/2012, “Lymphatic delivery of tetrahydrobiopterin-loaded nanoparticles for vascular dysfunction in diabetes”, $50,000 (PI: Dr. C.J. Meininger). Project

#110008.

National Natural Science Foundation of China, 1/2012 –12/2015, "Leucine nutrition in low-birth-weight piglets", $100,000 (PI: Dr. Zhenlong Wu, China Agricultural University), Grant #

National Natural Science Foundation of China, 1/2013 –12/2016, "Glutamine and apoptosis in pig intestinal cells", $150,000 (PI: Dr. Zhenlong Wu, China Agricultural University), Grant #

As Mentor of NIH K08 Grantee:

National Institutes of Health, 3/20/2010 - 2/28/2013, "Mechanisms and nutritional intervention for fetal alcohol spectrum", $391,500 (This is a KO8 award for Dr. Shannon Wilson, Department of Veterinary Physiology and Pharmacology. Mentors: Dr. Timothy Cudd and Guoyao Wu).

As Co-Investigator of NIH Center Grant at Texas A&M University:

National Institutes of Health, 4/1998 - 3/2007, Center Grant "Center for Environmental and Rural Health", $8,758,411 (Director: Dr. K. Ramos). (Grant #P30-ES09106)

As Co-Investigator of training grants at Texas A&M University:

National Institutes of Health, 8/2001 - 7/2016, Training Grant "Nutrition, Biostatistics and Bioinformatics", $7,250,000 (Program Director: Dr. R.J. Carroll, Dept. of Statistics). (Grant # R25 CA90301).

Texas A&M University Life Sciences Task Forces, 9/2003 – 8/2004, "Training Program in Reproductive Biology", $180,000 (PI: Dr. F.W. Bazer).

NASA, 9/2005 - 8/2006, Training Grant "Ph.D. Education in Space Life Science – Phase I", $100,000 (Program Director: Dr. J.R. Lupton, Dept. of Nutrition and Food Science).

NASA, 9/2006 - 8/2011, Training Grant "Ph.D. Education in Space Life Science – Phase II", $2,500,000 (Program Director: Dr. J.R. Lupton, Dept. of Nutrition and Food Science).

NASA, 9/2011 - 8/2016, Training Grant "Ph.D. Education in Space Life Science – Phase III", $1,000,000 (Program Director: Dr. J.R. Lupton, Dept. of Nutrition and Food Science).

National Institutes of Health, 9/2006 – 8/2011, "Bridges to the Doctorate in Reproductive Biology", $620,491 (PI: Dr. F.W. Bazer) (Grant No. 1R25 GM075300-01A1).

NATIONALLY AND INTERNATIONALLY HIGHLIGHTED PAPERS

1. *Biochemical Journal* (BJ) Letters, "Methionine transamination *in vivo*", Biochemical Journal 262: 689-691, 1989. This BJ article highlights the paper "Wu, G., and J.R. Thompson. 1989. Is methionine transaminated in skeletal muscle? Biochem. J. 257:281-284." http://www.biochemj.org

2. *Biochemical Journal* (BJ) Letters, "The possible role of glutamine substrate cycle in skeletal muscle", Biochemical Journal 279: 327-328, 1991; "Glutamine transport and metabolism in mammalian skeletal muscle", Biochemical Journal 285: 339-340, 1992. These two BJ articles highlight the paper "Wu, G., J.R. Thompson, and V.E. Baracos. 1991. Glutamine metabolism in skeletal muscle from the broiler chick (Gallus domesticus) and the

laboratory rat (Rattus norvegicus). Biochem. J. 274:769-774." www.biochemj.org

3. USDA National Research Initiative (NRI) Cover Story, "Maternal nutrition and fetal development", http://www.csrees.usda.gov/funding/nri/covers/2004_08_wu.pdf. This NRI cover story highlights the paper "Wu, G., F.W. Bazer, T.A. Cudd, C.J. Meininger, and T.E. Spencer. 2004. Maternal nutrition and fetal development. J. Nutr. 134:2169-2172."

4. ISI (Institute for Scientific Information), "Fast Breaking Paper by Guoyao Wu", http://www.esi-topics.com.fbp/2005/june05-GuoyaoWu.html. This ISI article highlights the paper "Wu, G., Y.Z. Fang, S. Yang, J.R. Lupton, and N.D. Turner. 2004. Glutathione metabolism and its implications for health. J. Nutr. 134:489-492."

5. ISI (Institute for Scientific Information), "Hot Paper by Guoyao Wu", http://www.esi-topics.com.nhp/2006/january-06-GuoyaoWu.html. This ISI article highlights the paper "Wu, G., F.W. Bazer, T.A. Cudd, C.J. Meininger, and T.E. Spencer. 2004. Maternal nutrition and fetal development. J. Nutr. 134:2169-2172."

6. USDA National Research Initiative (NRI) Research Highlight, "Modified diet may increase swine birthrate", http://www.csrees.usda.gov/newsroom/impact/2008/nri/pdf/swine.pdf. This NRI article highlights the paper "Mateo, R.D., G. Wu, F.W. Bazer, J.C. Park, I. Shinzato, and S.W. Kim. 2007. Dietary L-arginine supplementation enhances the reproductive performance of gilts. J. Nutr. 137: 652-656."

7. Country World Central Texas. Arginine provision increases swine birthrate, litter birth weight. www.CountryWorldNews.com. February 28, 2008. Page 7A.

8. Combining expertise, lifting performance with arginine. Pig Progress 24:31-33; 2008

PRESS RELEASE

1. Arginine provision increases swine birthrate and litter birth weight. Texas AgriLife Research. Feb. 16, 2008

2. Arginine discovery could help fight human obesity. Texas AgriLife Research. Jan. 28, 2009

3. Study shows male erectile dysfunction drug enhances fetal growth in female sheep: Findings could have important implications for human health and agriculture. Texas AgriLife Research. Feb 3, 2010

4. Functional amino acids regulate key metabolic pathways. Texas AgriLife Research. November 17, 2010

PUBLICATIONS (last 5 years):

Refereed Papers in Scientific Journals **(SCI citations: > 10,000 times; Hirsch index = 54):**

187. Li, L.L., Z.P. Hou, C.B. Yang, G.Y. Wu, R.L. Huang, Z.R. Tang, J.H. Gong, Y. Hai, T.J. Li, X.F. Kong, C.F. Pan, J. Deng, X.Q. Wang, F.G. Yin, and Y.L. Yin. 2008. Effects of dietary probiotic supplementation on ileal digestibility of nutrients and growth performance in 1- to 42-day-old broilers. J. Sci. Food Agric. 88:35-42.

188. Wu, G., and C.J. Meininger. 2008. Analysis of citrulline, arginine, and methylarginines using high-performance liquid chromatography. Methods Enzymol. 440:177-189.

189. Wang, J.J., L.X. Chen, D.F. Li, Y.L. Yin, X.Q Wang, P. Li, L.J. Dangott, W.X. Hu and, G. Wu. 2008. Intrauterine growth restriction affects the proteomes of the small intestine, liver and skeletal muscle in newborn pigs. J. Nutr. 138:60-66.

190. Dekaney, C.M., G. Wu, Y.L. Yin, and L.A. Jaeger. 2008. Regulation of ornithine aminotransferase gene expression and activity by all-trans retinoic acid in Caco-2 intestinal epithelial cells. J. Nutr. Biochem 19:674-681.

191. Mateo, R.D., G. Wu, H.K. Moon, J.A. Carroll, and S.W. Kim. 2008. Effects of dietary arginine supplementation during gestation and lactation on the performance of lactating primiparous sows and nursing piglets. J. Anim. Sci. 86:827-835.

192. Delp, M.D., B.J. Behnke, S.A. Spier, G. Wu, and J.M. Muller-Delp. 2008. Aging diminishes endothelium-dependent vasodilation and tetrahydrobiopterin content in rat skeletal muscle arterioles. J. Physiol. 586:1161-1168.

193. Wu, G., F.W. Bazer, S. Datta, H. Gao, G.A. Johnson, A. Lassala, P. Li, M.C. Satterfield, T.E. Spencer. 2008. Intrauterine growth retardation in livestock: Implications, mechanisms and solutions. Archives of Animal Breeding 51 (Special Issue 1): 4-10.

194. Jobgen, W.S., S. P. Ford, S. C. Jobgen, C. P. Feng, B. W. Hess, P. W. Nathanielsz, P. Li, and G. Wu. 2008. Baggs ewes adapt to maternal undernutrition and maintain conceptus growth by maintaining fetal plasma concentrations of amino acids. J. Anim. Sci. 86:820-826.

195. Hou, Z.P., Y.L Yin, R.L. Huang, T.J. Li, Y.Q. Hou, Y.L. Liu, X. Wu, Z.Q. Liu, W. Wang, H. Xiong, G.Y. Wu, L.X. Tan. 2008. Rice protein concentrate partially replaces dried whey in the diet for early-weaned piglets and improves their growth performance. J. Sci. Food Agric. 88:1187-1193.

196. Wu, G., F.W. Bazer, S. Datta, G.A. Johnson, P. Li, M.C. Satterfield, and T.E. Spencer. 2008. Proline metabolism in the conceptus: Implications for fetal growth and development. Amino Acids 35:691-702.

197. Yin, Y.L., Z.R. Tang, Z.H. Sun, Z.Q. Liu, T.J. Li, R.L. Huang, Z. Ruan, Z.Y. Deng, B. Gao, L.X. Chen, G.Y. Wu, and S.W. Kim. 2008. Effect of galacto-mannan-oligosaccharides or chitosan supplementation on cytoimmunity and humoral immunity in early-weaned piglets. Asian-Aust. J. Anim. Sci. 21:723-731.

198. Yao, K., Y.L. Yin, W.Y. Chu, Z.Q. Liu, D. Deng, T.J. Li, R.L. Huang, J.S. Zhang, B.E. Tan, W. Wang, and G. Wu. 2008. Dietary arginine supplementation increases mTOR signaling activity in skeletal muscle of neonatal pigs. J. Nutr. 138:867-872.

199. Kim, J.Y., G.H. Song, H.J. Gao, J.L. Farmer, M.C. Satterfield, R.C. Burghardt, G. Wu, G.A. Johnson, T.E. Spencer, and F.W. Bazer. 2008. Insulin-like growth factor 2 (IGF2) activates PI3K-AKT1 and MAPK cell signaling pathways and stimulates migration of ovine trophectoderm cells. Endocrinology 149:3085-3094.

200. Wang, J.J., L.X. Chen, P. Li, X.L. Li, H.J. Zhou, F.L. Wang, D.F. Li, Y.L. Yin, and G. Wu. 2008. Gene expression is altered in piglet small intestine by weaning and dietary glutamine supplementation. J. Nutr. 138:1025-1032.

201. Bazer, F.W., R.C. Burghardt, G.A. Johnson, T.E. Spencer, and G. Wu. 2008. Interferons and progesterone for establishment and maintenance of pregnancy: Interactions among novel cell signaling pathways. Reprod. Biol. 8:179-211.

202. Wei, L.H., Y. Yang, G. Wu, and L.J. Ignarro. 2008. IL-4 and IL-13 upregulate ornithine decarboxylase expression by PI3K and MAP kinase pathways in vascular smooth muscle cells. Am. J. Physiol. 294:C1198-C1205.

203. Jeyabalan, G., J.R. Klune, A. Nakao, N. Martik, G. Wu, A. Tsung, and D.A. Geller. 2008. Arginase blockade protects against hepatic damage in warm ischemia-reperfusion. Nitric Oxide 19:29-35.

204. Zeng, X.F., F.L. Wang, X. Fan, W.J. Yang, B. Zhou, P.F. Li, Y.L. Yin, G. Wu, and J.J. Wang. 2008. Dietary arginine supplementation during early pregnancy enhances embryonic survival in rats. J. Nutr. 138:1421-1425.

205. Rhoads, J.M., X.M. Niu, S. Surendran, Y.Y. Liu, and G. Wu. 2008. Arginine stimulates cdx2-transformed intestinal epithelial cell migration via a mechanism requiring both nitric oxide and p70s6k signaling. J. Nutr. 138:1652-1657.

206. Li, P., S.W. Kim, X.L. Li, S. Datta, W.G. Pond and G. Wu. 2008. Dietary supplementation with cholesterol and docosahexaenoic acid increases the activity of the arginine-nitric oxide pathway in tissues of young pigs. Nitric Oxide 19:259-265.

207. Orellana, R.A., A. Suryawan, S.R. Kimball, G. Wu, H.V. Nguyen, L.S. Jefferson, and T.A. Davis. 2008. Insulin signaling in skeletal muscle and liver of neonatal pigs during endotoxemia. Pediatr. Res. 64:505-510.

208. Ramadoss, J., G. Wu, and T.A. Cudd. 2008. Chronic binge ethanol mediated acidemia reduces availability of glutamine and related amino acids in maternal plasma of pregnant sheep. Alcohol 42:657-666.

209. Song, X.Y., M.M. Geng, W.Y. Chu, T.J. Li, J.S. Zhang, C.Y. Shi, W.C. Wang, Y.L. Yin, and G. Wu. 2008. Expression and purification of Ningxiang pig N-acetylglutamate synthase in E. coli and preparation of its antibody. Acta Laser Biol Sinica 17:750-755.

210. Deng, D., Y.L. Yin, W.Y. Chu, K. Yao, T.J. Li, R.L. Huang, Z.Q. Liu, J.S. Zhang, and G. Wu. 2009. Impaired translation initiation activation and reduced protein synthesis in weaned piglets fed a low-protein diet. J. Nutr. Biochem. 20: 544-552.

211. Gao, H.J., G. Wu, T.E. Spencer, G.A. Johnson, X.L. Li, and F.W. Bazer. 2009. Select nutrients in the ovine uterine lumen: I. Amino acids, glucose and ions in uterine lumenal flushings of cyclic and pregnant ewes. Biol. Reprod. 80:86-93.

212. Gao, H.J., G. Wu, T.E. Spencer, G.A. Johnson, and F.W. Bazer. 2009. Select nutrients in the ovine uterine lumen: II. Glucose transporters in the uterus and peri-implantation conceptuses. Biol. Reprod. 80:94-104.

213. Gao, H.J., G. Wu, T.E. Spencer, G.A. Johnson, and F.W. Bazer. 2009. Select nutrients in the ovine uterine lumen: III. Expression of cationic amino acid transporters in ovine uterus and peri-implantation conceptuses. Biol. Reprod. 80:602-609.

214. Gao, H., G. Wu, T.E. Spencer, G.A. Johnson, and F.W. Bazer. 2009. Select nutrients in the ovine uterine lumen: IV. Expression of neutral and acidic amino acid transporters in ovine uteri and peri-implantation conceptuses. Biol. Reprod. 80: 1196-1208.

215. Gao, H.J., G. Wu, T.E. Spencer, G.A. Johnson, and F.W. Bazer. 2009. Select nutrients in the ovine uterine lumen: V. Nitric oxide synthase, GTP cyclohydrolase and ornithine decarboxylase in ovine uteri and peri-implantation conceptuses. Biol. Reprod. 81:67-76.

216. Gao, H.J., G. Wu, T.E. Spencer, G.A. Johnson, and F.W. Bazer. 2009. Select nutrients in the ovine uterine lumen: VI. Expression of FK506-binding protein 12-rapamycin complex-associated protein 1 (FRAP1) and associated regulators and effectors of mTORC1 and mTORC2 complexes in ovine uteri and peri-implantation conceptuses. Biol. Reprod. 81:87-100.

217. Manso Filho, H.C., H. E., Costa, G. Wu, K.H. McKeever, and M. Watford. 2009. Equine placenta expresses glutamine synthetase. Vet. Res. Commun. 33:175-182.

218. Wu, G. and C.J. Meininger. 2009. Nitric oxide and vascular insulin resistance. BioFactors 35:21-27.

219. Jobgen, W.J., C.J. Meininger, S.C. Jobgen, P. Li, M.-J. Lee, S.B. Smith, T.E. Spencer, S.K. Fried, and G. Wu. 2009. Dietary L-arginine supplementation reduces white-fat gain and enhances skeletal muscle and brown fat masses in diet-induced obese rats. J. Nutr. 139:230-237.

220. Lassala, A., F.W. Bazer, T.A. Cudd, P. Li, X.L. Li, M.C. Satterfield, T.E. Spencer, and G. Wu. 2009. Intravenous administration of L-citrulline to pregnant ewes is more effective than L-arginine for increasing arginine availability in the fetus. J. Nutr. 139:660-665.

221. Bergen, W.G. and G. Wu. 2009. Intestinal nitrogen recycling and utilization in health and disease. J. Nutr. 139:821-825.

222. Kong, X.F., Y.L. Yin, and G. Wu. 2009. Research advances in functional amino acid nutrition of pigs. Chinese J. Anim. Nutr. 21:1-7.

223. Wu, G. 2009. Amino acids: metabolism, functions, and nutrition. Amino Acids 37:1-17.

224. Li, P., K.S. Mai, J. Trushenski, and G. Wu. 2009. New developments in fish amino acid nutrition: towards functional and environmentally oriented aquafeeds. Amino Acids 37:43-53.

225. Li, X.L., F.W. Bazer, H. Gao, W. Jobgen, G.A. Johnson, P. Li, J.R. McKnight, M.C. Satterfield, T.E. Spencer, and G. Wu. 2009. Amino acids and gaseous signaling. Amino Acids 37:65-78.

226. Kim, S.W. and G. Wu. 2009. Regulatory role for amino acids in mammary gland growth and milk synthesis. Amino Acids 37:89-95.

227. Rhoads, J.M. and G. Wu. 2009. Glutamine, arginine, and leucine signaling in the intestine. Amino Acids 37:111-122.

228. Haynes, T.E., P. Li, XL Li, K. Shimotori, H. Sato, N.E. Flynn, J.J. Wang, D.A. Knabe, and G. Wu. 2009. L-Glutamine or L-alanyl-L-glutamine prevents oxidant- or endotoxin-induced death of neonatal enterocytes. Amino Acids 37:131-142.

229. Chen, L.X., P. Li, J.J. Wang, X.L. Li, H.J. Gao, Y.L. Yin, Y.Q. Hou, and G. Wu. 2009. Catabolism of nutritionally essential amino acids in developing porcine enterocytes. Amino Acids 37:143-152.

230. Wu, G., F.W. Bazer, T.A. Davis, S.W. Kim, P. Li, J.M. Rhoads, M.C. Satterfield, S.B. Smith, T.E. Spencer, and Y.L. Yin. 2009. Arginine metabolism and nutrition in growth, health and disease. Amino Acids 37:153-168.

231. Tan, B.E., Y.L. Yin, Z.Q. Liu, X.G. Li, H.J. Xu, X.F. Kong, R.L. Huang, W.J. Tang, I. Shinzato, S.B. Smith, and G. Wu. 2009. Dietary L-arginine supplementation increases muscle gain and reduces body fat mass in growing-finishing pigs. Amino Acids 37:169-175.

232. Wang, J.J., G. Wu, H.J. Zhou, and F.L. Wang. 2009. Emerging technologies for amino acid nutrition research in the post-genome era. Amino Acids 37:177-186.

233. Jobgen, W., W.J. Fu, H. Gao, P. Li, C.J. Meininger, S.B. Smith, T.E. Spencer, G. Wu. 2009. High fat feeding and dietary L-arginine supplementation differentially regulate gene expression in rat white adipose tissue. Amino Acids 37:187-198.

234. He, Q.H., X.F. Kong, G. Wu, P.P. Ren, H.R. Tang, F.H. Hao, R.L. Huang, T.J. Li, B.E. Tan, P. Li, Z.R. Tang, Y.L. Yin, and Y.N. Wu. 2009. Metabolomic analysis of the response of growing pigs to dietary L-arginine supplementation. Amino Acids 37:199-208.

235. Wang, X.Q., D.Y Ou, J.D. Yin, G. Wu, and J.J. Wang. 2009. Proteomic analysis reveals altered expression of proteins related to glutathione metabolism and apoptosis in the small intestine of zinc oxide-supplemented piglets. Amino Acids 37:209-218.

236. Yin, J.D., X.L. Li, D.F. Li, T. Yue, Q. Fang, J.J. Ni, X. Zhou, and G. Wu. 2009. Dietary supplementation with zinc oxide stimulates ghrelin secretion from the stomach of young pigs. J. Nutr. Biochem. 20:783-790.

237. Smith, S.B., H. Kawachi, C.B. Choi, C.W. Choi, G. Wu, and J.E. Sawyer. 2009. Cellular regulation of bovine intramuscular adipose tissue development and composition. J. Anim. Sci. 87:E72-82.

238. Kim, S.W., W.L. Hurley, G. Wu, and F. Ji. 2009. Ideal amino acid balance for sows during gestation and lactation. J. Anim. Sci. 87:E123-132.

239. Lin, C., D.C. Mahan, G. Wu and S.W. Kim. 2009. Protein digestibility of porcine colostrum by neonatal pigs. Livest. Sci. 121:182-186.

240. Fang, J., F.Y. Yan, X.F. Kong, Z. Ruan, Z.Q. Liu, R.L. Huang, T.J. Li, M.M. Geng, F. Yang, Y.Z. Zhang, P. Li, J. Gong, G.Y. Wu, M.Z. Fan, Y.L. Liu, Y.Q. Hou, and Y.L. Yin. 2009. Dietary supplementation with Acanthopanax senticosus extract enhances gut health in weanling piglets. Livest. Sci. 123:268-275.

241. Nall, J.L., G. Wu, K.H. Kim, C.W. Choi, and S.B. Smith. 2009. Dietary supplementation of L-arginine and conjugated linoleic acid reduces retroperitoneal fat mass and increases lean body mass in rats. J. Nutr. 139:1279-1285.

242. Yin, F.G., Y.L. Liu, Y.L. Yin, X.F. Kong, R.L. Huang, T.J. Li, G.Y. Wu, and Y.Q. Hou. 2009. Dietary supplementation with Astragalus polysaccharide enhances ileal digestibilities and serum concentrations of amino acids in early weaned piglets. Amino Acids 37:263-270.

243. Tan, B.E., X.G. Li, X.F. Kong, R.L. Huang, Z. Ruan, K. Yao, Z.Y. Deng, M.Y. Xie, I. Shinzato, Y.L. Yin, and G. Wu. 2009. Dietary L-arginine supplementation enhances the immune status in early-weaned piglets. Amino Acids 37:323-331.

244. Kong, X.F., Y.L. Yin, Q.H. He, F.G. Yin, H.J. Liu, T.J. Li, R.L. Huang, M.M. Geng, Z. Ruan, Z.Y. Deng, M.Y. Xie, and G. Wu. 2009. Dietary supplementation with Chinese herbal powder enhances ileal digestibilities and serum concentrations of amino acids in young pigs. Amino Acids 37:573-582.

245. Li, P., S.W. Kim, X.L. Li, S. Datta, W.G. Pond, and G. Wu. 2009. Dietary supplementation with cholesterol and docosahexaenoic acid affects concentrations of amino acids in tissues of young pigs. Amino Acids 37:709-716.

246. McNeal, C.J., D.P. Wilson, D. Christou, R.L. Bush, L.G. Shepherd, J. Santiago, and G.Y. Wu. 2009. The use of surrogate vascular markers in youth at risk for premature cardiovascular disease. J. Pediatr. Endocrinol. Metab. 22:195-211.

247. Manso Filho, H.C., K.H. McKeever, M.E. Gordon, H.E. Manso, W.S. Lagakos, G. Wu, and M. Watford. 2009. Developmental changes in the concentrations of glutamine and other amino acids in plasma and skeletal muscle of the Standardbred foal. J. Anim. Sci. 87:2528-2535.

248. Bazer, F.W., T.E. Spencer, G.A. Johnson, R.C. Burghardt, and G. Wu. 2009. Comparative aspects of implantation. Reproduction 138:195-209.

249. Li, P., D.A. Knabe, S.W. Kim, C.J. Lynch, S.M. Hutson, and G. Wu. 2009. Lactating porcine mammary tissue catabolizes branched-chain amino acids for glutamine and aspartate synthesis. J. Nutr. 139:1502-1509.

250. Sindler, A.L., M.D. Delp, R. Reyes, G. Wu, and J.M. Muller-Delp. 2009. Effects of aging and exercise training on eNOS uncoupling in skeletal muscle resistance arterioles. J. Physiol. 587:3885-3897.

251. Farley, D., M.E. Tejero, A.G. Comuzzie, P.B. Higgins, L. Cox, S.L. Werner, S.L. Jenkins, C. Li, J. Choj, E.J. Dick, Jr, G.B. Hubbard, P. Frost, D.D. Dudley, B. Ballesteros, G. Wu, P.W. Nathanielsz, and N.E. Schlabritz-Loutsevitch. 2009. Feto-placental adaptations to maternal obesity in the baboon. Placenta 30:752-760.

252. Kong, X.F., Y.Z. Zhang, Y.L. Yin, G.Y. Wu, H.J. Zhou, Z.L. Tan, F. Yang, M.J. Bo, R.L. Huang, T.J. Li, and M.M. Geng. 2009. Chinese yam polysaccharide enhances growth performance and cellular immune response in weanling rats. J. Sci. Food Agric. 89:2039-2044.

253. Bazer, F.W., H. Gao, G.A. Johnson, G. Wu, D.W. Bailey, and R.C. Burghardt. 2009. Select nutrients and glucose transporters in pig uteri and conceptuses. Soc. Reprod. Fertil. Suppl. 66:335-336.

254. Johnson, G.A., F.W. Bazer, R.C. Burghardt, T.E. Spencer, G. Wu, and K.J. Bayless. 2009. Conceptus-uterus interactions in pigs: endometrial gene expression in response to estrogens and interferons from conceptus. Soc. Reprod. Fertil. Suppl. 66:321-332.

255. Yin, F.G., Y.L. Yin, X.F. Kong, Y.L. Liu, Q.H. He, T.J. Li, R.L. Huang, Y.Q. Hou, X.G. Shu, L.X. Tan, L.X. Chen, J.H. Gong, S.W. Kim, G. Wu. 2009. Dietary supplementation

with *Acanthopanax senticosus* extract modulates gut microflora in weaned piglets. Asian-Aust. J. Anim. Sci. 21:1330-1338.

256. Song, X.Y., M.M. Geng, W.Y. Chu, T.J. Li, W.C. Wang, W.T. Gu, C.Y. Shi, R.L. Huang, Y.L. Yin, and G. Wu. 2009. Expression profiling of intestinal N-acetylglutamate synthase in pre-weaned Tibetan suckling piglets. Sci. Agric. Sinica 42:3265-3271.

257. Kong, X.F., G. Wu, and Y.L. Yin. 2009. Recent advances in swine intrauterine growth retardation and its prevention and treatment. Animal Husbandry & Veterinary Medicine 10:96-101.

258. Tan, B.E., Y.L. Yin, X.F. Kong, P. Li, X.L. Li, H.J. Gao, X.G. Li, R.L. Huang, and G. Wu. 2010. L-Arginine stimulates proliferation and prevents endotoxin-induced death of intestinal cells. Amino Acids 38:1227-1235.

259. Satterfield, M.C., H.J. Gao, X.L. Li, G. Wu, G.A. Johnson, T.E. Spencer, and F.W. Bazer. 2010. Select nutrients and their associated transporters are increased in the ovine uterus following early progesterone administration. Biol. Reprod. 82:224-231.

260. Hou, Y.Q., L. Wang, B.Y. Ding, Y.L. Liu, H.L. Zhu, J. Liu, Y.T. Li, X. Wu, Y.L. Yin, and G. Wu. 2010. Dietary α-ketoglutarate supplementation ameliorates intestinal injury in lipopolysaccharide-challenged piglets. Amino Acids 39:555-564.

261. Wu, G., F.W. Bazer, R.C. Burghardt, G.A. Johnson, S.W. Kim, X.L. Li, M.C. Satterfield, and T.E. Spencer. 2010. Impacts of amino acid nutrition on pregnancy outcome in pigs: mechanisms and implications for swine production. J. Anim. Sci. 88: E195-E204.

262. Bazer, F.W., G. Wu, T.E. Spencer, G.A. Johnson, R.C. Burghardt, and K. Bayless. 2010. Novel pathways for implantation and establishment and maintenance of pregnancy in mammals. Mol. Human Reprod. 16:135-152.

263. Satterfield, M.C., F.W. Bazer, T.E. Spencer, and G. Wu. 2010. Sildenafil citrate treatment enhances amino acid availability in the conceptus and fetal growth in an ovine model of intrauterine growth restriction. J. Nutr. 140:251-258.

264. Fu, W.J., A.J. Stromberg, K. Viele, R.J. Carroll, and G. Wu. 2010. Statistics and bioinformatics in nutritional sciences: analysis of complex data in the era of systems biology. J. Nutr. Biochem. 21:561-572.

265. Wang, X.Q., W.Z. Wu, G. Lin, D.F. Li, G. Wu, and J.J. Wang. 2010. Temporal proteomic analysis reveals continuous impairment of intestinal development in neonatal piglets with intrauterine growth restriction. J. Proteome Res. 9:924-935.

266. Nurkiewicz, T.R., G. Wu, P. Li, M.A. Boegehold. 2010. Decreased arteriolar tetrahydro-biopterin is linked to superoxide generation from nitric oxide synthase in mice fed high salt. Microcirculation 17:147-157.

267. Dai, Z.L., J. Zhang, G. Wu, and W.Y. Zhu. 2010. Utilization of amino acids by bacteria from the pig small intestine. Amino Acids 39:1201-1215.

268. Flynn, N.E., M. Patryak, J. Seely, and G. Wu. 2010. Glycine oxidation and conversion into amino acids in *Saccharomyces cerevisiae* and *Candida albicans*. Amino Acids 39:605-608.

269. Wu, X., Z. Ruan, Y.L. Gao, Y.L. Yin, X.H. Zhou, L. Wang, M.M. Geng, Y.Q. Hou, and G. Wu. 2010. Dietary supplementation with L-arginine or N-carbamylglutamate enhances intestinal growth and heat shock protein-70 expression in weanling pigs fed a corn- and soybean meal-based diet. Amino Acids 39:831-839.

270. Wang, W.W., X.F. Zeng, X.B. Mao, G. Wu, and S.Y. Qiao. 2010. Optimal dietary true ileal digestible threonine for supporting mucosal barrier in the small intestine of weanling pigs. J. Nutr. 140:981-986.

271. Lassala, A., F.W. Bazer, T.A. Cudd, S. Datta, D.H. Keisler, M.C. Satterfield, T.E. Spencer, and G. Wu. 2010. Parenteral administration of L-arginine prevents fetal growth restriction in undernourished ewes. J. Nutr. 140:1242-1248.

272. Bauchart-Thevret, C., L.W. Cui, G. Wu, and D.G. Burrin. 2010. Arginine-induced stimulation of protein synthesis and survival in IPEC-J2 cells is mediated by mTOR but not nitric oxide. Am. J. Physiol. 299:E899-E909.

273. Yin, Y.L., R.L. Huang, T.J. Li, Z. Ruan, M.Y. Xie, Z.Y. Deng, Y.Q. Hou, and G. Wu. 2010. Amino acid metabolism in the portal-drained viscera of young pigs: effects of dietary supplementation with chitosan and pea hull. Amino Acids 39:1581-1587.

274. Li, X.L., F.W. Bazer, G.A. Johnson, R.C. Burghardt, D.W. Erikson, J.W. Frank, T.E. Spencer, I. Shinzato, and G. Wu. 2010. Dietary supplementation with 0.8% L-arginine between days 0 and 25 of gestation reduces litter size in gilts. J. Nutr. 140:1111-1116.

275. Johnson, G.A., J.Y. Kim, D.W. Erikson, G.H. Song, T.E. Spencer, K.J. Bayless, G. Wu, R.C. Burghardt, and F.W. Bazer. 2010. Secreted phosphoprotein 1 binds integrins to initiate multiple cell signaling pathways, including FRAP1/mTOR, to support attachment and force-generated migration of trophectoderm cells. Matrix Biol 29:369-382.

276. McKnight, J.R., M.C. Satterfield, W.S. Jobgen, S.B. Smith, T.E. Spencer, C.J. Meininger, C.J. McNeal, and G. Wu. 2010. Beneficial effects of L-arginine on reducing obesity: Potential mechanisms and important implications for human health. Amino Acids 39:349-357.

277. Wu, W.Z., X. Q. Wang, G.Y. Wu, S.W. Kim, F. Chen, and J. J. Wang. 2010. Differential composition of proteomes in sow colostrum and milk from anterior and posterior mammary glands. J. Anim. Sci. 88:2657-2664.

278. Rizal, Y., M.E. Mahata, M. Andriani, and G. Wu. 2010. Utilization of juice wastes as corn replacement in the broiler diet. Int. J. Poultry Sci. 9:886-889.

279. Wu, G. 2010. Recent advances in swine amino acid nutrition. J. Anim. Sci. Biotech. 1:49-61.

280. Wu, G. 2010. Functional amino acids in growth, reproduction and health. Adv. Nutr. 1:31-37.

281. Yin, Y.L., K. Yao, Z.J. Liu, M. Gong, Z. Ruan, D. Deng, B.E. Tan, Z.Q. Liu, and G. Wu. 2010. Supplementing L-leucine to a low-protein diet increases tissue protein synthesis in weanling pigs. Amino Acids 39:1477-1486.

282. Gao, H.J., T.E. Spencer, G. Wu, and F.W. Bazer. 2010. Uteroferrin (ACP5) in the ovine uterus; Regulation by pregnancy and progesterone. J. Anim. Sci. Biotech. 1:137-150.

283. Lin, G. C. Liu, H.J. Zhou, S. Feng, Y.Q. Chen, L.Y. Fang, G. Wu, J. Zhang, S.Y. Qiao, and J.J. Wang. 2010. Progresses on personalized nutritional evaluation and recommendation. J. Anim. Sci. Biotech. 1:182-193.

284. Tan, B.E., Y.L. Yin, Z.Q. Liu, W.J. Tang, H.J. Xu, X.F. Kong, X.G. Li, K. Yao, W.T. Gu, S.B. Smith, and G. Wu. 2011. Dietary L-arginine supplementation differentially regulates expression of lipid-metabolic genes in porcine adipose tissue and skeletal muscle. J. Nutr. Biochem. 22:441-445.

285. McKnight, J.R., M.C. Satterfield, X.L. Li, H.J. Gao, J.J. Wang, D.F. Li, and G. Wu. 2011. Obesity in pregnancy: problems and potential solutions. Front. Biosci. E3:442-452.

286. Xi, P.B., Z.Y. Jiang, C.T. Zheng, Y.C. Lin, and G. Wu. 2011. Regulation of protein metabolism by glutamine: implications for nutrition and health. Front. Biosci. 16:578-597.

287. Yao, K., Y.L. Yin, Z.M. Feng, Z.R. Tang, J. Fang, and G. Wu. 2011. Tryptophan metabolism in animals: important roles in nutrition and health. Front. Biosci. S3:286-297.

288. Lei, X.Q., C.P. Feng, C. Liu, G. Wu, C.J. Meininger, F.L. Wang, D.F. Li, and J.J. Wang. 2011. Regulation of protein expression by L-arginine in endothelial cells. Front. Biosci. S3:655-661.

289. Kong, X.F., G. Wu and Y.L. Yin. 2011. Roles of phytochemicals in amino acid nutrition. Front. Biosci. S3:372-384.

290. Hou, Y.Q., L. Wang, B.Y. Ding, Y.L. Liu, H.L. Zhu, J. Liu, Y.T. Li, P. Kang, Y.L. Yin, and G. Wu. 2011. Alpha-ketoglutarate and intestinal function. Front. Biosci. 16:1186-1196.

291. Satterfield, M.C. and G. Wu. 2011. Growth and development of brown adipose tissue: significance and nutritional regulation. Front. Biosci. 16:1589-1608.

292. Dai, Z.L., G. Wu, and W.Y. Zhu. 2011. Amino acid metabolism in intestinal bacteria: links between gut ecology and host health. Front. Biosci. 16:1768-1786.

293. Kim, J.Y., R.C. Burghardt, G. Wu, G.A. Johnson, T.E. Spencer, and F.W. Bazer. 2011. Select nutrients in the ovine uterine lumen: VII. Effects of arginine, leucine, glutamine, and glucose on trophectodem cell signaling, proliferation, and migration. Biol. Reprod. 84:62-69.

294. Kim, J.Y., R.C. Burghardt, G. Wu, G.A. Johnson, T.E. Spencer, and F.W. Bazer. 2011. Select nutrients in the ovine uterine lumen: VIII. Arginine stimulates proliferation of ovine trophectoderm cells through mTOR-RPS6K-RPS6 signaling cascade and synthesis of nitric oxide and polyamines. Biol. Reprod. 84:70-78.

295. Kim, J.Y., R.C. Burghardt, G. Wu, G.A. Johnson, T.E. Spencer, and F.W. Bazer. 2011. Select nutrients in the ovine uterine lumen: IX. Differential effects of arginine, leucine, glutamine and glucose on interferon tau, orinithine decarboxylase and nitric oxide synthase in the ovine conceptus. Biol. Reprod. 84:1139-1147.

296. Chen, F., Y. Hao, X.S. Piao, X. Ma, G.Y. Wu, S.Y. Qiao, D.F. Li, and J. J. Wang. 2011. Soybean-derived β-conglycinin affects proteome expression in pig intestinal cells in vivo and in vitro. J. Anim Sci. 89:743-753.

297. Li, X.L., R. Rezaei, P. Li, and G. Wu. 2011. Composition of amino acids in feed ingredients

for animal diets. Amino Acids 40:1159-1168.

298. Mao, X.B., X.F. Zeng, S.Y. Qiao, G. Wu, and D.F. Li. 2011. Specific roles of threonine in intestinal mucosal integrity and barrier function. Front. Biosci. E3:1192-1200.

299. Lekatz, L.A., G. Wu, J.S. Caton, J.B. Taylor, L.P. Reynolds, D.A. Redmer, and K.A. Vonnahme. 2011. Maternal selenium supplementation and timing of nutrient restriction in pregnant sheep: Impacts on nutrient availability to the fetus. J. Anim. Sci. 89:59-76.

300. Geng, M.M., T.J. Li, X.F. Kong, X.Y. Song, W.Y. Chu, R.L. Huang, Y.L. Yin, and G. Wu. 2011. Reduced expression of intestinal N-acetylglutamate synthase in suckling piglets: a novel molecular mechanism for arginine as a nutritionally essential amino acid for neonates. Amino Acids 40:1513-1522.

301. Watford, M. and G. Wu 2011. Protein. Adv. Nutr. 2:62-63.

302. Rezaei, R., D.A. Knabe, X.L. Li, S. Feng, and G. Wu. 2011. Enhanced efficiency of milk utilization for growth in surviving low-birth-weight piglets. J. Anim. Sci. Biotech. 2:73-83.

303. He, Q.H., P.P. Ren, X.F. Kong, G. Wu, and Y.L. Yin. 2011. Metabolomics and its role in amino acid nutrition research. Front. Biosci. 16:2451-2460.

304. Lin, G., C. Liu, T.J. Wang, G. Wu, S.Y. Qiao, D.F. Li, and J.J. Wang. 2011. Biomarkers for optimal requirements of amino acids by animals and humans. Front. Biosci. S3:1298-1307.

305. Wu, G., F.W. Bazer, G.A. Johnson, D.A. Knabe, R.C. Burghardt, T.E. Spencer, X.L. Li, and J.J. Wang. 2011. Important roles for L-glutamine in swine nutrition and production. J. Anim. Sci. 89:2017-2030.

306. Wu, G., F.W. Bazer, R.C. Burghardt, G.A. Johnson, S.W. Kim, D.A. Knabe, P. Li, X.L. Li, J.R. McKnight, M.C. Satterfield, and T.E. Spencer. 2011. Proline and hydroxyproline metabolism: implications for animal and human nutrition. Amino Acids 40:1053-1063.

307. Yao, K., T.J. Li, R.L. Huang, G. Wu, Z. Ruan, and Y.L. Yin. 2011. Dietary L-arginine supplementation enhances intestinal development and expression of vascular endothelial growth factor in weanling piglets. Br. J. Nutr. 105:703-709.

308. Hou, Y.Q., K. Yao, L. Wang, B.Y. Ding, D.B. Fu, Y.L. Liu, H.L. Zhu, J. Liu, Y.T. Li, P. Kang, Y.L. Yin, and G. Wu. 2011. Effects of α-ketoglutarate on energy status in the intestinal mucosa of weaned piglets chronically challenged with lipopolysaccharide. Br. J. Nutr. 106:357-363.

309. Bowers, M.C., L.A. Hargrove, K.A., Kelly, G. Wu, and C.J. Meininger. 2011. Tetrahydro-biopterin attenuates superoxide-induced reduction in nitric oxide. Front. Biosci. S3:1263-1272.

310. Lassala, A., F.W. Bazer, T.A. Cudd, S. Datta, D.H. Keisler, M.C. Satterfield, T.E. Spencer, and G. Wu. 2011. Parenteral administration of L-arginine enhances fetal survival and growth in sheep carrying multiple pregnancies. J. Nutr. 141:849-855.

311. Meininger, C.J. and G. Wu. 2011. Tetrahydrobiopterin: Important endothelial mediator independent of endothelial nitric oxide synthase. Hypertension 58:145-147.

312. Tjalkens, R.B., D.L. Carbone, and G. Wu. 2011. Detection of nitric oxide formation in primary neural cells and tissues. Methods Mol. Biol. 758:267-277.

313. Li, F.N., Y.L. Yin, B.E. Tan, X.F. Kong, and G. Wu. 2011. Leucine nutrition in animals and humans: mTOR signaling and beyond. Amino Acids 41:1185-1193.

314. He, Q.H., H.R. Tang, P.P. Ren, X.F. Kong, G. Wu, Y.L. Yin, and Y.L. Wang. 2011. Dietary supplementation with L-arginine partially counteracts serum metabonome induced by weaning stress in piglets. J. Proteome Res. 10:5214-5221.

315. Bazer, F.W., G. Wu, G.A. Johnson, J.Y. Kim, and G.W. Song. 2011. Uterine histotroph and conceptus development: Select nutrients and secreted phosphoprotein 1 affect MTOR cell signaling in ewes. Biol. Reprod. 85:1094-1107.

316. Wu, G. 2011. Amino acid metabolism in the small intestine: new development in animal nutrition. Feed Industry (Chinese) 32 (22): 52-58 and 32 (24): 51-54.

317. He, Q.H., P.P. Ren, X.F. Kong, Y.N. Wu, G. Wu, P. Li, F.H. Hao, H.R. Tang, Y.L. Yin. 2012. Comparison of serum metabolite compositions between obese and lean growing pigs using an NMR-based metabonomic approach. J. Nutr. Biochem. 23:133-139.

318. Foster, E., B.G. Fisher, J.L. Sartin, T.H. Elsasser, G. Wu, W. Cowan, and D.D. Pascoe. 2012. Acute regulation of IGF-I by alterations in post-exercise macronutrients. Amino Acids 42:1005-1016.

319. Dai, Z.L., X.L. Li, P.B. Xi, J. Zhang, G. Wu, and W.Y. Zhu. 2012. Metabolism of select amino acids in bacteria from the pig small intestine. Amino Acids 42:1597-1608.

320. Ma, X., W. Ding, J.J. Wang, G. Wu, H.Y. Zhang, J.D. Yin, L.U. Zhou, and D.F. Li. 2012. LOC66273 isoform 2, a novel protein highly expressed in white adipose tissue, induces adipogenesis in 3T3-L1 cells. J. Nutr. 142:448-455.

321. Wei, J.W., R.J. Carroll, K.K. Harden, and G. Wu. 2012. Comparisons of treatment means when factors do not interact in two-factorial studies. Amino Acids 42:2031-2035.

322. Ren, W., Y.L. Yin, G. Liu, X. Yu, Y. Li, G. Yang, T. Li, and G. Wu. 2012. Effect of dietary arginine supplementation on reproductive performance of mice with porcine circovirus type 2 infection. Amino Acids 42:2089-2094.

323. Liu, X.D., X. Wu, Y.L. Yin, Y.Q. Liu, M.M. Geng, H.S. Yang, F. Blachier, and G.Y. Wu. 2012. Effects of dietary L-arginine or N-carbamylglutamate supplementation during late gestation of sows on the miR-15b/16, miR-221/222, VEGFA and eNOS expression in umbilical vein. Amino Acids 42:2111-2119.

324. Gao, K.G., Z.Y. Jiang, Y.C. Lin, C.T. Zheng, G.L. Zhou, F. Chen, L. Yang, and G. Wu. 2012. Dietary L-arginine supplementation enhances placental growth and reproductive performance in sows. Amino Acids 42:2207-2214.

325. Zeng, X.F. X.B. Mao, Z.M. Huang, F.R. Zhang, S.H. Zhang, M. Ren, G.Y. Wu, S.Y. Qiao. 2012. Arginine enhances embryo implantation in rats through PI3K/Akt/mTOR/NO signaling pathway during early pregnancy. PLoS One 7(7):e41192.

326. Gao, H.J., K.R. Sathishkumar, U. Yallampalli, M. Balakrishnan, X.L. Li, G. Wu, and C. Yallampalli. 2012. Maternal protein restriction regulates IGF2 system in placental labyrinth. Front. Biosci. E4:1434-1450.

327. Yao, K., Y.L. Yin, X.L. Li, P.B. Xi, J.J. Wang, J. Lei, Y.Q. Hou, and G. Wu. 2012. Alpha-ketoglutarate inhibits glutamine degradation and enhances protein synthesis in intestinal porcine epithelial cells. Amino Acids 42:2491-2500.

328. Dai, Z.L., X.L. Li, P.B. Xi, J. Zhang, G. Wu, and W.Y. Zhu. 2012. Regulatory role for L-arginine in the utilization of amino acids by pig small-intestinal bacteria. Amino Acids 43:233-244.

329. Bazer, F.W., G.H. Song, J.Y. Kim, D.W. Erikson, G.A. Johnson, R.C. Burghardt, H.J. Gao, M.C. Satterfield, T.E. Spencer, and G. Wu. 2012. Mechanistic mammalian target of rapamycin (MTOR) cell signaling: Effects of select nutrients and secreted phosphoprotein 1 on development of mammalian conceptuses. Mol. Cell. Endocrinol. 354:22-33.

330. Wang, X.Q., F. Yang, C. Liu, H.J. Zhou, G. Wu, S.Y. Qiao, D.F. Li, J.J. Wang. 2012. Dietary supplementation with probiotic *L. fermentum* I5007 and antibiotic aureomycin differentially affects the small-intestinal proteomes of weanling piglets. J. Nutr. 142:7-13.

331. Tan, B.E., X.G. Li, Y.L. Yin, Z.L. Wu, C. Liu, C.D. Tekwe, and G. Wu. 2012. Regulatory roles for L-arginine in reducing white adipose tissue. Front. Biosci. 17:2237-2246.

332. Wang, J.J., Z.L. Wu, D.F. Li, N. Li, S.V. Dindot, M.C. Satterfield, F.W. Bazer, and G. Wu. 2012. Nutrition, epigenetics, and metabolic syndrome. Antioxid. Redox Signal. 17:282-301

333. Kang, L., T. Nurkiewicz, G. Wu, and Matthew Boegehold. 2012. Changes in eNOS phosphorylation contribute to increased arteriolar nitric oxide release during juvenile growth. Am. J. Physiol. 302:H560-H566.

334. Bazer, F.W., J. Kim, H. Ka, G.A. Johnson, G. Wu and G. Song. 2012. Select nutrients in the uterine lumen of sheep and pigs affect conceptus development. J. Reprod. Develop. 58:180-188.

335. Lei, J., D.Y. Feng, Y.L. Zhang, F.Q. Zhao, Z.L. Wu, A. San Gabriel, Y. Fujishima, H. Uneyama, and G. Wu. 2012. Nutritional and regulatory role of branched-chain amino acids in lactation. Front. Biosci. 17:2725-2739.

336. Lin, G., C. Liu, C.P. Feng, Z.Y. Fan, Z.L. Dai, C.H. Lai, Z. Li, G. Wu, and J.J. Wang. 2012. Metabolomic analysis reveals differences in umbilical vein plasma metabolites between normal and growth-restricted fetal pigs during late gestation. J. Nutr. 142:990-998.

337. Lei, J., Z.Y. Zhang, J.J. Zuo, D.Y. Feng, and G. Wu. 2012. Lactating porcine mammary gland: uptake of milk precursors and secretion of milk components. Chinese J Anim Nutr 24:212-219.

338. Wu, G., B. Imhoff-Kunsch, and A.W. Girard. 2012. Biological mechanisms for nutritional regulation of maternal health and fetal development. Paediatr. Perinatal Epidemiol. 26 (Suppl. 1): 4-26.

339. Dorniak, P., F.W. Bazer, G. Wu, and T.E. Spencer. 2012. Prostaglandins regulate endometrial function in sheep. Biol. Reprod. 87:9, 1-7.

340. Kim, J.Y., G.W. Song, G. Wu, and F.W. Bazer. 2012. Functional roles of fructose. Proc. Natl. Acad. Sci. USA. 109:E1619-1628.

341. Hou, Y.Q, L. Wang, W. Zhang, Z.G. Yang, B.Y. Ding, H.L. Zhu, Y.L. Liu, Y.S. Qiu, Y.L. Yin, and G. Wu. 2012. Protective effects of N-acetylcysteine on intestinal functions of piglets challenged with lipopolysaccharide. Amino Acids 43:1233-1242.

342. Bazer, F.W., G.W. Song, J.Y. Kim, K.A. Dunlap, M.C. Satterfield, G.A. Johnson, R.C. Burghardt, and G. Wu. 2012. Uterine biology in sheep and pigs. J. Anim. Sci. Biotech. 3:23.

343. Xi, P.B., Z.Y. Jiang, Z.L. Dai, X.L. Li, K. Yao, C.T. Zheng, Y.C. Lin, J.J. Wang, and G. Wu. 2012. Regulation of protein turnover by L-glutamine in porcine intestinal epithelial cells. J. Nutr. Biochem. 23:1012-1017.

344. Kong, X.F., B.E. Tan, Y.L. Yin, H.J. Gao, X.L. Li, L.A. Jaeger, F.W. Bazer, and G. Wu. 2012. L-Arginine stimulates the mTOR signaling pathway and protein synthesis in porcine trophectoderm cells. J. Nutr. Biochem. 23:1178-1183.

345. Manjarin, R., V. Zamora, G. Wu, J. P. Steibel, R. N. Kirkwood, N. P. Taylor, E. Wils-Plotz, K. Trifilo, and N.L. Trottier. 2012. Effect of amino acids supply in reduced crude protein diets on performance, efficiency of mammary uptake, and transporter gene expression in lactating sows. J. Anim. Sci. 90:3088-3100.

346. Satterfield, M.C., K.A. Dunlap, D.H. Keisler, F.W. Bazer, and G. Wu. 2012. Arginine nutrition and fetal brown adipose tissue development in diet-induced obese sheep. Amino Acids 43:1593-1603.

347. Go, G.W., G. Wu, D.T. Silvey, S. Choi, X.L. Li, and S.B. Smith. 2012. Lipid metabolism in pigs fed supplemental conjugated linoleic acid and/or dietary arginine. Amino Acids 43:1713-1726.

348. Bazer, F.W., J. Kim, G. Song, H. Ka, C.D. Tekwe, and G. Wu. 2012. Select nutrients, progesterone, and interferon tau affect conceptus metabolism and development. Ann. N. Y. Acad. Sci. 1271:88-96.

349. Wu, Z.L., M.C. Satterfield, F.W. Bazer, and G. Wu. 2012. Regulation of brown adipose tissue development and white fat reduction by L-arginine . Curr. Opin. Clin. Nutr. Metab. Care 15:529-538.

350. Lei, J., D.Y. Feng, Y.L. Zhang, S. Dahanayaka, X.L. Li, K. Yao, J.J. Wang, Z.L. Wu, Z.L. Dai, and G. Wu. 2012. Regulation of leucine catabolism by metabolic fuels in mammary epithelial cells. Amino Acids 43:2179-2189.

351. Yang, H., F. Li, X. Kong, X. Yuan, W. Wang, R. Huang, T. Li, M. Geng, G. Wu, and Y. Yin. 2012. Chemerin regulates proliferation and differentiation of myoblast cells via ERK1/2 and mTOR signaling pathways. Cytokine 60:646-652.

352. Tan, BE, X.G. Li, G. Wu, X.F. Kong, Z.Q. Liu, T.J. Li, and Y.L. Yin. 2012 Dynamic changes in blood flow and oxygen consumption in the portal-drained viscera of growing pigs receiving acute administration of L-arginine. Amino Acids 43:2481-2489.

353. Rizal, Y., M.E. Mahata, I. Joli, and G. Wu. 2012. Improving the nutrient quality of juice wastes mixture through fermentation by using *Trichodherma viride* for poultry diet. Pakistan J. Nutr. 11: 203-207.

354. Mahata, M.E., Y. Rizal, and G. Wu. 2012. Improving the nutrient quality of juice waste mixture by steam pressure for poultry diet. Pakistan J. Nutr. 11:172-175.

355. Wu, G. 2012. Arginine nutrition and reproductive performance of gestating sows. Feed Industry (Chinese) 33 (22): 46-54.

356. Wu, X., Y.Z. Zhang, Y.L. Yin, Z. Ruan, H.M. Yu, Z.L. Wu, and G. Wu. 2013. Roles of heat-shock protein 70 in protecting against intestinal mucosal damage. Front. Biosci. 18:356-365.

357. Zeng, X., X. Mao, Z. Huang, F. Wang, G. Wu, and S. Qiao. 2013. Arginine enhances embryo implantation in rats through PI3K/PKB/mTOR/NO signaling pathway during early pregnancy. Reproduction 145:1-7.

358. Rezaei, R., D.A. Knabe, C.D. Tekwe, S. Dahanayaka, M.D. Ficken, S.E. Fielder, S.J. Eide, S.L. Lovering, and G. Wu. 2013. Dietary supplementation with monosodium glutamate is safe and improves growth performance in postweaning pigs. Amino Acids 44:911-923.

359. Ren, W.K., L.X. Zou, N.Z. Li, Y. Wang, Y.Y. Peng, J.N. Ding, L.C. Cai, Y.L. Yin, and G. Wu. 2013. Dietary arginine supplementation promotes immune responses to inactivated Pasteurella multocida vaccination in mice. Br. J. Nutr. 109:867-872.

360. Mahata, M.E., Sasti, M.J., Aryani, R.S., Rizal, Y., and G. Wu. 2013. The effect of improved juice wastes mixture (IJWM) for corn substitution on broilers' performance. Int. J. Poultry Sci. 12:102-106.

361. Lei, J., D.Y. Feng, Y.L. Zhang, S. Dahanayaka, X.L. Li, K. Yao, J.J. Wang, Z.L. Wu, Z.L. Dai, and G. Wu. 2013. Hormonal regulation of leucine catabolism in mammary epithelial cells. Amino Acids. doi: 10.1007/s00726-012-1332-9.

362. Liu, C., G. Lin, X.Q. Wang, T.J. Wang, G. Wu, D.F. Li, and J.J. Wang. 2013. Intrauterine growth restriction alters the hepatic proteome in fetal pigs. J. Nutr. Biochem. doi: 10.1016/j.jnutbio.2012.0 6.016

363. McDonald, T.J., G. Wu, S.L. Jenkins, P.W. Nathanielsz, and T. Jansson. 2013. Effect of 30% nutrient restriction in the first half of gestation on maternal and fetal baboon serum amino acid concentration. Br. J. Nutr. 109:1382-1388.

364. Ren, W.K., W. Luo, M.M. Wu, G. Liu, X.L. Yu, F. Jun, T.J. Li, Y.L. Yin, G. Wu. 2013. Dietary L-glutamine supplementation improves pregnancy outcome in mice infected with type-2 porcine circovirus. Amino Acids. doi: 10.1007/s00726-011-1134-5

365. Satterfield, M.C., K.A. Dunlap, D.H. Keisler, F.W. Bazer, and G. Wu. 2013. Arginine nutrition and fetal brown adipose tissue development in nutrient-restricted sheep. Amino Acids. doi: 10.1007/s00726-011-1168-8.

366. Dai, Z.L., X.L. Li, P.B. Xi, J. Zhang, G. Wu, and W.Y. Zhu. 2013. L-Glutamine regulates amino acid utilization by intestinal bacteria. Amino Acids. doi: 10.1007/s00726-012-1264-4.

367. Hou, Y.Q., L. Wang, D. Yi, B.Y. Ding, Z.G. Yang, J. Li, X. Chen, Y.S. Qiu, and G. Wu 2013. N-Acetylcysteine reduces inflammation in the small intestine by regulating redox, EGF and TLR4 signaling. Amino Acids. doi: 10.1007/s00726-012-1295-x.

368. Wu, G., Z.L. Wu, Z.L. Dai, Y. Yang, W.W. Wang, C. Liu, B. Wang, J.J. Wang and Y.L. Yin. 2013. Dietary requirements of "nutritionally nonessential amino acids" by animals and humans. Amino Acids 44:1107-1113.

369. Washburn, S.E., O.B. Sawant, E.R. Lunde, G. Wu, and T.A. Cudd. 2013. Acute alcohol exposure, acidemia or glutamine administration impacts amino acid homeostasis in ovine maternal and fetal plasma. Amino Acids. doi: 10.1007/s00726-012-1453-1.

370. Mullen, M.P., F.W. Bazer, G. Wu, M.H. Parr, A.C.O. Evans, M.A. Crowe, and M.G. Diskin. 2013. Effects of systemic progesterone during the early luteal phase on the availabilities of amino acids and glucose in the bovine uterine lumen. Reprod. Fert. Dev. doi.org/10.1071/RD12319.

371. Dai, Z.L., Z.L. Wu, Y. Yang, J.J. Wang, M.C. Satterfield, C.J. Meininger, F.W. Bazer, and G. Wu. 2013. Nitric oxide and energy metabolism in mammals. BioFactors. doi: 10.1002/biof.1099.

372. He, L.Q., Y.L. Yin, T.J. Li, R.L. Huang, Z.L. Wu, and G. Wu. 2013. Use of the Ussing chamber technique to study nutrient transport by epithelial tissues. Front. Biosci. (In press)

373. Rezaei, R., W.W. Wang, Z.L. Wu, Z.L. Dai, J.J. Wang, and G. Wu. 2013. Biochemical and physiological bases for utilization of dietary amino acids by young pigs. J. Anim. Sci. Biotech. 4:7 (doi: 10.1186/2049-1891-4-7).

374. Kim, J.Y., G.H. Song, G. Wu, H.J. Gao, G.A. Johnson, and F.W. Bazer. 2013. Arginine, leucine, and glutamine stimulate proliferation of porcine trophectoderm cells through the MTOR-RPS6K-RPS6-EIF4EBP1 signal transduction pathway. Biol. Reprod. 88:113.

375. Li, C., T.J. McDonald, G. Wu, M.J Nijland, and P.W. Nathanielsz. 2013. IUGR alters term fetal baboon hypothalamic appetitive 1 peptide balance. J. Endocrinol. 217:275-282.

376. Ren, W.K., L.X. Zou, Z. Ruan, N.Z. Li, Y. Wang, Y. Peng, G. Liu, Y.L. Yin, R.L. Huang, Y.Q. Hou, and G. Wu. 2013. Dietary L-proline supplementation confers immuno-stimulatory effects on inactivated *Pasteurella multocida* vaccine immunized mice. Amino Acids. doi: 10.1007/s00726-013-1490-4

377. Wang, W.W., Z.L. Wu, Z.L. Dai, Y. Yang, J.J. Wang, and G. Wu. 2013. Glycine metabolism in animals and humans: implications for nutrition and health. Amino Acids. doi: 10.1007/s00726-013-1493-1.

378. Wu, G. 2013. Functional amino acids in nutrition and health. Amino Acids. doi: 10.1007/s00726-013-1500-6.

379. Tekwe, C.D., J. Lei, K. Yao, R. Rezaei, X.L. Li, S. Dahanayaka, R.J. Carroll, C.J. Meininger, F.W. Bazer, and G. Wu. 2013. Oral administration of interferon tau enhances oxidation of energy substrates and reduces adiposity in Zucker diabetic fatty rats. BioFactors (Accepted in revision)

380. Del Curto, H., G. Wu, and M.C. Satterfield. 2013. Nutrition and reproduction: Links to epigenetics and metabolic syndrome in offspring. Curr. Opin. Clin. Nutr. Metab. Care (In press)

381. Ajinkya Sase, Sudath Dahanayaka, Harald Höger, Guoyao Wu, and Gert Lubec. 2013. Changes of hippocampal β-alanine and citrulline levels parallel early and late phase of retrieval in the Morris Water Maze. Behav. Brain Res. doi:10.1016/j.bbr.2013.04.033.

Books:

1. Wu, G. 2013. Amino Acids: Biochemistry and Nutrition, CRC Press, Boca Raton, Florida. p. 503.

2. Blachier, F., G. Wu, and Y.L. Yin. 2013. Amino Acids and Pig Nutrition. Springer, New York. p. 346.

Other publications (Non-refereed articles):

4. Wu, G. 2008. Funciones importantes de la glutamine en la nutrición y en la producción animal. In: AminoGut: ciencia y práctica en la nutrición de lechones. pp. 6-9. Ajinomoto Animal Nutrition Special Edition. January 16, 2008

5. Wu, G. 2008. Arginina y AA relacionados en porcino. www.stres3.com. June 4, 2008.

6. Wu, G. 2009. New development in swine amino acid nutrition. SALE Feed Industry (Chinese) 93: 71-75.

7. Wu, G. and H.R. Cross. 2012. Taurine: An abundant amino acid in meats and an essential nutrient for humans. Phi Tau Sigma Newsletter - The Honor Society of Food Science and Technology, December 15, 2012. pp. 10-12.

8. Wu, G. and H.R. Cross. 2012. Beef has a great story on the amino acid taurine. Beef Magazine, December 13, 2012. beefmagazine.com.

Refereed Chapters in Books:

32. Wu, G. 2008. Intrauterine growth retardation in livestock: Implications, mechanisms, and solutions. 44th Easter Nutrition Conference, Animal Nutrition Association of Canada. pp. 143-152, Ottawa, Canada.

33. Wu, G. 2008. Arginine nutrition and reproductive performance in swine. III CONGRESO CLANA (Congress of Latin America Animal Nutrition) (Cancun, Mexico), pp. 143-155.

34. Kim, S.W., Wu, G., Y. Zhao, and P. Li. 2009. Applications of ideal protein and selection of protein sources for sows and piglets. In: Progress in Functional Amino Acids and Carbohydrates for Animal Production. (Proceedings of 4th International Symposium on Animal Nutrition, Health and Feed Additive, July 4-5, 2009, Guangzhou, China (Y.L. Yin, G. Liu and T.E. Spencer, eds.), Institute of Subtropical Agriculture, Chinese Academy of Sciences, Changsha, Hunan, China. pp. 32-40.

35. Wu, G., F.W. Bazer, G.A. Johnson, S.W. Kim, D.A. Knabe, P. Li, X.L. Li, T.E. Spencer, and Y.L. Yin. 2009. Recent advances in swine amino acid nutrition: molecular and functional studies. In: Progress in Functional Amino Acids and Carbohydrates for Animal Production. (Proceedings of 4th International Symposium on Animal Nutrition, Health and Feed Additive, July 4-5, 2009, Guangzhou, China (Y.L. Yin, G. Liu and T.E. Spencer, eds.),

Institute of Subtropical Agriculture, Chinese Academy of Sciences, Changsha, Hunan, China. pp. 645-652.

36. Wu, G., F.W. Bazer, R.C. Burghardt, G.A. Johnson, S.W. Kim, D.A. Knabe, X.L. Li, M.C. Satterfield, S.B. Smith, and T.E. Spencer. 2010. Functional amino acids in swine nutrition and production. In: Dynamics in Animal Nutrition (J. Doppenberg and P. van der Aar, ed.), Wageningen Academic Publishers, The Netherlands, pp. 69-98.

37. McNeal, C., G. Wu, S. Vasquez, D.P. Wilson, M.C. Satterfield, J.R. McKnight, and H. Malbari. 2010. The role of arginine for treating obese youth. In: Global Perspectives on Childhood Obesity (D. Bagchi, ed.), Elsevier, New York, NY. pp. 433-442.

38. Wu, G. 2010. Importance of intestinal amino acid metabolism in nutrition and health: Thinking Out of the box. In: Gentech's First Nutrition International Forum. Shanghai, China. pp. 2-20.

39. Wu, G. 2010. Biochemical and physiological limitations to efficiency of amino acid utilization for animal growth. In: Energy and Protein Metabolism and Nutrition (G.M. Crovetto, ed.), Wageningen Academic Publishers, The Netherlands. pp. 363-372.

40. Satterfield, M.C., J.A. Coverdale, and G. Wu. 2010. A review of fetal programming: Implications to horse health. Proceedings of the 56th Annual Convention of the American Association of Equine Practitioners. pp. 207-214.

41. Satterfield, M.C., J.R. McKnight, X.L. Li, and G. Wu. 2011. Nutrition, epigenetics, and vascular function. In: Nutrition, Epigenetic Mechanisms, and Human Disease (N. Maulik, ed.), CRC Press, New York. pp. 125-139.

42. Wu, G., and M.C. Satterfield. 2011. Proteins: oxidation, turnover and proteomics. In: Encyclopedia of Animal Science, 2nd edition (W.G. Pond, D. Ullrey and C. Kirk-Baer, eds.), Taylor & Francis Group, New York, NY. pp. 1:1, 929-931.

43. Wu, G., X.L. Li, J.R. McKnight, and M.C. Satterfield. 2011. Amino acids: utilization, gene expression and cell signaling. In: Encyclopedia of Animal Science, 2nd edition (W.G. Pond, D. Ullrey and C. Kirk-Baer, eds.), Taylor & Francis Group, New York, NY. pp. 1:1, 17-19.

44. Kristensen, N.B. and G. Wu. 2011 Metabolic functions of the porcine liver. In: Swine Metabolism and Nutrition. (In press)

45. Wu, G. 2011. Arginine and immune function. In: Diet, Immunity, and Inflammation, edited by P.C. Calder, Woodhead Publishing, U.K.

46. Wu, G., Beth Imhoff-Kunsch, and A.W. Girard. 2011. Biological mechanisms for nutritional regulation of fetal growth and development. Gates Foundation Nutrition and Health book series.

47. Bazer, F.W., G.A. Johnson, G.H. Song, and G. Wu. 2012. Pregnancy recognition signaling, fetal-placental development and prenatal fetal programming. In: Animal Reproduction in Livestocks (Eds., Susana Astiz Blanco and Antonio Gonzalez Buines), in Encyclopedia of Life Support Systems (EOLSS), Developed under the Auspices of the UNESCO, Eolss Publishers, Oxford, UK [http://www.eolss.net/]. Vol. 5.15.20.01

48. Wu, G. 2012. Dietary requirements of "nutritionally essential amino acids" by swine. Recent Advances in Animal Nutrition and Feed Sciences (Y.L. Yin, ed.), Chinese Academy of Sciences, Institutes of Subtropical Agriculture, Changsha, China.

49. Botchlett, R., J.M. Lawler, and G. Wu. 2013. L-Arginine and L-citrulline in sports nutrition and health. In: Nutrition and Enhanced Sports Performance: Recommendations for muscle Building (edited by Debasis Bagchi, Sreejayan Nair, and Chandan K. Sen), Elsevier, New York. (In press)

50. Wu, G., F.W. Bazer, G.A. Johnson, R.C. Burghardt, X.L. Li, Z.L. Dai, J.J. Wang, and Z.L. Wu. 2013. Maternal and fetal amino acid metabolism in gestating sows. (In press)

51. Bazer, F.W., J.Y. Kim, G.H. Song, H. Ka, G. Wu, G.A. Johnson, and J.L. Vallet. 2013. Roles of selected nutrients on development of the conceptus during pregnancy. (In press)

Ping Yang

Professional Preparation

Lanzhou University, Lanzhou, China;	**Theoretical Physics;**	**B.S.;**	**1985**
Lanzhou Institute of Plateau Atmospheric Physics Chinese Academy of Science, Lanzhou, China;	**Atmospheric Physics;**	**M.S.;**	**1988**
University of Utah, Salt Lake City, Utah, U.S.A.;	**Meteorology**	**Ph.D.;**	**1995**
Department of Meteorology, University of Utah Salt Lake City, Utah, U.S.A.;	**Radiative Transfer & Remote Sensing,**	**Postdoc ;**	**1996-1997**

Appointments

Department Head, 09/2012- present, Dept. of Atmospheric Sciences, Texas A&M University
Professor, 09/2008- present, Dept. of Atmospheric Sciences, Texas A&M University Associate Professor, 09/2005-present, Dept. of Atmospheric Sciences, Texas A&M University
Assistant Professor, 09/2001- 08/2005, Dept. of Atmospheric Sciences, Texas A&M University Associate Research Scientist, 03/2001-09/2001, Goddard Earth Sciences and Technology Center,
University of Maryland Baltimore County
Staff Scientist, 01/1999-02/2001, Science and System Application, Inc., Lanham, Maryland
Assistant Research Scientist, 12/1997-01/1999, Dept of Atmospheric Sciences, University of California, Los Angeles
Postdoctoral Research Associate, 01/1996- 11/1997, Dept. of Meteorology/Center for Atmospheric Remote Sensing Study, University of Utah

Selected Publications (1 book; 7 book chapters; 205 peer-reviewed articles; citations=4330; h–index = 36; as of 2/22/2013)

- Meng, Z., P. Yang, G. W. Kattawar, L. Bi, K. N. Liou, I. Laszlo, 2010: Single-scattering Properties of Nonspherical Mineral Dust Aerosols: A Database for Application to Radiative Transfer Calculations, *J. of Aerosol Science*, 41, 501-512.
- Yang, P., L. Bi, B. A. Baum, K. N. Liou, G. W. Kattawar, M.I. Mishchenko, and B. Cole, 2013: Spectrally consistent scattering, absorption, and polarization properties of atmospheric ice crystals at wavelengths from 0.2 μm to 100 μm. *J. Atmos. Sci*., 70, 330-347.
- Yang, P., and K. N. Liou, 1996: Geometric-Optics-integral-equation method for light scattering by nonspherical ice crystals, *Appl. Opt.*, 35, 6568-6584.
- Yang, P., Q. Feng, G. Hong, G. W. Kattawar, W. J. Wiscombe, M. I. Mishchenko, O. Dubovik, I. Laszlo, and I. N. Sokolik, 2007: Modeling of the scattering and radiative properties of nonspherical dust particles, *J. of Aerosol Sci.* 38, 995-1014.
- Bi, L., P. Yang, G. W. Kattawar, M. I. Mishchenko, 2013: Efficient implementation of the invariant imbedding T-matrix method and the separation of variables method applied to large nonspherical inhomogeneous particles, *J. Quant. Spectrosc. Radiat. Transfer, 116, 169-183.*
- Yang, P., and K. N. Liou, 1996: Finite-difference time domain method for light scattering by small ice crystals in three-dimensional space, J. Opt. Soc. Amer., A13, 2072-2085.
- Yang, P., H.L. Wei, G. W. Kattawar, Y. X. Hu, D. M. Winker, C. A. Hostetler, and B. A. Baum, 2003: Sensitivity of the backscattering Mueller matrix to particle shape and thermodynamic phase.

Appl. Opt. 42, 4389-4395.

- Yang, P., H. Wei, H.-L. Huang, B. A. Baum, Y. X. Hu, G. W. Kattawar, M. I. Mishchenko, and Q. Fu, 2005: Scattering and absorption property database for nonspherical ice particles in the near- through far-infrared spectral region, *Appl. Opt.*, 44, 5512-5523.

- Yang, P., G. Hong, G. W. Kattawar, P. Minnis and Y. Hu, 2008: Uncertainties associated with the surface texture of ice particles in satellite-based retrieval of cirrus clouds: Part II. Effect of particle surface roughness on retrieved cloud optical thickness and effective particle size, *IEEE Transactions on Geosciences and Remote Sensing* 46, 1948-1957.

- Yang, P., Z. Zhang, G. W. Kattawar, S. G. Warren, B. A. Baum, H.-L. Huang, Y. Hu, D. Winker, and J. Iaquinta, 2008: Effect of cavities on the optical properties of bullet rosettes: Implications for active and passive remote sensing of ice cloud properties, *J. Appl. Meteor. Clim.* 47, 2311-2330.

Synergistic Activities

- Member of the International Radiation Commission (IRC) for term 2012-2016.

- Associate Editor of the *Journal of the Atmospheric Sciences* (January, 2004- present), the *Journal of Quantitative Spectroscopy & Radiative Transfer* (01/2007-present), and the *Journal of Applied Meteorology and Climatology* (01/2007-present)

- Co-chair of Program Committee (2005, 2007, 2009, 2011), Hyperspectral Imaging and Sounding of Environment Topical Meeting sponsored by the Optical Society of America.

- Session co-organizer (2005, 2009), *Progress in Electromagnetics Research Symposium* (PIERS).

- Convener and Chairperson of AGU sessions (2006 & 2007): Light Scattering and Radiative Transfer: Basic Research and Applications.

Identification of Potential Conflicts of Interest or Bias in Selection of Reviewers:

Collaborators

C. Hsu, R. Khan, L. Oreopoulos, S. Platnick,
S.-C. Tsay, W. Wiscombe, and D. L. Wu, NASA Goddard Space Flight Center;
M. Mishchenko, B. van Diedenhoven, NASA Goddard Institute of Space Study;
Y. Hu, X. Liu, and P. Minnis, NASA Langley Research Center;
A. Heidinger, I. Laszlo, and F. Weng, X.P. (Tom) Zhao, NOAA;
A. Heymsfield, National Center for Atmospheric Research;
B. Baum, T. Greenwald, and J. Li, SSEC/University of Wisconsin;
K.-N. Liou and Y. Takano, University of California, Los Angles;
Xianglei Huang, and Joyce Penner, University of Michigan;
J. Coakley College of Earth, Ocean & Atmospheric Sci., Oregon State University
S. Brooks, A. Dessler, G. Kattawar, S. Nasiri, G. North, R. L. Panetta; Texas A&M University
M. Wendisch, Leibniz-Institute for Tropospheric Research, Germany.
O. Dubovik, J. Reidi, Université de Lille, France.
Eli Mlawer:, AERI, Cambridge, Massachusetts
David Paynter, Ramaswamy, Yi Ming (Co-Is on a pending proposal), GFDL
Nadine Unger, Yale University

Graduate and postdoctoral advisors

Prof. Kuo-Nan Liou (Ph.D. advisor, and also Postdoctoral advisor), UCLA

Thesis Advisees and Postgraduate-scholars Sponsored

Total Number of graduate students (including current students) advised: 32
Total Number of graduate students (including current students) advised: 5
Current Graduate Students at Texas A&M: Benjamin Cole, Yifeng Ding, Xin Huang, Chao Liu, Derek Podowitz, Binqiang Sun, Chenxi Wang, Bingqi Yi, Jianing Zhang, Chen Zhou. *Current Postdocs* (2): Lei Bi, *Former Postdocs/Research Associates*: Shouguo Ding , Univ. of Nebraska-Lincoln; Gang Hong, SSAI; Ron Li, Univ. of Maryland- College Park; Guang Guo and Jianguo Niu, I. M. System Group, Inc.; *Former students***:** Elizabeth Baugher, Guang Chen, Hyoun -Myoung Cho, Qiang Feng, Kevin Garret, Jacqueline Kinney, Ryan Lawless, Joonsuk Lee, Yongkeun Lee, Yue Li, Jianxu Lu, Kai Lu, Zhaokai Meng, Kerry Meyer, Guanglin Tang, Yu Xie, Christopher Yost, Yu You, Peng-Wang Zhai, Feng Zhang, Zhibo Zhang

QI YING

205 K Wisenbaker Engineering Research Center (WERC),
Zachry Department of Civil Engineering,
Texas A&M University,
College Station, Texas, 77843-3136
Phone: (979) 845-9709
E-mail: qying@civil.tamu.edu

EDUCATION

Ph.D., Environmental Engineering, September 2004, University of California, Davis
B.S., Environmental Engineering, July 2000, Tsinghua University, Beijing, China

RESEARCH AND WORK EXPERIENCE

Assistant Professor Texas A&M University, College Station, August 2007 – Present
Air Resources Engineer California Air Resources Board, December 2005 – August 2007
Postdoctoral Researcher UC Davis, September 2004 – November 2005
Doctoral Researcher UC Davis, August 2000 – September 2004

REFEREED JOURNAL PUBLICATIONS

(* Denotes students advised, # denotes corresponding author)

Manuscript under Review

1. Jingyi Li*, **Qi Ying#**, Bingqi Yi and Ping Yang. Can Stabilized Criegee Intermediates Be an Important Source of Atmospheric Sulfate? Atmospheric Environment, Revised, Under Review.

2. Sri Harsha Kota*, **Qi Ying**#, Changhyoun Park, Nicholas D. Werner and Gunnar W. Schade. Estimation of VOC emission factors from flux measurements using receptor models and footprint analysis. Atmospheric Environment, Under Review.

3. Jianlin Hu, Shu-Hua Chen, Christine Wiedinmyer, Francois Vandenberghe, Hongliang Zhang, Qi Ying, and Michael Kleeman. Predicting primary PM2.5 and PM0.1 trace composition for epidemiological studies in California. Environmental Science and Technology, Under Review

4. Sri Harsha Kota*, Hongliang Zhang*, Gang Chen*, Gunnar W. Schade, and **Qi Ying#.** Evaluation of CO and NOx emissions from MOVES and MOBILE6.2 in Southeast Texas using a source-oriented regional air quality model. Atmospheric Environment, Under Review.

5. Hongliang Zhang*, Gang Chen*, Jianlin Hu, Shu-Hua Chen, Christine Wiedinmyer, Michael Kleeman, and **Qi Ying#**. Evaluation of a seven-year (2000-2006) high resolution WRF/CMAQ simulation for epidemiology studies in the eastern United States. Science of the Total Environment, Under Review.

Published or Accepted Papers (last 5 years)

(2 in 2013; 0 first author, 1 second author; 2 corresponding author; 2 with students)

6. Sri Harsha Kota*, **Qi Ying**# and Yunlong Zhang. Simulating Near-road Reactive Dispersion of Gaseous Air Pollutants using a Three-Dimensional Eulerian Model. Science of the Total Environment, 454-455, p348-357

7. Hongliang Zhang*, Jingyi Li*, **Qi Ying#**, Birnur Buczu Guven, Eduardo P. Olaguer. 2013. Source Apportionment of Formaldehyde during TexAQS 2006 using a Source-Oriented Chemical Transport Model. Journal of Geophysical Research - Atmospheres. doi: 10.1002/jgrd.50197

   (3 in 2012; 0 first author, 1 second author; 3 corresponding author; 3 with students)

8. Hongliang Zhang*, Jingyi Li*, **Qi Ying#**, Jian Zhen Yu, Dui Wu, Yuan Chen, Kebin He, Jingkun Jiang. Source Apportionment of Secondary $PM_{2.5}$ Nitrate and Sulfate in China using a Source-Oriented Air Quality Model. Atmospheric Environment, 62, 228-242.

9. Hongliang Zhang* and **Qi Ying#**. Secondary Organic Aerosol from Polycyclic Aromatic Hydrocarbons in Southeast Texas. Atmospheric Environment, 55, 279-287, 2012

10. Jingyi Li*, Hongliang Zhang* and **Qi Ying**#. Comparison of the SAPRC07 and SAPRC99 Photochemical Mechanisms during a High Ozone Episode in Texas: Differences in Concentrations, OH Budget and Relative Response Factors. Atmospheric Environment, 54(1), 25-35, 2012

    (4 in 2011; 2 first author, 2 second author; 3 corresponding author; 3 with students)

11. **Qi Ying**#. Physical and Chemical Processes of Wintertime Secondary Nitrate Aerosol Formation. Frontiers of Environmental Science and Engineering in China, 5(3), 348-361, 2011

12. Hongliang Zhang* and **Qi Ying**#. Secondary Organic Aerosol Formation and Source Apportionment in Southeast Texas. Atmospheric Environment, 45(19), 3217-3227, 2011

13. **Qi Ying**# and Jingyi Li* Implementation and application of the near-explicit Master Chemical Mechanism in the 3D Community Multiscale Air Quality Model. Atmospheric Environment, 45(19), 3244-3256, 2011

14. Hongliang Zhang* and **Qi Ying**#. Contributions of local and regional NOx sources to ozone concentration in Southeast Texas. Atmospheric Environment, 45(17), 2877-2887, 2011

    (6 in 2010; 1 first author, 4 second author; 3 corresponding author; 3 with students)

15. Hongliang Zhang* and **Qi Ying**#. Source Contributions to Primary and Secondary Airborne Particulate Matter in Southeast Texas during Texas Air Quality Study 2000 using a Three-Dimensional Source Oriented Air Quality Model. Atmospheric Environment, 44(29), 3547-3557, 2010

16. Yunlong Zhan g#, Jinpeng Lv and **Qi Ying**. Traffic Assignment Considering Air Quality. Transportation Research, Part D., 15(8), 497-502, 2010

17. **Qi Ying**# and Anupama Krishnan*. Source Contribution of Volatile Organic Compounds to Ozone Formation in Southeast Texas. Journal of Geophysical Research – Atmospheres, 115(D17), D17306, 2010

18. Sri Harsha Kota*, **Qi Ying**# and Yunlong Zhang. TAMNROM-3D: A Three-Dimensional Eulerian Model to Simulate Air Quality near Highways. Transportation Research Record: Journal of Transportation Research Board, v2158, 61-68, 2010

19. Jianjun Chen, **Qi Ying** and Michael J. Kleeman#. Source apportionment of wintertime secondary organic aerosol during the California regional PM10/PM2.5 air quality study. Atmospheric Environment, 44(10), 1331-1340, 2010

20. Jianlin Hu, **Qi Ying**, Jianjun Chen, Abdullah Mahmud, Zhan Zhao, Shu-Hua Chen, Michael J. Kleeman#. Particulate Air Quality Model Predictions using Prognostic vs. Diagnostic Meteorology in Central California. Atmospheric Environment, 44(2), 215-226, 2010

    (4 in 2009; 2 first author, 1 second author; 0 corresponding author; 0 with students)

21. Jianjun Chen, **Qi Ying** and Michael J. Kleeman#. Source apportionment of visual impairment during the California regional PM10/PM2.5 air quality study. Atmospheric Environment, 43(39), 6136-6144, 2009

22. P.L. Livingstone#, K. Magliano, K. Gurer, P.D. Allen, K.M. Zhang, **Q. Ying**, B.S. Jackson, A. Kaduwela, M. Kleeman, L.F. Woodhouse, K. Turkiewicz, L.W. HGorowitz, K. Scott, D. Johnson, C. Taylor, G. O'Brien, J. DaMassa, B.E. Croes. Simulating PM concentration during a winter episode in a subtropical valley: Sensitivity simulations and evaluation methods. Atmospheric Environment, 43(37), 5971-5977, 2009

23. **Qi Ying**, Michael Kleeman#. Regional contributions to airborne particulate matter in central California during a severe pollution episode, Atmospheric Environment, 43(6), 1218-1228, 2009

24. **Qi Ying**, Jin Lu, Michael Kleeman#. Modeling air quality during the California Regional PM10/PM2.5 Air Quality Study (CPRAQS) using the UCD/CIT source-Oriented air quality model - Part III. Regional source apportionment of secondary and total airborne particulate matter, Atmospheric Environment, 43(2), 419-430, 2009

    (2 in 2008; 2 first author; 0 with students)

25. **Qi Ying**, Jin Lu, Paul Allen, Paul Livingstone, Ajith Kaduwela, Michael Kleeman#. Modeling air quality during the California Regional PM10/PM2.5 Air Quality Study (CRPAQS) using the UCD/CIT source-oriented air quality model - Part I. Base case model results, Atmospheric Environment, Volume 42(39), 8954-8966, 2008

26. **Qi Ying**, Jin Lu, Ajith Kaduwela, Michael Kleeman#. Modeling air quality during the California Regional PM10/PM2.5 Air Quality Study (CPRAQS) using the UCD/CIT Source Oriented Air Quality Model - Part II. Regional source apportionment of primary airborne particulate matter, Atmospheric Environment, 42(39), 8967-8978, 2008

    (2 in 2007; 1 first author; 0 with students)

EXTENDED CONFERENCE ABSTRACTS and CONFERENCE PAPERS

1. Sri Harsha Kota*, **Qi Ying**, Hongliang Zhang* and Gunnar W. Schade, "Evaluation of CO and NOx emissions from MOVES and MOBILE6.2 in Southeast Texas using a Source-Oriented CMAQ model", Transportation Research Board 91th Annual Meeting, Washington D.C., January, 2013

2. Jingyi Li*, **Qi Ying**, Bingqi Yi and Ping Yang, "Direct Radiative Forcing due to Regional Formation of Sulfate from Reactions of SO_2 with Criegee Biradicals", International Conference: Aerosol and Atmospheric Optics: Visibility and Air Pollution, Air and Waste Management Association, September 24-28, 2012

3. Sri Harsha Kota*, Hongliang Zhang*, **Qi Ying**, Yungang Wang and Philip K. Hopke, "Black Carbon Emission from Barbeque Activities during College Football Games", International Conference: Aerosol and Atmospheric Optics: Visibility and Air Pollution, Air and Waste Management Association, September 24-28, 2012

4. Martin Hale, Gunnar Schade, Sri Kota* and **Qi Ying**, "Emission Model vs. Reality: Volatile Organic Hydrocarbon Fluxes in Urban Houston". A&WMA's 105th Annual Conference and Exhibition.

5. Sri Harsha Kota*, **Qi Ying** and Yunlong Zhang. "MOVES vs. Mobile6.2: Differences in Emission Factors and Regional Air Quality Predictions", Transportation Research Board 90th Annual Meeting, Washington D.C., January, 2012

6. Iris V. Cureño, Humberto A. Bravo, Gang Chen*, **Qi Ying**, Rodolfo Sosa. "Comparison of two different air quality models (CALPUFF vs. CMAQ) to assess the air quality impact for the operation of a thermoelectric power plant". A&WMA's 104th Annual Conference and Exhibition, Orlando FL, June 21-24, 2011.

7. Sajjad Ali*, Gang Chen*, Hongliang Zhang*, **Qi Ying**, Iris V. Cureño, Adrián Marín, Humberto A. Bravo, Rodolfo Sosa. "High Resolution Air Quality Modeling for the Mexico City Metropolitan Zone using a Source-Oriented CMAQ model – Part I: Emission Inventory and Base Case Model Results". Presented at the 9th Annual CMAS Conference, Chapel Hill, NC, October 11-13, 2010

8. Jianjun Chen, **Qi Ying** and Mike Kleeman. "Source Apportionment of Wintertime Secondary Organic Aerosol During the California Regional Particulate Matter Study", p613-616, Proceedings of the 30th NATO/SPS International Technical Meeting on Air Pollution Modeling and Its Application. San Francisco, California. May 18-22, 2009.

9. **Qi Ying** and Anupama Krishnan*, "Source Contribution of Volatile Organic Compounds to Ozone Formation in Southeast Texas", 2009 CMAS Conference, University of North Carolina at Chapel, Hill's Friday Center. October 19-21, 2009.

10. Michael J. Kleeman and **Qi Ying**, "Modeling particulate matter in central California", Air and Waste Management Association – Symposium on Air Quality Measurement Methods and Technology 2007, pp. 184-187

FUNDED EXTERNAL RESEARCH PROJECTS

1. "Environmental Chamber experiments and CMAQ modeling to improve mechanisms to model ozone formation from HRVOCs", Texas Commission on Environmental Quality, September 2012 – August 2013. Co-PI. $44,494. Total funding: $146,259.

2. “A 3D Eulerian Modeling Study of Ozone and Secondary Organic Aerosol Formation in Texas using the Master Chemical Mechanism”, Texas Air Research Center, September 2009 – August 2013. PI. $74,872. (Administrative cost waived)

3. “Estimating the Effect of Modeled Air Pollution Exposure on Ovarian Function and Complications of Labor and Delivery”, National Institute of Child Health & Human Development (NICHD)/National Institutes of Health (NIH). September 2011 – March 2013. PI. $196,675.

4. "Enhanced Air Pollution Epidemiology using a Source-Oriented Chemical Transport Model", US EPA, Science To Achieve Results (STAR) Program. November 2008 - October 2012. Co-PI. $175,000. Total $900,000.

5. “Improving Emission Inventories Using Direct Flux Measurements and Modeling” US EPA, Science To Achieve Results (STAR) Program. January 2010 – December 2012. Co-PI. $150,000, Total $500,000.

6. "Source Apportionment of Airborne Particulate Matter and Ozone Precursors in Texas Using a Source-Oriented 3D Mechanistic Air Quality Model", Texas Air Research Center (TARC). August 2007 - August 2009, PI. $59,000. (Administrative cost waived)

7. "Methodology and Guideline for Regulating Traffic Flows under Air Quality Constraints in Metropolitan Areas", University Transportation Center for Mobility (UTCM). January 2008 - August 2009. Co-PI. $40,000. Total $80,000.

8. “Quantifying the contribution of major emission sources of volatile organic compounds to ozone air pollution in the Mexico City Air Basin”, Texas A&M University-CONACyT: Collaborative Research Grant Program. August 2009 – August 2010. PI. $25,000. (Administrative cost waived)

TEACHING EXPERIENCE

Classes Taught

Undergraduate Level

1. CVEN 301 Introduction to Environmental Engineering and Science (F07, F08, F10, F11, F12)
2. CVEN 302 Computer Applications in Engineering and Construction (S11, S12)
3. CVEN 413 Natural Environmental Systems (S13)

Graduate Level

1. CVEN 619 Environmental Engineering Processes I – Physical Processes (S09, F09, F10, F11,F12)
2. CVEN 607 Air Quality (S08, S09, S10)
3. CVEN 681 Graduate Student Seminar (F11)
4. CVEN 689 Air Quality Modeling (S10)

MS Students Advised

1. Kota, Sri Harsha, MS, Completed Summer 2009. Thesis: “Modeling Air Quality Near Freeways Using a Three-Dimensional Eulerian Model”
2. Krishnan, Anupama, MS, Completed Spring 2010. Thesis: Source contribution of VOCs to ozone formation in Texas using a source-oriented air quality model.
3. Li, Jingyi, MS, Completed Fall 2010. Thesis: Implementation and application of SAPRC07 and MCM mechanisms in the Community Multi-scale Air Quality Model.

4. Ali, Sajjad Ghulam, MS, Completed Fall 2010. Thesis topic: Using a regional chemical transport model for the analysis of gaseous and particulate air pollutants in the Mexico City Metropolitan Area.

PhD Student Advised

- Hongliang Zhang, PhD, completed Spring 2012. Thesis Topic: Source and Age Resolved Mechanistic Air Quality Models: Model Development and Application in Southeast Texas.
- Kota, Sri Harsha, started Fall 2009. Expect completion time: Fall 2012. Thesis Topic: Near-road Air Quality.
- Li, Jingyi, started Fall 2008. Expected completion time: Fall 2013. Thesis topic: Implement and application of explicit photochemical mechanisms in a 3D air quality model.
- Gang Chen, started Spring 2010. Expected completion time: Spring 2015. Air quality modeling for air pollution epidemiology studies.
- Peng Wang, started Fall 2012. Thesis topic to be determined.

ME Students Advised

1. Devkota Ashok, ME, Fall 2011. Project: "Measuring UV absorbing organics and black carbon emission from Asian cooking in a small apartment"
2. David Infortunio, ME, Spring 2011. Project: "Source apportionment of PM2.5 in Houston area using Positive Matrix Factorization"
3. Charles Kuo, ME, Spring 2013. Project: "Web interface for a box model with multiple photochemical mechanisms"

HONORS

Editor's Citation for Excellence in Referencing for Journal of Geographical Research – Atmospheres, 2011

PROFESSIONAL SERVICES

1. Center for Atmospheric Chemistry and Environment (CACE), Internal Executive Committee Representative, 2007-present.
2. Panelist for Science, Mathematics and Research for Transformation Scholarship (SMART) Program, Department of Defense (DOE) and American Society for Engineering Education (ASEE), 2008-2010.
3. Panelist for NSF Graduate Research Fellowship Program (GRFP), Environmental Chemistry. National Science Foundation (NSF) and American Society for Engineering Education (ASEE), 2010 and 2011.
4. Peer Reviewer for Atmospheric Chemistry and Physics (ACP), Environmental Science and Technology (ES&T), Atmospheric Environment (AE), Journal of Geophysical Research (JGR) – Atmosphere, Journal of American Air and Waste Management Association (JAWMA), Geoscientific Model Development (GMD) and Environmental Engineering Science (EES).

PROFESSIONAL AFFILIATIONS

American Association for Aerosol Research (AAAR)
American Geophysical Union

Shari Yvon-Lewis

Dept. of Oceanography
Texas A&M University
3146 TAMU
College Station, TX 77845
979-458-1816 (Phone)
979-845-6331 (fax)
syvon-lewis@ocean.tamu.edu

Education

Undergraduate:	University of Massachusetts, Amherst, MA, B.S. in Chemistry, 1989
Graduate:	University of Miami, FL, Ph.D., Marine and Atmospheric Chemistry, 1994
Dissertation:	The Cycling of Sulfur Dioxide in the Remote Marine Boundary Layer
Advisor:	Dr. Eric S. Saltzman

Experience

09/11-present	Associate Professor, Dept. of Oceanography Texas A&M University, College Station, TX
10/04-08/11	Assistant Professor, Dept. of Oceanography Texas A&M University, College Station, TX
08/97-09/04	Research Chemist, National Oceanic and Atmospheric Administration/ Atlantic Oceanographic and Meteorological Laboratory, Miami, FL
03/96-07/97	Research Associate, University of Colorado, Boulder, CO
03/94-02/96	DOE Global Change Distinguished Postdoctoral Fellow, DOC/NOAA/ERL/CMDL, Boulder, CO

Teaching Interests

My teaching interests include both undergraduate and graduate education. For undergraduate non-science majors, I hope to help them develop an awareness of environmental issues and the reliability of science in assessing these issues. For undergraduate science majors, I try to help them make connections between the facts they must learn and the application to real world cases. For graduate students, I hope to guide them through the process of becoming successful researchers who can apply their expertise to any path academic or other.

Courses Taught

OCNG 181 (1cr.) – First Year Seminar: Oceans in the News
OCNG 205 (1cr.) – Introduction to Ocean Studies
OCNG 251 (3cr.) – Oceanography
OCNG 440 (3cr.) – Introduction to Chemical Oceanography (writing intensive)
OCNG 640 (3cr.) – Chemical Oceanography

OCNG 689 (3cr.) – Marine Trace Gas Biogeochemistry
GEOS 105 (3cr.) – Introduction to Environmental Geoscience
Supervisor for OCNG 252 (Oceanography Lab – 1 Cr.) – Supervising 15 teaching assistants and maintaining curriculum.

Graduate Student Committees

Chair:

Current:
Yina Liu (Ph.D., Oceanography, Co-Chair Dan Thornton)
Alison Smyth (M.S., Oceanography)
Jordan Young (Ph.D., Oceanography)

Graduated:
Fenix Garcia Tigreros (M.S., Oceanography – May 2013)
Lei Hu (Ph.D., Oceanography – August 2012)
David Finneran (Ph.D., Oceanography, Co-Chair with John Morse - December 2010)

Member:

Current:
Mengran Du (Ph.D., Oceanography; Co-advisor)
Jillian Mattus (Ph.D., Atmospheric Sciences)
Michael Shields (Ph.D., Oceanography)
Dalon Stone (MS, Atmospheric Sciences)

Graduated:
Scarlett Arbuckle (Ph.D., Oceanography, August 2012)
Reagan Errera (Ph.D., Oceanography, May 2013)
Yongsun Kim (Ph.D., Oceanography – August 2012)
Keun-Hee Lee (Ph.D., Atmospheric Sciences, December 2011)
Changhyoun Park (Ph.D., Atmospheric Sciences; May 2010)
Kathryn Schreiner (Ph.D., Oceanography, May 2013)
Jason Tomlison (Ph.D., Atmospheric Sciences, December 2010)
Timothy Taylor (Ph.D., Civil Engineering; May 2009)
Amber Reynolds (MS, Atmospheric Sciences, December 2007)

Undergraduate Research Advising

Rachel Reddig (Chemistry major, supervising undergraduate research Fall 2012-present)

Research Interests

My research focuses on role of the ocean in regulating atmospherically important trace gases. This includes studying air-sea gas exchange; halocarbons; greenhouse gases; biogeochemical cycles; and transient tracers.

Department/College/University Committees

Department:

Chair: OCNG/IGPEEF committee (2010-present)
Member: OCNG Curriculum Committee (2009-present)
Member: OCNG Executive Committee (2006-2008; 2010-present)
Member: OCNG Faculty Search Committee (2007; 2012-present)
Chair: OCNG Recruiting and Academic Advisory Committee (RAAC) (2006-2008)
Member: OCNG Department Head Search Committees (2006 and 2007)
Member: OCNG Graduate Recruiting and Academic Advisory Committee (GRAAC) (2005-2006)

College:

Member: Environmental Programs Advisory Committee (2010-present)
Member: Environmental Faculty of the College of Geosciences (2010-present)
Member: College of Geosciences Safety Committee (2007-present)
Member: College of Geosciences Graduate Advisors Committee (2006-2008)

University:

Member: Core Curriculum Technology Enhancement Committee (2011-present)

Other:

Member: Advisory Committee: Geochemistry of the Earth Sea and Atmosphere (GESA) (2005-
2007)
Member: Center for Atmospheric Chemistry in the Environment (2004-present)
Member: NOAA/AOML Safety Committee (2004)

Memberships in Professional Societies

American Geophysical Union (1990-present)
American Association for the Advancement of Science (1998-2009)
American Chemical Society (2003-2008)

Awards and Fellowships

U.S. Dept. of Energy Global Change Distinguished Postdoctoral Fellowship (1994-1996)
NASA Graduate Student Global Change Fellowship (1992-1994)
Koczy Fellowship (1992-1993)
Admirals of the Fleet Award (1990)
Rosenstiel Fellowship (1989-1990)

Field Work

Atlantic Ocean (HalocAST-A, FS Polarstern, Oct-Nov 2010) – 32 days

[included 1 TAMU graduate student – ***Lei Hu***]
Pacific Ocean (HalocAST-P, R/V Thomas Thompson, Mar-Apr 2010) – 30 days (**Chief Sci.**)
[included 2 TAMU graduate students – ***Lei Hu*** and ***Yina Liu***]
Gulf of Mexico (HYFLUX, R/V Brooks McCall, July 2009) – 14 days
[included 1 TAMU graduate student – ***Lei Hu***]
Antarctic (ESASSI, R/V Hesperides, January 2008) – 21 days
[included 2 TAMU graduate students – ***Yina Liu*** and ***Julia O'Hern***]
Coastal US (GOMECC, R/V Ron Brown, July, 2007) – 28 days
[included 1 TAMU graduate student – ***Julia O'Hern***]
Bahamas: (RB-07-01-WBTS, R/V Ron Brown, March, 2007) – 20 days
[included 4 TAMU graduate students – ***Julia O'Hern***, ***Lindsey Visser***, ***Laura Rubiano Gomez*** and ***Jamie Steichen***]
Bahamas: (RB-06-02-WBTS, R/V Ron Brown, March, 2006) – 19 days
[included 1 TAMU graduate student – ***Julia O'Hern***]
South Atlantic:(A16S 2005, R/V Ron Brown, Jan.-Feb., 2005) – 44 days
Eq and NE Pacific: (PHASE-1, R/V Wecoma, May-July, 2004) – 41 days (**Co-Chief Sci.**)
North Atlantic:(A16N 2003, R/V Ron Brown, June-Aug., 2003) – 49 days
Southern Ocean: (ANARE V3, Aurora Australis, Oct-Dec, 2001) – 46 days
North Pacific: (RB-99-06, R/V Ron Brown, Sept-Oct, 1999) – 38 days
North Atlantic:(GasEx98, R/V Ron Brown, May-July, 1998) – 62 days (**Chief Sci.** - Leg 3)
Southern Ocean: (BLAST-3, RVIB Nathaniel B. Palmer, Feb.-Apr. 1996) – 46 days
Atlantic Ocean: (BLAST-2, R/V Polarstern, Oct.-Nov. 1994) – 34 days
Equatorial Pacific: (IGAC/MAGE, R/V John V. Vickers, Feb.-March 1992) – 33 days
Western Atlantic: (STACS, R/V Malcolm Baldridge, September 1991) – 13 days
South Atlantic:(RITS/CO_2, R/V Malcolm Baldridge, August 1991) – 24 days
Northeast Pacific: (PSI-3, R/V Discoverer, April 1991) – 16 days
Northeast Pacific: (CGC/RITS/CO_2, R/V Discoverer, Feb. 1991) – 15 days
Equatorial Pacific: (SAGA-3, R/V Akademik Korolev, Feb.- March 1990) – 28 days

<u>Field Opportunities Provided to Students in Addition to Above</u>
Gulf of Mexico (GISR, R/V Pelican, December 2012) – 20 days
[sent 2 TAMU graduate students – ***Alison Smyth*** and ***Jordan Young***]
Gulf of Mexico (MCH, R/V Pelican, August 2012) – 6 days
[sent 1 TAMU graduate student – ***Fenix Garcia Tigreros***]
Gulf of Mexico (GISR, R/V Pelican, July 2012) – 6 days
[sent 1 TAMU graduate student – ***Mengran Du***]
Gulf of Mexico (MCH, R/V Pelican, April 2012) – 6 days
[sent 1 TAMU graduate student - ***Fenix Garcia Tigreros***]
Gulf of Mexico (MCH, R/V Pelican, August 2011) – 6 days
[sent 1 TAMU graduate student - ***Fenix Garcia Tigreros***]
Gulf of Mexico (MCH, Blazing Seven, June 2011) – 4 days
[sent 1 TAMU graduate student - ***Fenix Garcia Tigreros***]
Gulf of Mexico (MCH, R/V Pelican, April 2011) – 6 days
[sent 1 TAMU graduate student - ***Fenix Garcia Tigreros***]
Gulf of Mexico (MCH, R/V Pelican, August 2010) – 6 days
[sent 1 TAMU graduate student - ***Fenix Garcia Tigreros***]
Gulf of Mexico (PLUMES, R/V Cape Hatteras, June 2010) – 13 days
[sent 2 TAMU graduate students – ***Lei Hu*** and ***Fenix Garcia Tigreros***]

<u>Peer-Reviewed Journal Publications (last 5 years)</u>

2013

Bianchi, T.S., F. Garcia-Tigreros[*], **S. A. Yvon-Lewis**, M. Shields[**], H. J. Mills, D. Butman, C. Osburn, P. Raymond, C. Shank, S. F. DiMarco, N. Walker, B. Reese, R. Mullins, A. Quigg, G. R. Aiken, and E. L. Grossman (2013), Enhanced transfer of terrestrially derived carbon to the atmosphere in a flooding event, *Geophys. Res. Lett*., vol. 40, 1–7, doi:10.1029/2012GL054145.

Hu[*], L., **S.A. Yvon-Lewis**, J.H. Butler, D.B. King, J. Lobert and S.A. Montzka (2013), An Improved Oceanic Budget for Methyl Chloride, *J. Geophys. Res*., VOL. 118, 1–11, doi:10.1029/2012JC008196.

Liu[*], Y., **S. A. Yvon-Lewis**, D.C.O. Thornton, L. Campbell and T.S. Bianchi (2013), Spatial Distribution of Brominted Very Short-Lived Substances in the Eastern Pacific, *J. Geophys. Res.*, 118, DOI 10.1002/jgrc.20183.

F. Ziska, B. Quack, K. Abrahamsson, S. D. Archer, E. Atlas, T. Bell, J. H. Butler, L. J. Carpenter, C. E. Jones, N. R. P. Harris, H. Hepach, K. G. Heumann, C. Hughes, J. Kuss, K. Krüger, P. Liss, R. M. Moore, A. Orlikowska, S. Raimund, C. E. Reeves, W. Reifenhäuser, A. D. Robinson, C. Schall, T. Tanhua, S. Tegtmeier, S. Turner, L. Wang, D. Wallace, J. Williams, H. Yamamoto, **S. Yvon-Lewis**, and Y. Yokouchi (2013), Global sea-to-air flux climatology for bromoform, dibromomethane and methyl iodide, *Atmos. Chem. Phys. Discuss.*, 13, 5601-5648, doi:10.5194/acpd-13-5601-2013.

2012

Hu[*], L., **S.A. Yvon-Lewis**, Y. Liu[*], T. S. Bianchi (2012), The Ocean in near Equilibrium with Atmospheric CH3Br, *Global Biogeochem. Cycles*, GB3016, doi:10.1029/2011GB004272.

Hu[*], L., **S.A. Yvon-Lewis**, J. D. Kessler and I.R. MacDonald (2012), Methane fluxes to the atmosphere from deep hydrocarbon seeps in the northern Gulf of Mexico, *J. Geophys. Res.*, 117, C01009, doi:10.1029/2011JC007208.

Mahajan, A.S., J. C. Gómez Martín, T. Hay, S.-J. Royer, **S. A. Yvon-Lewis**, Y. Liu[*], L. Hu[*], C. Prados-Roman, C. Ordóñez, J. M. C. Plane and A. Saiz-Lopez (2012), Latitudinal distribution of reactive iodine in the Eastern Pacific and its link to open ocean sources, *Atmos. Chem. Phys.,* 12, 11609-11617*,* doi:10.5194/acp-12-11609-2012.

2011

Kessler, J.D., D.L. Valentine, M.C. Redmond, M. Du[**], E.W. Chan[**], S.D. Mendes, E.W. Quiroz, C.J. Villanueva, S.S. Shusta, L.M. Werra, **S.A. Yvon-Lewis** and T.C. Weber (2011), A persistent oxygen anomaly reveals the fate of spilled methane in the deep Gulf of Mexico, *Science*, 331, DOI: 10.1126/science.1199697.

Liu[*], Y., **S.A. Yvon-Lewis**, L.Hu[*], J. Salisbury and J.E. O'Hern[**] (2011), $CHBr_3$, CH_2Br_2 and $CHClBr_2$ in the U.S. Coastal Waters during the Gulf of Mexico and East Coast Carbon (GOMECC) Cruise, *J. Geophys. Res.*, 116, C10004, doi:10.1029/2010JC006729.

Yvon-Lewis, S. A., L. Hu[*], and J. Kessler (2011), Methane flux to the atmosphere from the Deepwater Horizon oil disaster, *Geophys. Res. Lett*., 38, L01602, doi:10.1029/2010GL045928.

2010

Hu[*], L., **S.A**. **Yvon-Lewis**, Y. Liu[*], J. Salisbury and J.E. O'Hern[**] (2010), Coastal emissions of methyl bromide and methyl chloride along the eastern Gulf of Mexico and east coast of the U.S., *Global Biogeochem. Cycles*, 24, GB1007, doi:10.1029/2009GB003514.

Taylor[**], T.R.B., D.N. Ford, **S.A. Yvon-Lewis** and E. Lindquist (2010), Science, engineering, and technology in the policy process for natural systems risk mitigation, *System Dynamics Review*, in press.

Valentine, D.L., J.D. Kessler, M.C. Redmond, S.D. Mendes, M.B. Heintz, C. Farwell, L. Hu[*], F. Kinnaman, **S.A. Yvon-Lewis**, M. Du[**], E.W. Chan[**], F. Garcia Tigreros[*], C.J. Villanueva (2010), Propane respiration jump-starts microbial response to a deep oil spill, *Science*, 330, 208, DOI: 10.1126/science.1196830.

2009

Yvon-Lewis, S.A., E.S. Saltzman and S.A. Montzka (2009), Recent trends in atmospheric methyl bromide: analysis of post-Montreal Protocol variability, *Atmos. Chem. Phys.*, 9, 5963–5974.

Technical Reports/Book Chapters/Assessments

2007

Law, K.S., W.T. Sturges (Lead Authors), D.R. Blake, N.J. Blake, J.B. Burkholder, J.H. Butler, R.A. Cox, P.H. Haynes, M.K.W. Ko, K. Kreher, C. Mari, K. Pfeilsticker, J.M.C. Plane, R.J. Salawitch, C. Schiller, B.-M. Sinnhuber, R. von Glasow, N.J. Warwick, D.J. Wuebbles, **S.A. Yvon-Lewis** (2007), Halogenated Very Short-Lived Substances, Chapter 2 in *Scientific Assessment of Ozone Depletion 2006*, Global Ozone Research and Monitoring Project – Report No. 50, World Meteorological Organization, Geneva.

1998

Butler, J. H., J. W. Elkins, S. A. Montzka, T. M. Thompson, T. H. Swanson, A. D. Clarke, F. L. Moore, D. F. Hurst, P. A. Romashkin, **S. A. Yvon-Lewis**, J. M. Lobert, M. Dicorleto, G. S. Dutton, L. T. Lock, D. B. King, R. E. Dunn, E. A Ray, M. Pender, P. R. Wamsley, and C. M. Volk, 5. Nitrous Oxide and Halocompounds, in Climate Monitoring and Diagnostics Laboratory Summary Report No. 24, eds. D. J. Hofmann, J. T. Peterson, and R. M. Rosson, National Technical Information Services, Springfield, VA, 91-121, 1998.

1996

Lobert, J. M., J. H. Butler, L. S. Geller, **S. A. Yvon**, S. A. Montzka, R. C. Myers, A. D. Clarke, and J. W. Elkins, BLAST94: Bromine latitudinal air/sea transect 1994 - Report on oceanic measurements of methyl bromide and other compounds, NOAA Tech. Memorandum ERL CMDL-10, Climate Monitoring and Diagnostics Laboratory, Boulder, Colorado, 1996.

Elkins, J. W., J. H. Butler, T. M. Thompson, S. A. Montzka, R. C. Myers, J. M. Lobert, **S. A. Yvon**, P. R. Wamsley, F. L. Moore, D. F. Hurst, A. D. Clarke, T. H. Swanson, C. M. Volk, L. T. Lock, L. S. Geller, G. S. Dutton, R. M. Dunn, M. F. Dicorleto, T. J. Baring, and A. H. Hayden, 5. Nitrous Oxide and Halocompounds, in Climate Monitoring and Diagnostics Laboratory No. 23, eds. D. J. Hofmann, J.

T. Peterson, and R. M. Rosson, National Technical Information Services, Springfield, VA, 84-111, 1996.

1995

Butler, J. H., J. M. Lobert, **S. A. Yvon**, and L. S. Geller, The distribution and cycling of halogenated trace gases between the atmosphere and ocean, in The Expedition ANTARKTIS XII of RV "Polarstern" in 1994/95 Reports of Legs ANT XII/1 and 2, eds. G. Kattner and K. Fütterer. Ber. Polarforsch., 168, 27-39, 1995.

1993

Yvon, S. A. and E. S. Saltzman, A time-dependent photochemical box model for atmospheric chemistry (PBMAC), RSMAS Technical Report 93-008, Univ. of Miami, Miami, Florida, 78 pp., 1993.

CURRICULUM VITAE – RENYI ZHANG

EDUCATION

Ph.D., 1993, Atmospheric Chemistry, Department of Chemistry and Department of Earth, Atmospheric, and Planetary Sciences, MIT
M.S., 1989, Physics, University of Nevada-Reno
B.S., 1983, Atmospheric Science, Nanjing Institute of Meteorology

EXPERIENCE

Chair, Committee on Atmospheric Chemistry, American Meteorological Society, 2011 – present
Member, International Commission on Atmospheric Chemistry and Global Pollution (ICACGP), 2010 - present
Editor, Journal of Geophysical Research – Atmospheres, 2009 – present
Chang-Jiang Professorship, Peking University, 2009 - present
Director, Center for Atmospheric Chemistry and Environment, Texas A&M University, 2007 - present
Professor, Department of Chemistry, Texas A&M University, 2007 - present
Adjunct Professor, Nanjing University of Information Science and Technology, China, 2006 – present
Professor, Department of Atmospheric Sciences, Texas A&M University, 2005 – present
Associate Professor, Department of Atmospheric Sciences, Texas A&M University, 2002 - 2005
Assistant Professor, Department of Atmospheric Sciences, Texas A&M University, 1997 - 2002
Research Associate, 1996-1997, Department of Chemistry and Department of Earth, Atmospheric, and Planetary Sciences, MIT
Post Doctoral Research Associate, 1993-1996, Chemical Kinetics and Photochemistry Group, NASA Jet Propulsion Laboratory, California Institute of Technology

HONORS

University-Level Distinguished Achievement Award – Research, Texas A&M University and The Association of Former Students, 2012
Fellow, American Geophysical Union (AGU), 2012
Holder of Harold J. Haynes Endowed Chair in Geosciences, Texas A&M University, 2010
Cheung-Kong Distinguished Scholar Award, Ministry of Education - China, 2009
Bush Excellence Award for Faculty in International Research, Texas A&M University, 2009
Outstanding International Research Collaboration Award, China National Science Foundation, 2007
Honorary Professorship, Fudan University, China, 2007
Distinguished Achievement Award for Faculty Research, College of Geosciences, Texas A&M University, 2002
NASA New Investigator Award
Invited speaker in Atmospheric Chemistry Colloquium for Emerging Senior Scientists (ACCESS), Harvard University, 1993
NASA Graduate Fellowship, 1990 – 1993

PUBLICATIONS

* Denote leading or senior (corresponding) author for R. Zhang
[#] Denote current or past R. Zhang's graduate student co-author
Dr. Zhang has published 157 refereed journal papers, including 99 papers as the senior author (i.e., first or corresponding author and denoted by *) and 96 papers with his past/current graduate students as co-authors (denoted by [#]). His publications have received over 5000 literature citations with an h-index of 44 (from Web of Science)

Published Refereed Journal Papers (last 5 years)

(157)* Wang, Y., J. Fan, R. Zhang, L. R. Leung, C. Franklin, Improving Bulk Microphysics Parameterizations in Simulations of Aerosol Effects, *J*. *Geophys*. *Res*. **118**, doi:10.1029/2012JD018992 (2013).

(156) Tie, X., F. Geng, A. Guenther, J. Cao, J. Greenberg, R. Zhang, E. Apel, G. Li, A. Weinheimer, J. Chen, and C. Cai, Megacity impacts on regional ozone formation: observations and WRF-Chem modeling for the MIRAGE-Shanghai field campaign, *Atmos*. *Chem*. *Phys*. **13**, in press (2013).

(155) Wang, Z. B., M. Hu, D. L. Yue, L. Y. He, X. F. Huang, Q. Yang, J. Zheng, R. Zhang, and Y. H. Zhang, New particle formation in the presence of a strong biomass burning episode at a downwind rural site in PRD, China, *Tellus*, DOI: 10.3402/tellusb.v65i0.19965 (2013).

(154)* Clegg, S.L., C. Qiu, and R. Zhang, The Deliquescence Behaviour, Solubilities, and Densities of Aqueous Solutions of Five Methyl- and Ethyl-Aminium Sulphate Salts, *Atmos*. *Environ*. **73**, 1-14 (2013).

(153)* Khalizov, A. F., Y. Lin, C. Qiu, S. Guo, D. Collins, and R. Zhang, The role of OH-initiated oxidation of isoprene in aging of combustion soot, *Environ*. *Sci*. *Technol*. **47**, DOI: 10.1021/es3045339, 2254−2263 (2013).

(152)* Qiu, C., and **R. Zhang**, Multiphase Chemistry of Atmospheric Amines, *Phys*. *Chem*. *Chem*. *Phys*. **15**, DOI: 10.1039/C3CP43446J, 5738-5752 (2013).

(150)* Zheng, J., J.P. Garzón, M.E. Huertas, R. Zhang, M. Levy[#], Y. Ma, J.I. Huertas, R.T. Jardón, L.G. Ruíz, H. Tan, and L.T. Molina, Volatile Organic Compounds in Tijuana during the Cal-Mex 2010 Campaign: Measurements and Source Apportionment, *Atmos*. *Environ*. **70**, DOI: 10.1016/j.atmosenv.2012.11.030, 521-531 (2013).

(149)* Zheng, J., **R. Zhang**, J.P. Garzón, M.E. Huertas, M. Levy[#], Y. Ma, R. Torres-Jardón, L. G. Ruiz-Suárez, L. Russell, S. Takahama, H. Tan, G. Li[#], and L. T. Molina, Measurements of formaldehyde at the U.S. – Mexico border during the Cal-Mex 2010 Air Quality Study, *Atmos*. *Environ*. **70**, DOI: 10.1016/j.atmosenv.2012.09.041, 513-520 (2013).

(148) Takahama, S., A. Johnson, J. Guzman Morales, L.M. Russell, R. Duran, G. Rodriguez, J. Zheng, **R. Zhang**, D. Toom-Sauntry, W.R. Leaitch, Submicron organic aerosol in Tijuana, Mexico, from local and Southern California sources during the CalMex campaign, *Atmos*. *Environ*. **70**, DOI: 10.1016/j.atmosenv.2012.07.057, 500-512 (2013)

(147) Guo, S.[#], M. Hu, Q. Guo, X. Zhang, M. Zheng, J. Zheng, C.C. Chang, J.J. Schauer, and **R. Zhang**, Formation and Contribution of Biogenic and Anthropogenic Secondary Organic Aerosols in Beijing, *Environ*. *Sci*. *Technol*. **46**, 9846–9853 (2012).

(146)* Qiu, C.[#], A. Khalizov, and R. Zhang, Soot Aging from OH-Initiated Oxidation of Toluene, *Environ*. *Sci*. *Technol*. **46**, 9464−9472 (2012).

(145)* Lal, V.[#], A.K. Khalizov, Y. Lin[#], M. Galvan, B. Connell, **R. Zhang**, Heterogeneous Reactions of Epoxides in Acidic Media, *J*. *Phys*. *Chem*., **116** 6078-6090 (2012).

(144)* Xu, W.[#], and R. Zhang, A Theoretical Investigation of Interaction of Dicarboxylic Acids with Common Aerosol Nucleation Precursors, *J*. *Phys*. *Chem*. **116**, 4539-4550 (2012).

(143)* Khalizov, A. F., B. Hogan, C. Qiu[#], E. L. Petersen, and **R. Zhang**, Characterization of soot aerosol produced from combustion of propane in a shock tube, *Aerosol Sci*. *Technol*. **46**, 925–936 (2012).

(142)* Qiu, C.[#], and **R. Zhang**, Physiochemical Properties of Alkylaminium Sulfates: Hygroscopicity, Thermostability, and Density, *Environ*. *Sci*. *Technol*. **46**, 4474-4480 (2012).

(141)* **Zhang, R.**, A.F. Khalizov, L. Wang, M. Hu, W. Xu[#], Nucleation and growth of nanoparticles in the atmosphere, *Chem*. *Rev*. **112**, 1957-2011, DOI: 10.1021/cr2001756 (2012).

(140) Wang, Z.B.[#], M. Hu, D.L. Yue[#], J. Zheng, **R. Zhang**, A. Wiedensohler, Z.J. Wu, T. Nieminen, and M. Boy, Evaluation on the role of sulfuric acid in the mechanisms of new particle formation for Beijing case, *Atmos*. *Chem*. *Phys*. **11**, 12663–12671 (2011).

(139) He, L.-Y., X.-F. Huang, L. Xue, M. Hu, Y. Lin, J. Zheng, **R. Zhang**, and Y.-H. Zhang, Submicron aerosol analysis and organic source apportionment in an urban atmosphere in Pearl River Delta of China using high-resolution aerosol mass spectrometry, *J*. *Geophys*. *Res*. **116**, D12304, doi:10.1029/2010JD014566 (2011).

(138)* Wang, Y., Q. Wan, W. Meng, F. Liao, H. Tan, and **R. Zhang**, Long-term impacts of aerosols on precipitation and lightning over the Pearl River Delta megacity area in China, *Atmos*. *Chem*. *Phys*. **11**, 12421–12436 (2011).

(137) Zhang, H., D. Hu, J. Chen, X. Ye, S. Wang, J. M. Hao, L. Wang, R. Zhang, and Z. An, Particle Size Distribution and Polycyclic Aromatic Hydrocarbons Emissions from Agricultural Crop Residue Burning, *Environ*. *Sci*. *Technol*. **45**, 5477–5482 (2011).

(136) Yue, D.L.[#], M. Hu, **R. Zhang**, Z.J. Wu, H. Sue, Z.B. Wang[#], J.F. Peng, L.Y. He, X.F. Huang, Y.G. Gong, A. Wiedensohler, Potential contribution of new particle formation to cloud condensation nuclei in Beijing, *Atmos*. *Environ*. **45**, 6070-6077 (2011).

(135)* Wang, L., W. Xu[#], A.F. Khalizov, J. Zheng, Q. Qiu[#], and **R. Zhang**, Laboratory investigation on the role of organics in atmospheric nanoparticle growth, *J*. *Phys*. *Chem*. **115**, 8940–8947 (2011).

(134)* Zheng, J., M. Hu, R. Zhang, D. Yue[#], Z. Wang, S. Guo, X. Li, B. Bohn, M. Shao, L. He, X. Huang, A. Wiedensohler, and T. Zhu, Measurements of gaseous H_2SO_4 by AP-ID-CIMS during CAREBeijing 2008 Campaign, *Atmos*. *Chem*. *Phys*. **11**, 7755–7765 (2011).

(133)* Qiu, Q.[#], L. Wang, V. Lal[#], A.F. Khalizov, and **R. Zhang**, Heterogeneous Chemistry of Alkylamines on Ammonium Sulfate and Ammonium Bisulfate, *Environ*. *Sci*. *Technol*. **45**, 4748–4755 (2011).

(132) Huang, S., L.-Y. He, L. Xue, M. Hu, Y. Lin, R. Liu, J. Zheng, **R. Zhang**, Y. Zhang, X. Huang, Submicron aerosol analysis and organic source apportionment in an urban atmosphere in Pearl River Delta of China using high-resolution aerosol mass spectrometry, *J*. *Geophys*. *Res*. **116**, D12208, doi:10.1029/2010JD014933 (2011).

(131) Li, L., J. Chen, H. Chen, X. Yang, Y. Tang, **R. Zhang**, Monitoring optical properties of aerosols with cavity ring-down spectroscopy, *J*. *of Aerosol Sci*. **42**, 277–284 (2011).

(130) Zaveri, R.A., P.B. Voss, C.M. Berkowitz, E. Fortner, **R. Zhang**, R.J. Valente, D. Holcomb, T.A. Hartley, and L. Baran, Overnight transport and chemical processing of

photochemically aged Houston urban and petrochemical industrial plumes, *J*. *Geophys*. *Res*. **115**, doi:10.1029/2009JD013495, D23303 (2010).
(129) Du, H., L. Kong, T. Cheng, J. Chen, X. Yang, R. Zhang, Z. Han, Z. Yan, Y. Ma, Insights into Ammonium Particle-to-Gas Conversion: Non-sulfate Ammonium Coupling with Nitrate and Chloride, *Aerosol Air Qual*. *Res*. **10**, 589–595 (2010).
(128)* Wang, L., and **Zhang, R**., Book Review "Atmospheric Science for Environmental Scientists", *Bull*. *Amer*. *Meteor*. *Soc*. **91**, 1419-1420 (2010).
(127)* Zheng, J. A.F. Khalizov, L. Wang, and R. Zhang, Atmospheric pressure-ion drift chemical ionization mass spectrometry for detection of trace gas species, *Anal*. *Chem*. **82**, 7302–7308 (2010).
(126)* Khalizov, A.F., M. Cruz-Quinones[#], and **R. Zhang**, Heterogeneous reaction of NO_2 on fresh and coated soot surfaces, *J*. *Phys*. *Chem*. **114**, 7516–7524 (2010).
(125)* **Zhang, R**., Getting to the critical nucleus of aerosol formation, *Science* **328**, doi:10.1126/science.1189732, 1366-1367 (2010).
(124) Yue, D. L. [#], M. Hu, **R. Zhang**, Z.B. Wang[#], J. Zheng, Z.J. Wu, A. Wiedensohler, L.Y. He, X.F. Huang, and T. Zhu, The roles of sulfuric acid in new particle formation and growth in the mega-city of Beijing, *Atmos*. *Chem*. *Phys*. **10**, 4953–4960 (2010).
(123) Aiken, A. C., B. de Foy, C. Wiedinmyer, P. F. DeCarlo, I. M. Ulbrich, M. N. Wehrli, S. Szidat, A. S. H. Prevot, J. Noda, L. Wacker, R. Volkamer, E. Fortner[#], J. Wang, A. Laskin, V. Shutthanandan, J. Zheng, **R. Zhang**, G. Paredes-Miranda, W. P. Arnott, L. T. Molina, G. Sosa, X. Querol, and J. L. Jimenez, Mexico City aerosol analysis during MILAGRO using high resolution aerosol mass spectrometry at the urban supersite (T0) – Part 2: Analysis of the biomass burning contribution and the modern carbon fraction, *Atmos*. *Chem*. *Phys*. **10**, 5315–5341 (2010).
(122) Apel, E. C., L. K. Emmons, T. Karl, F. Flocke, A. J. Hills, S. Madronich, J. Lee-Taylor, A. Fried, P. Weibring, J. Walega, D. Richter, X. Tie, L. Mauldin, T. Campos, B. Sive, L. Kleinman, S. Springston, R. Zaveri, J. Ortega, P. Voss, D. Blake, A. Baker, C. Warneke, D. Welsh-Bon, J. de Gouw, J. Zheng, **R. Zhang**, J. Rudolph, W. Junkermann, and D. D. Riemer, Chemical evolution of volatile organic compounds in the outflow of the Mexico City Metropolitan area, *Atmos*. *Chem*. *Phys*. **10**, 2353–2376 (2010).
(121) Song, J., W. Lei[#], N. Bei, M. Zavala, B. de Foy, R. Volkamer, B. Cardenas, J. Zheng, **R. Zhang**, and L. T. Molina, Ozone response to emission changes: a modeling study during the MCMA-2006/MILAGRO campaign, *Atmos*. *Chem*. *Phys*. **10**, 3827–3846 (2010).
(120)* Wang, L., V. Lal[#], A.F. Khalizov, and **R. Zhang**, Heterogeneous Chemistry of Alkylamines with Sulfuric Acid: Implications for Atmospheric Formation of Alkylaminium Sulfates, *Environ*. *Sci*. *Technol*. **44**, doi:10.1021/es9036868, 2461–2465 (2010).
(119)* Wang, L., A.F. Khalizov, J. Zheng, W. Xu[#], V. Lal[#], Y. Ma, and **R. Zhang**, Atmospheric nanoparticles formed from heterogeneous reactions of organics, *Nature Geosci*. **3**, doi:10.1038/ngeo778, 238-242 (2010).
(118) Ye, X. T. Chen, D. Hu, X. Yang, J. Chen, **R. Zhang**, A.F. Khalizov, and L. Wang, A multifunctional HTDMA system with a robust temperature control, *Adv*. *Atmos*. *Sci*. **26**, 1235-1240 (2009).

(117)* **Zhang, R**., L. Wang, A. F. Khalizov, J. Zhao[#], J. Zheng, R. L. McGraw, and L. T. Molina, Formation of nanoparticles of blue haze enhanced by anthropogenic pollution, *Proc*. *Natl*. *Acad*. *Sci*. *USA*, **106**, doi:10.1073/pnas.0910125106, 17650-17654 (2009).

(116) Zhang, Y., M. K. Dubey, S. C. Olsen, J. Zheng, and **R. Zhang**, Comparisons of WRF/Chem simulations in Mexico City with ground-based RAMA measurements during the 2006-MILAGRO, *Atmos*. *Chem*. *Phys*. **9**, 3777-3798 (2009).

(115) Wang, M., T. Zhu, J. Zheng, **R. Zhang**, S.Q. Zhang, X.X. Xie, Y.Q. Han, and Y. Li, Use of a Mobile Laboratory to Evaluate Changes in On-road Air Pollutants during the Beijing 2008 Summer Olympics, *Atmos*. *Chem*. *Phys*. **9**, 8247–8263 (2009).

(114)* Xue, H.[#], A. F. Khalizov, L. Wang, J. Zheng, and **R. Zhang**, Effects of dicarboxylic acid coating on the optical properties of soot, *Phys*. *Chem*. *Chem*. *Phys*. **11**, 7865-7875, DOI:10.1039/b700001a (2009).

(113)* Li, G.[#], Y. Wang[#], K.-H. Lee[#], Y. Diao, and **R. Zhang**, The impacts of aerosols on development and precipitation of a mesoscale squall line, *J*. *Geophys*. *Res*. **114**, D17205, doi:10.1029/2008JD011581R (2009).

(112) Dusanter, S., D. Vimal, P. S. Stevens, R. Volkamer, L. T. Molina, A. Baker, S. Meinardi, D. R. Blake, P. Sheehy, A. Merten, **R. Zhang**, J. Zheng, E. C. Fortner, W. Junkermann, M. K. Dubey, T. Rahn, W. E. Eichinger, P. Lewandowski, J. Prueger, and H. Holder, Measurements of OH and HO_2 concentrations during the MCMA-2006 field campaign – Part 2: Model comparison and radical budget, *Atmos*. *Chem*. *Phys*. **9**, 6655-6675 (2009).

(111) Aiken, A. C., D. Salcedo, M. J. Cubison, J. A. Huffman, P. F. DeCarlo, I. M. Ulbrich, K. S. Docherty, D. Sueper, J. R. Kimmel, D. R. Worsnop, A. Trimborn, M. Northway, E. A. Stone, J. J. Schauer, R. Volkamer, E. Fortner[#], B. de Foy, J. Wang, A. Laskin, V. Shutthanandan, J. Zheng, **R. Zhang**, J. Gaffney, N. A. Marley, G. Paredes-Miranda, W. P. Arnott, L. T. Molina, G. Sosa, and J. L. Jimenez, Mexico City aerosol analysis during MILAGRO using high resolution aerosol mass spectrometry at the urban supersite (T0) – Part 1: Fine particle composition and organic source apportionment, *Atmos*. *Chem*. *Phys*. **9**, 6633–6653 (2009).

(110)* Xue, H. [#], A F. Khalizov, **R. Zhang**, Effects of coating of dicarboxylic acids on the mass-mobility relationship of soot particles, *Environ*. *Sci*. *Technol*. **43**, 2787–2792 (2009).

(109) Pagels, J., P.H. McMurry, A.F. Khalizov, and **R. Zhang**, Processing of soot by controlled sulphuric acid and water condensation—Mass and mobility relationship, *Aerosol Sci*. *Tech*. **43**, 629–640 (2009).

(108)* Khalizov, A. F., **R. Zhang**, D. Zhang[#], H. Xue[#], J. Pagels, and P.H. McMurry, Formation of highly hygroscopic aerosols upon internal mixing of airborne soot particles with sulfuric acid vapor, *J*. *Geophys*. *Res*. **114**, D05208, doi:10.1029/2008JD010595 (2009).

(107)* Khalizov, A. F., H. Xue[#], and **R. Zhang**, Enhanced light absorption and scattering by carbon soot aerosols internally mixed with sulfuric acid, *J*. *Phys*. *Chem*. **113**, 1066–1074 (2009).

(106)* Zhao, J.[#], A.F. Khalizov, **R. Zhang**, and R. McGraw, Hydrogen bonding interaction of molecular complexes and clusters of aerosol nucleation precursors, *J*. *Phys*. *Chem*. **113**, 680–689 (2009).

(105)* Fortner, E.C.[#], Zheng, J., **R. Zhang**, Berk Knighton, W., Volkamer, R. M., Sheehy, P., Molina, L., and André, M., Measurements of volatile organic compounds using proton transfer reaction mass spectrometry during the MCMA - 2006 campaign, *Atmos*. *Chem*. *Phys*. **9**, 467–481 (2009).

(104) Zhang, H., X. Ye, T. Cheng, J. Chen, X. Yang, L. Wang, and **R. Zhang**, A laboratory study of agricultural crop residue combustion in China: Emission factors and emission inventory, *Atmos*. *Environ*. **42**, 8432-8441 (2008).

(103)* Li, G.[#], Y. Wang[#], K.-H. Lee[#], Y. Diao, and **R. Zhang**, Increased winter precipitation over the North Pacific from 1984-1994 to 1995-2005 inferred from the global precipitation climatology project, *Geophys*. *Res*. *Lett*. **35**, L13821, doi: 10.1029/2008GL034668 (2008).

(102)* **Zhang, R.**, A.F. Khalizov, J. Pagels, D. Zhang[#], H. Xue[#], and P.H. McMurry, Variability in morphology, hygroscopic and optical properties of soot aerosols during internal mixing in the atmosphere, *Proc*. *Natl*. *Acad*. *Sci*. *USA* **105**, 10291–10296 (2008).

(101)* Zheng, J., **R. Zhang**, E. C. Fortner[#], R. M. Volkamer, L. Molina, A. C. Aiken, J. L. Jimenez, K. Gaeggeler, J. Dommen, S. Dusanter, P.S. Stevens, X. Tie, Measurements of HNO_3 and N_2O_5 using ion drift - chemical ionization mass spectrometry during the MCMA - 2006 campaign, *Atmos*. *Chem*. *Phys*. **8**, 6823–6838 (2008).

(100)* Fan, J.[#], and **R. Zhang**, Density functional theory study on OH-initiated atmospheric oxidation of m-xylene, *J*. *Phys*. *Chem*. *A* **112**, 4314-4323 (2008).

(99)* Li, G.[#], Y. Wang[#], and **R. Zhang**, Implementation of a two-moment bulk microphysics scheme to the WRF model to investigate aerosol-cloud interaction, *J*. *Geophys*. *Res*. **113**, D15211, doi:10.1029/2007JD009361 (2008).

(98)* Fan, F.[#], **R. Zhang**, W.-K. Tao, and K. Mohr, Effects of aerosol optical properties on deep convective clouds and radiative forcing, *J*. *Geophys*. *Res*. **113**, D08209, doi:10.1029/2007JD009257 (2008).

(97) Heald, C. L., A. H. Goldstein, J. D. Allan, A. C. Aiken, E. Apel, E. L. Atlas, A. K. Baker, T. S. Bates, A. J. Beyersdorf, D. R. Blake, T. Campos, H. Coe, J. D. Crounse, P. F. DeCarlo, J. A. de Gouw, E. J. Dunlea, F. M. Flocke, A. Fried, P. Goldan, R. J. Griffin, S. C. Herndon, J. S. Holloway, R. Holzinger, J. L. Jimenez, W. Junkermann, W. C. Kuster, A. C. Lewis, S. Meinardi, D. B. Millet, T. Onasch, A. Polidori, P. K. Quinn, D. D. Riemer, J. M. Roberts, D. Salcedo, B. Sive, A. L. Swanson, R. Talbot, C. Warneke, R. J. Weber, P. Weibring, P. O. Wennberg, A. E. Wittig, **R. Zhang**, J. Zheng, and W. Zheng, Total observed organic carbon (TOOC): A synthesis of North American observations, *Atmos*. *Chem*. *Phys*. **8**, 2007-2025 (2008).

(96) Yuan, T., Z. Li, **R. Zhang**, and J. Fan[#], Increase of cloud droplet size with aerosol optical depth: An observation and modeling study, *J*. *Geophys*. *Res*. **113**, D04201, doi:10.1029/2007JD008632 (2008).

(95)* Zhao, J.[#], and **R. Zhang**, A theoretical investigation of nitrooxyalkyl peroxy radicals from NO_3-initiated oxidation of isoprene, *Atmos*. *Environ*. **42**, 5849–5858 (2008).

(94)* Zhao, J.[#], and **R. Zhang**, Theoretical investigation of atmospheric oxidation of biogenic hydrocarbons: A critical review, *Adv*. *Quantum Chem*. **55**, 177-213 (2008).

(93) McGraw, R., and **R. Zhang**, Multivariate analysis of homogeneous nucleation rate measurements: I. Nucleation in the p-toluic acid/sulfuric acid/water system, *J*. *Chem*. *Phys*. **128**, 064508, DOI:10.1063/1.2830030 (2008).

Statistics of Renyi Zhang's Publications**

Journal	*Impact Factor*	*# of Published Papers*
Chemical Reviews	40.197	1
Science	31.201	3

Nature Geoscience	11.754	1
Journal of the American Chemical Society	9.907	5
Proceedings of National Academy of Science USA	9.681	5
Bulletin of the American Meteorological Society	6.026	1
Analytical Chemistry	5.856	2
Atmospheric Chemistry and Physics	5.520	14
Environmental Science & Technology	5.228	11
Tellus	4.382	2
Geophysical Research Letters	3.792	10
Physical Chemistry Chemical Physics	3.573	3
Atmospheric Environment	3.465	9
Journal of Chemical Physics	3.333	7
Journal of Geophysical Research	3.021	29
Journal of Physical Chemistry	2.946	25
Aerosol and Air Quality Research	2.827	1
Aerosol Science & Technology	2.667	2
Journal of the Atmospheric Sciences	2.555	1
Environmental Chemistry	2.570	1
International Journal of Mass Spectrometry	2.549	1
Journal of Aerosol Science	2.447	1
Journal of Photochemistry and Photobiology	2.421	1
Chemical Physics Letters	2.337	9
Advances in Quantum Chemistry	2.275	1
Journal of Applied Meteorology	1.799	2
Review of Scientific Instruments	1.367	1
Journal of Atmospheric Chemistry	0.985	1
Advances in Atmospheric Sciences	0.987	2

** 2011 Impact factor from Thomson Scientific (ISI) Journal Citation Reports.

Thesis/Dissertation

(2) **Zhang, R.**, "*Laboratory Investigations of Heterogeneous Chemistry Important to Ozone Depletion in the Stratosphere*", Ph.D. dissertation, 267 pp., Massachusetts Institute of Technology, 1993.

(1) **Zhang, R.**, "*A Numerical Study of Aerosol Scavenging by Ice Crystals*", M.S. thesis, 93 pp., University of Nevada – Reno, 1989.

Contributions to Books, Chapters, and Magazines

(3) **Zhang, R.,** People may be changing the weather to make stormy skies, *National Geographic-Explorer*, pp. 10-15, September 2007.

(2) **Zhang, R.**, Organic acids in new particle formation and acid-catalyzed reactions of carbonyls, in *Report Series in Aerosol Science*, No. 80, edited by M. Kulmala and T. Petaja, pp. 97-102, Helsinki, Finland, 2006.

(1) **Zhang, R.**, and R.L. Pitter, Effect of internal charge distribution in ice crystals on scavenging of aerosol particles, In *Precipitation Scavenging and Atmospheric-Surface Exchange*, edited by S.E. Schwartz and W.G.N. Slinn, Hemisphere Publishing Corp., pp. 97-108, 1992.

Patents

(1) "*Ion Drift - Chemical Ionization Mass Spectrometry*", **R. Zhang**, Texas A&M University, US Patent NO. 7,375,317, May 20, 2008.

FUNDED PROJECTS (LAST 5 YEARS)

(52) *Enhancing Teaching and Research in Health Impacts of Air Pollution - The Tier One Program (TOP)*, $300,000, 4/1/2013 – 3/31/2016, TAMU, PI

(51) *Implementation of particle size magnification for analysis of sub-4 nm nanoparticles*, $22,271, 7/1/2012 – 7/15/2013, Texas Air Research Center (TARC), co-PI with Alexei Khalizov

(50) *Investigation of Aerosol-Cloud-Climate Interaction in China*, ¥1,000,000, Ministry of Science and Technology – China, 9/12 – 8/17, PI

(49) *2013 AMS Robert A. Duce Symposium*, $10,000, 10/1/2012 – 5/31/2013, National Science Foundation (NSF), PI,

(48) *Formation Mechanism and Spectral Properties of Light-Absorbing Secondary Organic Aerosols*, $100,000, Texas A&M – Weizmann Collaborative Program, 9/1/2012 – 8/31/2014, PI

(47) *Analysis of Particulate Matter Chemistry*, $150,000, 1/2013 – 10/2014, Texas Environmental Research Consortium/Houston Advanced Research Center, PI

(46) *2011 International Year of Chemistry (IYC) Symposium on Stratospheric Ozone and Climate Change; Washington, DC; November 7-10*, 2011, $25,000, National Science Foundation (NSF), PI

(44) *2011 International Year of Chemistry (IYC) Symposium on Stratospheric Ozone and Climate Change; Washington, DC; November 7-10*, 2011, $49,130, National Aeronautics and Space Administration (NASA), PI

(44) *2011 International Year of Chemistry (IYC) Symposium on Stratospheric Ozone and Climate Change; Washington, DC; November 7-10*, 2011, $20,000, Department of Energy (DOE), PI

(43) *2011 International Year of Chemistry (IYC) Symposium on Stratospheric Ozone and Climate Change; Washington, DC; November 7-10*, 2011, $10,000, United Nation World Meteorological Organization (UN-WMO), PI

(42) *Collaborative Research: Characterization of Sources and Processes of Primary and Secondary Particulate Matter (PM) and Precursor Gases in the California-Mexico Border Region*, $200,000, National Science Foundation (NSF), 4/1/2010 – 3/31/3012, PI

(41) *Aerosol Growth and Chemical Compositions from Heterogeneous Processing of Organic Compounds*, $597,358, National Science Foundation (NSF), 1/10 – 12/13, PI

(40) *Impact of US-Mexico border transport of ozone and its precursors on attainment of the proposed 2010 NAAQS*, $25,000, Texas A&M University-CONACyT - Collaborative Research Grant Program, 5/2010 – 4/2011, PI

(39) *Generation, Characterization, and Atmospheric Aging of Soot Particles from Diesel Combustion*, $330,000, National Science Foundation (NSF), 9/2009 – 8/2013, PI

(38) *Investigation of Cloud and Precipitation Processes Using WRF with A Two-Moment Microphysics: Contribution to the DOE Climate Change Prediction Program (CCPP)*

project, $100,000, Brookhaven National Laboratory (BNL) Department of Energy (DOE), 9/09 – 8/2013, PI

(37) *Chemical Kinetics and Mechanism of Hydrocarbon Oxidation Reactions*, $200,000, 5/2010 – 4/2013, The Welch Foundation, PI

(36) *Formation, transformation, and properties of atmospheric aerosols and their impacts on multiphase processes and climate*, ¥2,400,000, Peking University/Ministry of Education – China, 9/2009 – 8/2012, PI

(35) *On-line chemical analysis of ambient organic aerosols*, $38,000, Texas Air Research Center, 10/1/09 – 9/30/10, co-PI with A. Khalizov

(34) *Investigation of the Effects of the Asian Pollution Outflow on Winter Storms over the North Pacific*, $90,000, NASA, 9/2009 – 8/2012, PI

(33) *Investigation of impacts of aerosols on thunderstorms and lightning over summertime city clusters in China*, ¥200,000, 12/2009 – 1/2011, Institute of tropical and marine meteorology/State Meteorological Administration, China, PI

(32) *Surface-induced Oxidation of Organics in the Troposphere (SOOT)*, $576,000, 3/2008 – 12/2009, Texas Environmental Research Consortium/Houston Advanced Research Center, PI

(31) *Investigation of urban and regional aerosol formation and transformation in China and associated climate effects*, ¥400,000, 7/2007 – 6/2010, China National Science Foundation, PI

(30) *An integrated experimental and modeling study for improving mercury chemical mechanism in atmospheric mercury models*, $93,000, 10/2007 – 12/2009, Texas Air Research Center (TARC), co-PI with A. Khalizov

(29) *Chemical Kinetics and Mechanism of Hydrocarbon Oxidation Reactions*, $180,000, 5/2007 – 4/2010, The Welch Foundation, PI

(28) *Improving the chemical mechanism of aromatic hydrocarbons in photochemical modeling*, 1/1/06 – 12/31/07, $95,000, Texas Air Research Center, PI

(27) *Measurements of NO_3 using cavity cavity-ring down during TexASQ II*, 11/01 – 9/03, Texas Air Research Center, 1/1/06 – 12/31/07, $82000, co-PI with S. North

(26) *Ground-based Measurements of Volatile Organic Compounds (VOCs) and Nitrogen Reservoir Species during TexAQS II – 2006*, 6/1/06 – 8/31/07, $211,500, Texas Commission on Environmental Quality, PI

(25) *Field Measurements of Gaseous Inorganic and Organic Compounds during TexASQ II – 2006*, EPA, 9/1/07 – 8/31/10, $47,142, US Environmental Protection Agency, PI

(24) *Laboratory Investigation of Mixing States and Optical and Physical Properties of Soot-Containing Aerosols*, 9/1/06 – 8/31/09, $278,740, Department of Energy - National Institute for Climate Change Research, PI

RECENT INVITED PRESENTATIONS, LECTURES, AND CONFERENCES / SESSIONS CHAIRED

Invited speaker, The First Sino-European School on Atmospheric Chemistry (SESAC), China, May 2013

Invited speaker, Penn State Chemistry Colloquium, The Pennsylvania State University, November 2012

Session Chair, Sino-European Symposium on Environment and Health, National University of

Ireland - Galway, Ireland, August 2012
Invited speaker, AOGS – AGU (WPGM) Joint Assembly, Singapore, August, 2012
Invited seminar speaker, College of Environmental Sciences and Engineering, Tsinghua University, Singapore, August 2012
Invited seminar speaker, Institute of Earth Environment, Chinese Academy of Sciences, China, July 2012
Invited seminar speaker, College of Environmental Sciences and Engineering, Nanjing University of Information Science & Technology, China, July 2012
Invited speaker, CLOUD-ITN Conference, Frankfurt, Germany, May 2012
Invited seminar speaker, Department of Atmospheric and Oceanic Science, University of Maryland, February 2012
Chair, 15th Conference on Atmospheric Chemistry, American Meteorological Society, New Orleans, LA, January 2012
Chair, Fourth Symposium on Aerosol-Cloud-Climate Interactions, American Meteorological Society, New Orleans, LA, January 2012
AGU Fall Meeting Seminar "A Good Scientific Paper: 101", AGU Fall Meeting, San Francisco, December 2011 (http://www.youtube.com/watch?v=AiHyMh0U6rA&feature=youtu.be/)
Invited seminar speaker, Department of Chemistry, Texas Tech University, November 2011
Chair, 2011 International Year of Chemistry (IYC) Symposium on Stratospheric Ozone and Climate Change, Washington, DC, November 7–10, 2011 (http://2011-iyc-o3.org/)
Co-chair, oversea distinguished experts session, 6th National Conference on Environmental Chemistry, Shanghai, China, September 2011
Invited speaker, Session of Air-Surface Interactions: Chemistry from Molecular to Global Climate Scales, 242nd ACS National Meeting, Boulder, Colorado, July 2011
Invited seminar speaker, Division of Atmospheric Science & Global Change, Pacific Northwest National Laboratory, April 2011
AGU Fall Meeting Seminar "A Good Scientific Paper: 101", AGU Fall Meeting, San Francisco, December 2010
Invited seminar speaker, the Berkeley Atmospheric Sciences Center, University of California - Berkeley, November 2010
Chair, Symposium "Atmospheric Chemistry and Air Quality in Texas: Challenges and Opportunities", Annenberg Presidential Center, Texas A&M University, April, 2010
Invited presentation, the changing climate and environment in CHINA, Workshop for the Fulbright-Hays China Seminar, College Station, TX, April, 2010
Session Chair, Aerosol, Cloud, and Climate, Joint Meeting between the 2nd Symposium on Aerosol-Cloud-Climate Interactions and the 12th Conference on Atmospheric Chemistry, AMS Meeting, Atlanta, GA, February 2010
Session Chair, Study of Houston Atmospheric Radical Precursors (SHARP), 12th Conference on Atmospheric Chemistry, AMS Meeting, Atlanta, GA, February 2010
Invited presentation, special session on Aerosols and Climate in Asia, AGU Fall Meeting, San Francisco, December 2009
Invited presentation, special symposium on Atmospheric Aerosol Nucleation and Growth: Molecular Clusters to Nanoparticles and Climate, AAAR annual meeting, Minneapolis, Minnesota, October 2009
Invited presentation, session on Characterization of Air Pollution and Its Interactions With Weather and Climate in East Asia before, during, and after the 2008 Beijing Olympic

Games, AGU Spring Meeting/Joint Assembly, Toronto, CANADA, May 2008

Invited presentation, session on Chemical Transformations of Organic Compounds in Aerosol and Clouds: Organosulfates and Oligomerization, the AGU Spring Meeting/Joint Assembly, Toronto, CANADA, May 2008

Invited speaker, the 11th International Conference on Atmospheric Science and Applications to Air Quality, Jinan, China, April, 2009

Session chair, Urban and local scale air quality modeling, the 11th International Conference on Atmospheric Science and Applications to Air Quality, Jinan, China, April 2009

Invited seminar speaker, College of Environmental Sciences, Peking University, April 2009

Session chair, Aerosol, climate, and biogeochemical cycles, 11th Conference on Atmospheric Chemistry, AMS Meeting, Phoenix, AZ, January 2009.

Session Chair, Impact of aerosols on convection and weather, AMS Meeting, Phoenix, AZ, January, 2009

Invited keynote speaker, Symposium on Aerosol–Cloud–Climate Interactions, AMS Meeting, Phoenix, AZ, January, 2009

Invited seminar speaker, Hong Kong Polytechnic University, November, 2008

Invited seminar speaker, Institute of Tropical and Marine Meteorology, Guangzhou, China, November, 2008

Invited seminar speaker, Division of Atmospheric Chemistry, National Center for Atmospheric Research, October 2008

Invited colloquium speaker, Department of Chemistry and Biochemistry, Baylor University, September 2008

Invited seminar speaker, College of Environmental Sciences, Peking University, August 2008

Invited lecturer, Spring School for Atmospheric Chemistry of 2008, Shanghai, China, April, 2008

Session chair, Air quality and climate change, 10th Conference on Atmospheric Chemistry, AMS Meeting, New Orleans, LA, February 2008

RECENT DEPARTMENT AND UNIVERSITY SERVICE

Member, Tenure & Promotion Committee, College of Geosciences, 2008-2010

Co-Chair, Committee on Joint Faculty Appointment, Department of Atmospheric Sciences, 2006

Chair, Qualifying Exam Committee, Department of Atmospheric Sciences, 2005-2007

Co-Chair, Search Committee for Senior and Junior Atmospheric Chemistry Positions, Department of Atmospheric Sciences, 2004

Chair, Geosciences Faculty Advisory Committee (GFAC), College of Geosciences, 2003-2005

Chair, Selection Committee, Dean's Distinguished Achievement Awards, College of Geosciences, 2003

Member, Geosciences Faculty Advisory Committee (GFAC), College of Geosciences, 2002-2003

Member, Graduate Committee, Department of Atmospheric Sciences, 1998 - present

Chair, Science/Geosciences/Architecture disciplinary committee, TAMU International Research Travel Assistance Grants (IRTAG) and International Curriculum Development Grants (ICDG), 2001

Member, Review Panel, Texas A&M International Travel Assistance Grant, 1999, 2000

Member, Search for the manager of Laboratory for Molecular Simulation, Department of Chemistry, 2000

Member, Search Committee for the faculty member in Atmospheric Chemistry, Department of Atmospheric Sciences, 1999

Member, Facilities Committee, Department of Atmospheric Sciences, 1997-1998

PROFESSIONAL SERVICE

Journal Reviewer for (1) *Nature*, (2) *Science*, (3) *Nature – Geoscience*, *(4) Proceedings of National Academy of Science USA*, (5) *Journal of the American Chemical Society*, (6) *Analytical Chemistry*, (7) *Chemical Society Reviews*, (8) *Angewandte Chemie-International Edition*, (9) *Environmental Science & Technology*, (10) *Atmospheric Chemistry and Physics*, (11) *Atmospheric Environment*, (12) *Journal of Physical Chemistry*, (13) *Journal of Geophysical Research - Atmospheres*, (14) *Geophysical Research Letters*, (15) *Journal of Chemical Physics*, (16) *Physical Chemistry Chemical Physics*, (17) *Chemical Physics Letters*, (18) *Atmospheric Measurement Techniques*, (19) *Environmental Science and Pollution Research*, (20) *International Journal of Environmental Pollution*, (21) *International Journal of Chemical Kinetics*, (22) *International Journal of Environmental Chemistry*, (23) *International Journal of Environmental Analytical Chemistry*, (24) *International Journal of Molecular Structures*, (25) *International Journal of Molecular Sciences*, (26) *Journal of Atmospheric Chemistry*, (27) *Journal of Atmospheric and Oceanic Technology*, (28) *Journal of Atmospheric and Solar-Terrestrial Physics*, (29) *Aquatic Geochemistry*, (30) *Journal of Environmental Sciences*, (31) *Chemical Physics*, (32) *Journal of Hazardous Materials*, (33) *Journal of Molecular Structure: THEOCHEM*, (34) *Journal of Mass Spectrometry*, (35) *GeoJournal*, (36) *Air Quality, Atmosphere and Health*, (37) *Advances in Atmospheric Sciences*, (38) *Advances in Meteorology*, (39) *Entropy*, (40) *Aerosol Science & Technology*, (41) *Advances in Quantum Chemistry*, (42) *Science in China*, (43) *Theoretical Chemistry Accounts*, (44) *Weather and Forecast*, (45) *Analytica Chimica Acta*, (46) *Science of the Total Environment*, (47) *ChemPhyChem*, (48) *Physics Letters A*, (49) *Acta Chimica Sinica*, (50) *Earth and Planetary Science Letters*, (51) *Physics Letters A*, (52) *Stochastic Environmental Research and Risk Assessment*

Top reviewer, the *Journal of Physical Chemistry* (2006, 2009)

Exceptional Reviewer, *Nature* (2011)

Book reviewer for Academic Press

Reviewer for National Academies and National Research Council (NRC) Report "*Challenges in Characterizing Small Particles - Exploring Particles from the Nano- to Microscales*" (2011)

Proposal Reviewer for (1) NSF, (2) NASA, (3) DOE, (4) Natural Environmental Research Council (NERC) United Kingdom, (5) American Chemical Society (ACS) PRF Fund, (6) International Science and Technology Center/US Department of State, (7) the Netherlands Organisation for Scientific Research (NWO, the Dutch research council), (8) Austrian Science Fund (FWF), (9) The Deutsche Forschungsgemeinschaft (German Research Foundation), (10) Review Panel, Research Competitiveness Program, Science and Policy Programs, American Association for the Advancement of Science (AAAS), (11) Site Review Panel, Environmental Molecular Sciences Laboratory/Department of Energy (EMSL/DOE), (12) The Sino-German Center for Research Promotion, (13) Ministry of Education, Greece, (14) Review Panel, Atmospheric System Research

Program/Department of Energy (ASR/DOE), (15) National Science Foundation – China, (16) NASA MAP Review Panel, (17) NOAA, (18) NSF Chemistry Division, ECS Review Panel, (19) The Danish Council for Independent Research/Natural Sciences, (20) Swiss National Science Foundation

Tenure/Promotion dossier review for Rice University, The Pennsylvania State University, North Carolina State University, Rutgers University, University of Nevada – Reno, York University, University of Houston, Macalester College, Brookhaven National Laboratory, Pacific Northwest National Laboratory

SELECTED PRESS RELEASES, NEWS STORYS, TV/RADIO INTERVIEWS

A news story "David Blaine's Electrical Stunt Could Create Harmful Ozone", *Scientific American*, (http://www.scientificamerican.com/article.cfm?id=david-blaines-electrical), October 15, 2012

A news story "Four-day Symposium on Stratospheric Ozone and Climate Change", *United Nations Environment Programme*, (http://www.unep.org/ozonaction/virtualtour-new/TheBlog/tabid/56184/EntryId/50283/Four-day-Symposium-on-Stratospheric-Ozone-and-Climate-Change.aspx), November, 2011

A news story "American Chemical Society President speaks at 2011 Symposium on Stratospheric Ozone and Climate Change", *American Chemical Society*, (http://portal.acs.org:80/portal/acs/corg/content?_nfpb=true&_pageLabel=PP_ARTICLEMAIN&node_id=222&content_id=CNBP_028608&use_sec=true&sec_url_var=region1&__uuid=825480db-13cc-47d4-a976-0cac99bed3a0), November, 2011

A news story "Symposium features efforts for clean air", The Eagle – Byran/College Station, TX (http://www.theeagle.com/local/Symposium-features-efforts-for-clean-air--6761058), November, 2011

A news story "Students, faculty address climate issues with politicians in D.C.", *The Battalion,* (http://www.thebatt.com/students-faculty-address-climate-issues-with-politicians-in-d-c-1.2695117)", November, 2011

TAMU Press Release "Research Is Getting Closer To Understanding Critical Nucleus in Haze Formation" (http://tamunews.tamu.edu/2010/06/14/research-is-getting-closer-to-understanding-critical-nucleus-in-haze-formation/), June 14, 2010

A news story "Houston may hurt area's air quality" (http://www.theeagle.com/am/Houston-may-hurt-area-s-air-quality) in the Eagle/Bryan-College Station, April 25, 2010

TAMU Press Release "Earth Day Symposium To Address Texas Air Quality" (http://tamunews.tamu.edu/2010/04/21/earth-day-symposium-to-address-texas-air-quality), April 21, 2010

TAMU Press Release "Atmospheric Nanoparticles Impact Health, Weather Prof Says" (http://tamunews.tamu.edu/2010/02/28/atmospheric-nanoparticles-impact-health-weather-prof-says/), March 1, 2010

TAMU Press Release "Man-Made Activities Affect Blue Haze" (http://dmc-news.tamu.edu/templates/?a=8085&z=15), October 2009

TAMU main web site "Faculty Focus" (http://dmc-news.tamu.edu/templates/?a=7651&z=17), May 2009

AGU journal highlight "Airborne acid may help soot turn into cloud seeds " (http://www.agu.org/cgi-bin/highlights/highlights.cgi?action=show&doi=10.1029/2008JD010595&jc=jd), March 25, 2009

Participation in filming and interview for a documentary on lightning for the Discovery Channel, November, 2008

A news story "A&M studies Beijing's air" in The Eagle/Bryan-College Station (front page), August 16, 2008

TAMU Podcast "Olympic Inside: Air Quality in China" (http://itunes.tamu.edu/), August, 2008
TAMU Press Release "Researcher studying Beijing air quality" (http://dmc-news.tamu.edu/templates/?a=6487&z=15), August 12, 2008
An article "What's black and dirty and messing with the climate?" in *The Christian Science Monitor* (http://features.csmonitor.com/innovation/2008/08/05/what%e2%80%99s-black-and-dirty-and-messing-with-the-climate/), August 5, 2008
An article "Acid soot' worsens smog", *Chemistry World*, Royal Society Chemistry, Cambridge, *V* 5(9), p. 11, September, 2008
A news story "Scientists find soot has an even darker side" in *Houston Chronicle* (front page), July 28, 2009
TAMU Press Release "Soot Problems Affecting World's Weather, Health" (http://tamunews.tamu.edu/archives/article.php?articleid=6415&month=7&year=2008), July, 2008
An article "Blowing in the wind" in *Discovery*, pp. 38-39, June 2007
A news story "Huge dust plumes from China cause changes in climate" in the *Wall Street Journal*, June 20, 2007
An article "Asian pollution affects our weather" in *L.A. Times* (front page), March 6, 2007
An article "Clouds, Made in China" in *Science*NOW Daily News (http://sciencenow.sciencemag.org/cgi/content/full/2007/306/1), March 6, 2007
An article "Another Asian export: Stronger Pacific storms" in *Scientific American* (http://www.sciam.com/article.cfm?articleID=244CB58C-E7F2-99DF-3879FBAE72A8C584), March 5, 2007
An article "Western US's stronger storms traced to Asia pollution" in *The Christian Science Monitor* (http://www.csmonitor.com/2007/0312/p02s01-sten.html), March 12, 2007
An article "Scientists say Asia's soot causing weather imbalance" in *Houston Chronicle*, March 6, 2007
An article "Asia pollution changing world's weather, Scientists say" in *National Geographic News* (http://news.nationalgeographic.com/news/2007/03/070306-pollution-storms.html)
A news story "Global impact of Asia's Pollution" on *BBC News* (http://news.bbc.co.uk/1/hi/sci/tech/6421303.stm), March 6, 2007
An article "Pollution tied to big rainstorms" in *San Francisco Chronicle* (http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2007/03/06/BAGCQOG69O1.DTL&type=science), March 6, 2007
A news story "Asian Pollution affect Pacific storms" in *USA Today, Fox News, ABC News, CBS News*, and others, March 7, 2007
An article "India, China polluting US weather" in *Hindustan Times*, India, March 7, 2007
A news story "Pollution in Asia triggers intense Pacific storms" by *Xinhua News Agency*, China, March 6, 2007
An article "Asian air pollution generates stronger storms over Pacific" in *USA Today* (http://www.usatoday.com/weather/research/2007-03-05-asian-pollution_N.htm), March 6, 2007
An article "Asia smog fuelling Pacific storms 'will melt Arctic ice'" in *Guardian* (http://www.guardian.co.uk/environment/2007/mar/06/climatechange.climatechange), March 6, 2007
An article "Is Asia's bad air stirring storms in West?" in *Seattle Times*, March 6, 2007
An article "China's dirty air threatens darker days for Northwest" in *Oregonian*, March 6, 2007

A news story "Asian pollution affects weather over Pacific" on *Voice of America* (VOA) (http://www.voanews.com/english/archive/2007-03/2007-03-15-voa20.cfm), March 15, 2007
Interview on the effects of Asian pollution with *NBC Nightly News, Canadian Broadcasting Corporation (CBC), KCBS* (San Francisco), *NPR*, and others, March 2007
TAMU Press Release "Study Proves Pollution from China And India Affecting World's Weather"(http://tamunews.tamu.edu/archives/article.php?articleid=4295&month=3&year=2007), March 2007
A highlight article "Atmosphere, a chemical reactor - Formation pathways of secondary organic aerosols" featured by *Angewandte Chemie-International Edition* (2006 Impact Factor of 10.232), V. 44, pp. 1444-1446, February 25, 2005
A news article "Car and coal emissions interact" featured in *Chemical & Engineering News*, V82, p. 10, June 7, 2004
A news article "Aerosol story gets new angle" featured in *Chemistry World* (Royal Society of Chemistry), V1, No. 7, July 2004
A news article "Aerosols form in a cocktail of smoke and fumes" in issue 2451 of the *New Scientist Magazine*, p. 17, June 12, 2004
An article "Research finds city's air cleaner at night" in *Houston Chronicle*, April 13, 2003
A news story "Sun deemed variable in ozone levels" in *New York Times*, *L.A. Times*, and others, April 13, 2004
Interview with *National Geographic* for a television series on lightning and chemistry, May 2003
A WTOP News Story (a Washington D.C. based CBS affiliated radio station), May 2003
A documentary video produced by NASA TV (http://tv.gsfc.nasa.gov/G03-023_earth.htm), March 2003
Nowcast "Lightning has big effect on atmospheric chemistry" in the *Bulletin of American Meteorological Society* (BAMS), V. 84, pp. 744-745, June 2007
NASA Press Release "Surprise! Lightning has big effect on atmospheric chemistry" (http://www.gsfc.nasa.gov/topstory/2003/0312pollution.html), March 2003
An Osgood File story with the CBS Radio Network, June 2002
News Scan "Bright sky, dirty city?", *Scientific American*, p. 19, May 2001

CURRENT AND FORMER STUDENTS' INFORMATION AT TEXAS A&M

Current Ph.D. Graduate Students

(1) Chair, Wen Xu, CHEM, since 2008
(2) Chair, Mario Gomez-Hernandez, CHEM, since 2006
(3) Chair, Yun Lin, ATMO, since 2011
(4) Chair, Brittany Turner, CHEM, since 2011
(5) Chair, Jeremiah Secrest, CHEM, since 2011
(6) Chair, Shen Li, ATMO, since 2012
(7) Co-chair, Wilmarie Ortiz, CHEM, since 2012
(8) Chair, Misti Levy, ATMO, since 2010

Current M.S. Graduate Students

(1) Chair, Jiaxi Hu, ATMO, since 2010

Former Graduate Students

Ph.D. Students

(10) Chair, Yuan Wang, "Aerosol-cloud Interactions from Urban, Regional, to Global Scales", Ph.D. dissertation, 125 pp., Department of Atmospheric Sciences, Texas A&M University, 2013 (post doc at JPL/Caltech)

(9) Chair, Chong Qiu, "Atmospheric Aerosols Aging Involving Organic Compounds and Impacts on Particle Properties", Ph.D. dissertation, 118 pp., Department of Chemistry, Texas A&M University, 2013 (currently Assistant Professor, Department of Chemistry, University of Northern Alabama)

(8) Chair, Keun-Hee Lee, "Modeling the direct and indirect effects of atmospheric aerosols on tropical cyclones", Ph.D. dissertation, 100 pp., Department of Atmospheric Sciences, Texas A&M University, 2011 (currently Research Scientist, Korean Meteorological Administration)

(7) Chair, Guohui Li, "Investigation of the aerosol-cloud interaction using the WRF framework", Ph.D. dissertation, 141 pp., Department of Atmospheric Sciences, Texas A&M University, 2008 (Post doc at Molina Center/MIT; currently Professor at Institute of Earth Environment, Chinese Academy of Sciences, China)

(6) Chair, Jun Zhao, "Experimental and theoretical investigation of nucleation and growth of atmospheric aerosols", Ph.D. dissertation, 141 pp., Department of Atmospheric Sciences, Texas A&M University, 2007 (Post doc at the National Center for Atmospheric Research, Boulder, CO; currently post doc at University of Minnesota, Minneapolis, MN)

(5) Chair, Jiwen Fan, "Effects of aerosols on deep convective cumulus clouds", Ph.D. dissertation, 124 pp., Department of Atmospheric Sciences, Texas A&M University, 2007 (Now research scientist III at the Pacific Northwest National Laboratory/DOE; currently serving as a member on the Publication Committee of American Geophysical Union)

(4) Chair, Edward C. Fortner, "Airborne and ground based measurements of volatile organic compounds using proton transfer reaction mass spectrometry in Texas and Mexico City", Ph.D. dissertation, 90 pp., Department of Atmospheric Sciences, Texas A&M University, 2006 (Post doc in the Department of Chemistry, Montana State University; currently senior research scientist at the Aerodyne Research Inc., Boston, MA)

(3) Chair, Dan Zhang, "Laboratory investigation of physical and optical properties of soot-containing aerosols", Ph.D. dissertation, 90 pp., Department of Atmospheric Sciences, Texas A&M University, 2005 (Post doc at the Jet Propulsion Laboratory, California Institute of Technology; currently at OSIsoft, Inc., San Francisco, CA)

(2) Chair, Inseon Suh, "Photochemistry of aromatic hydrocarbons: Implications for ozone and secondary organic aerosol formation", Ph.D. dissertation, 130 pp., Department of Atmospheric Sciences, Texas A&M University, 2004 (currently Senior Research Scientist, Samsung Electronics Inc., Korea)

(1) Chair, Wenfang Lei, "Ozone formation in the Houston-Galveston area: A regional chemical transport model study", Ph.D. dissertation, 161 pp., Department of Atmospheric Sciences, Texas A&M University, 2003 (currently Research Scientist, Molina Center/MIT)

M.S. Students

(9) Chair, Misti Levy, "Atmospheric Measurements of Submicron Aerosols at the California-Mexico Borger and in Houston, Texas", M.S. thesis, 84 pp., Department of Atmospheric Sciences, Texas A&M University, 2013
(8) Chair, Jonathan Vogel, "Simulation of aerosol-cloud interactions on the WRF model at the Southern Great Plain site", M.S. thesis, 119 pp., Department of Atmospheric Sciences, Texas A&M University, 2012 (Pursuing Ph.D. at McGill University)
(7) Chair, Vanita Lal, "Heterogeneous Reactions of Epoxides in Acidic Media", M.S. thesis, 76 pp., Department of Atmospheric Sciences, Texas A&M University, 2011 (Research Associate, Trinity, Boston, MA)
(6) Chair, Miguel Cruz-Quiñones, "Heterogeneous reaction of NO_2 with soot surfaces and the effect of soot aging on its reactivity leading to HONO formation", M.S. thesis, 60 pp., Department of Chemistry, Texas A&M University, 2009 (Lab chemist, North Carolina State Bureau of Investigation)
(5) Chair, Huaxin Xue, "Variation in morphology, hygroscopicity, and optical properties of soot particles coated by dicarboxylic acids", M.S. thesis, 51 pp., Department of Atmospheric Sciences, Texas A&M University, 2008 (Lab Lab chemist, University of Houston)
(4) Chair, Nick P. Levitt, "Heterogeneous organic acid uptake on soot surfaces", M.S. thesis, 66 pp., Department of Atmospheric Sciences, Texas A&M University, 2007 (Shield Environmental, Kentucky)
(3) Chair, Donald W. Bond, "NO_x production by lightning in the continental U.S. and its impacts on tropospheric chemistry", M.S. thesis, 74 pp., Department of Atmospheric Sciences, Texas A&M University, 2001 (Scientist with Atmospheric Radiation Program ARM, Department of Energy)
(2) Chair, Dan Zhang, "Experimental and theoretical studies of OH-initiated reactions of isoprene", M.S. thesis, 76 pp., Department of Atmospheric Sciences, Texas A&M University, 2001
(1) Chair, Inseon Suh, "Atmospheric oxidation reactions of isoprene initiated by the hydroxyl radical and chlorine", M.S. thesis, 74 pp., Department of Atmospheric Sciences, Texas A&M University, 2000

Graduate Student Awards

(7) Yuan Wang, NASA Graduate Fellowship, 2009
(6) Jiwen Fan, NASA Graduate Fellowship, 2004
(5) Jiwen Fan, Ethel Ashworth-Tsutsui Memorial Award for Research, Texas A&M University, 2006
(4) Jiwen Fan, Chinese Government Achievement Award for Graduate Students Studying Aboard, 2006
(3) Jun Zhao, Chinese Government Achievement Award for Graduate Students Studying Aboard, 2005
(2) Dan Zhang, Chinese Government Achievement Award for Graduate Students Studying Aboard, 2005
(1) Dan Zhang, Ethel Ashworth-Tsutsui Memorial Award for Research, Texas A&M University, 2004

Post Docs/Research scientists Supervised At Texas A&M

Current Post Docs/Research Scientists

(2) Dr. Song Guo, Post Doctoral Research Associate, Ph.D., Peking University, 5/2012 - present
(1) Dr. Alexei Khalizov, Assistant Research Scientist, Ph. D., Russian Academy of Sciences, worked in the Department of Chemistry at University of Waterloo and at McGill University, 8/2005 - present

Former Post Docs/Research Scientists

(5) Dr. Jun Zheng, Assistant Research Scientist, Ph.D., SUNY – Stony Brook, worked at the Brookheaven National Lab, 7/2005 – 4/2012, now professor at Nanjing University of Information Science & Technology (NUIST), CHINA
(4) Dr. Lin Wang, Assistant Research Scientist, 9/2007 – 12/2010; Ph.D., University of California – Riverside; now Professor at Fudan University, China
(3) Dr. Yan Ma, Post Doctoral Research Associate, 8/2009 – 2/2010, Ph.D., University of Reading, United Kingdom, now Professor at Nanjing University of Information Science & Technology (NUIST), CHINA
(2) Dr. Yiwei Diao, Post Doctoral Research Associate, 11/2007 – 12/2008, now associated Professor at Nanjing University of Information Science & Technology (NUIST), CHINA
(1) Dr. Sang-Deuk Lee, Research Scientist, 1/2003 – 7/2004, now Professor and Head, Department of Environmental Engineering, Mokpo National University, SOUTH KOREA

Visiting Scholars At Texas A&M

(14) Dr. Ru-Jin Huang, 11/2012 – 12/2012, National University of Ireland – Galway, School of Physics & Centre for Climate, and Air Pollution Studies, Galway, Ireland
(13) Ms. Maria E. Huertas, 1/2011 – 12/2011, doctoral student, Instituto Tecnologico de Estudios Superiores de Monterrey, Campus Toluca, Mexico
(12) Ms. Jessica G. Barrera, 1/2011 – 12/2011, doctoral student, Instituto Tecnologico de Estudios Superiores de Monterrey, Campus Toluca, Mexico
(11) Mr. Jianfei Peng, 5/2011 – 10/2011, Doctoral Graduate Student, College of Environmental Sciences, Peking University, CHINA
(10) Ms. Fei Xu, doctoral graduate student, 9/2010 – present, Shandong University, CHINA
(9) Mr. Haobo Tan, 4/2010 – 9/2010, Research Scientist, Institute of Tropical Marine and Meteorology, Chinese Meteorological Administration
(8) Dr. Xingnan Ye, 1/2008 – 2/2008, associate Professor, Department of Environmental Engineering and Engineering, Fudan University, CHINA
(7) Ms. Dingli Yue, 10/2007 – 1/2008, Doctoral Graduate Student, College of Environmental Sciences, Peking University, CHINA
(6) Prof. Timonen Raimo, 9/2006 – 10/2006, Department of Chemistry, University of Helsinki, FINLAND
(5) Dr. Joakim Pagels, 6/2006 – 7/2006, Division of Aerosol Technology (EAT), Lund University, Lund, Sweden/Department of Mechanical Engineering, University of Minnesota

(4) Mr. Huaxin Xue, 3/2006 –11/2006, Doctoral Graduate Student, Department of Environmental Engineering and Engineering, Fudan University, CHINA
(3) Mr. Kentaro Misawa, 1/2005 – 3/2005, Doctoral Graduate Student, Department of Chemistry, Tokyo Institute of Technology, JAPAN
(2) Mr. Hajime T Verazono, 11/2003 – 12/2003, Doctoral Graduate Student, Department of Chemistry, Tokyo Institute of Technology, JAPAN
(1) Prof. Rafael Navarro-González, 3/2002 – 4/2002, Instituto de Ciencias Nucleares, Universidad Nacional Autónoma de México, MEXICO

Graduate Student Committees Served At Texas A&M

(1) Erin Greenwald, CHEM, Ph.D., 2007; (2) Katie Anderson, CHEM, Ph.D., 2008; (3) Hahkjoon Kim, CHEM, Ph.D., 2006; (4) Tim Thomas, ATMO, M.S., 2006; (5) Yong Seob Lee, ATMO, Ph.D., 2004; (6) Jiho Park, CHEM, Ph.D., 2004; (7) Kim Mace, OCNG, Ph.D., 2002; (8) Peng Zuo, CHEM, Ph.D., 2002; (9) Sean W. McGiven, CHEM, Ph.D., 2002; (10) Roberto Gasparini, ATMO, M.S., 2001; Ph.D., 2006; (11) Ruiyue Chen, ATMO, M.S., 2002; (12) Craig Collier, ATMO, M.S., 2001; (13) A. David Henderson, NUEN, M.S., 2001; (14) Kyong-Hwan Seo, ATMO, Ph.D., 2000; (15) Sri Harsha Kota, Civil Engineering, M.S., 2009; (16) Changhyoun Park, ATMO, Ph.D., 2010, (17) Anupama Krishnan, Civil Engineering, M.S., 2010; (19) Gagan Singh, Mechanical Engineering, M.S., 2010; (20) Jingyi Li, Civil Engineering, Ph.D., current; (21) Nathan Taylor, ATMO, Ph.D., current; (22) Crystal Reed, ATMO, Ph.D., 2010; (23) Hongliang Zhang, Civil Engineering, Ph.D., 2012; (24) Yoonso Kang, ATMO, Ph.D., current; (25) Tao Wang, ATMO, M.S., 2011; (26) Katie Suter, ATMO, M.S., 2011; (27) Keyl Ford, CHEM, Ph.D., current; (28) Tao Wang, ATMO, Ph.D., 2012; (29) Brian Hogan, Department of Mechanical Engineering, M.S., current; (30) Chen, Gang, Civil Engineering, Ph.D.; (31) Jonathan Gramann, ATMO, M.S., current; (32) Martin Hale, ATMO, M.S., current

UNDERGRADUATE ADVISING

Academic Advisor for undergraduate students majoring in Atmospheric Sciences

COURSES TAUGHT

ATMO – 685 Advanced Topics in Atmospheric Chemistry - Graduate (Spring, 2004)
ATMO - 363, Atmospheric Chemistry and Pollution – Undergraduate (Fall 2003, 2007, 2011)
ATMO - 446, Atmospheric Physics - Undergraduate (Fall 2002)
ATMO – 463, Air Pollution Meteorology - Undergraduate (Spring, 1999, 2000, 2001, 2002, 2003, 2004)
ATMO – 689, Advanced Atmospheric Chemistry - Graduate (Fall, 1998, Spring 2002, Spring 2003)
ATMO – 602, Thermodynamics and Atmospheric Physics - Graduate (Fall, 1999, 2000, 2001; Spring, 2004, 2005, 2006, 2007, 2008, 2009)
ATMO – 613, Advanced Atmospheric Chemistry - Graduate (Spring 2007, 2011)
ATMO – 681, Atmospheric Sciences Seminars - Graduate (Fall, 1999; Spring 2012)
METR – 612, Atmospheric Physics and Chemistry - Graduate (Spring, 1999)

ATMO – 606, Introduction to Atmospheric Chemistry - Graduate (Spring 2009, 2012)

TEXAS A&M UNIVERSITY

Atmospheric Chemistry and Air Quality in Texas:

Challenges and Opportunities

A symposium to discuss the current status and future directions in atmospheric chemistry and air quality research in Texas, and to explore broad collaboration among the research communities both inside and outside the state.

April 22–23, 2010

Annenberg Presidential Center
College Station, Texas

KEYNOTE SPEAKERS:

Bryan W. Shaw
Commissioner of Texas Commission on Environmental Quality

Robert Harriss
President of Houston Advanced Research Center

Luis Cifuentes
Associate Dean of the College of Geosciences

- National Ambient Air Quality Standard (NAAQS) and State Implementation Plan (SIP)
- Air pollution and health impacts
- Effects of air pollution on weather and climate
- Air pollution and policy decision-making
- Gaseous pollutants and air toxics
- Particulate matter pollutants
- Air pollution in the Texas-Mexico bi-nation context
- Findings from the 2009 SHARP field campaign
- Funding opportunities (state and federal)

CACE.TAMU.EDU

Jointly sponsored by the Center for Atmospheric Chemistry and the Environment and the Office of the Vice President for Research at Texas A&M University

In Celebration of 40th Anniversary of Earth Day
Texas A&M University presents
"Atmospheric Chemistry and Air Quality in Texas:
Challenges and Opportunities"
April 22-23, 2010

Thursday, April 22, 2010
Annenberg Presidential Center

8:00 -8:30 Registration and Refreshment

Session I, Chaired by Simon W. North
8:30 – 8:45 Martin Scholtz, Associate Vice President for Research, Texas A&M University
Welcoming remarks
8:45 – 9:00 Robert A. Duce, Texas A&M University
Overview of Atmospheric Chemistry and CACE
9:00 – 9:30 Keynote Speech, Bryan W. Shaw, Commissioner of the Texas Commission on Environmental Quality
Air quality regulations - Science and policy
9:30 – 10:00 Keynote speech, Robert Harriss, President of Houston Advanced Research Center
What's next: An Earth system model for Texas?
10:00 – 10:30 Keynote Speech, Luis Cifuentes, Associate Dean of College of Geosciences, Texas A&M University
Proposed EPA Texas Air Impact Research (AIR) Center

10:30 – 11:00 Coffee Break

Session II, Chaired by Kenneth Bowman
11:00 – 11:20 Jay Olaguer, Houston Advanced Research Center
The TERC Air Quality Research Program and its implications for NAAQS attainment
11:20 – 11:40 Dr. Joost de Gouw, Earth System Research Laboratory, National Oceanic and Atmospheric Administration (NOAA)
Emissions and chemistry of highly reactive volatile organic compounds and their trace gases near Houston, Texas
11:40 – 12:00 Luisa Molina, President of Molina Center for Energy and Environment/MIT
Air pollution in a bi-nation context

12:00 - 1:30 Lunch break

Session III, Chaired by John W. Nielsen-Gammon
1:30 – 1:50 David Allen, University of Texas – Austin
Lessons learned from the Texas Air Quality Studies: Highly reactive volatile organic compounds and episodic emissions
1:50 – 2:10 Barry Lefer, University of Houston
Major findings from the 2009 SHARP field Campaign

2:10 – 2:30 Renyi Zhang, Texas A&M University
Air pollution on weather and climate
2:30 – 2:50 Joe Pinto, National Center for Environmental Assessment, Environmental Protection Agency (EPA)
Nitrous acid (HONO) as a key radical precursor in the Houston airshed: Measurements and implications for modeling
2:50-3:10 Jay A. Al-Saadi, Manger for Tropospheric Chemistry Program, Headquarter, National Aeronautics and Space Administration (NASA)
The application of satellites to air quality

3:10 – 3:50 Coffee Break and Poster viewing

Session IV, Chaired by Don Collins
3:50 – 4:10 - Craig Beskid, President of Mickey Leland National Urban Air Toxics Research Center
Air pollution and human health
4:10 – 4:30 Arnie Vedlitz, Bush School, Texas A&M University
Air pollution and policy decision-making
4:30 – 4:50 Carla Kinslow, Texas Commission on Environmental Quality
Air toxics trends in Texas
4:50 – 5:10 Gilberto Velazquez, Universidad Autónoma de Ciudad Juárez, Mexico
Characterization of atmospheric emissions from major sources on the Texas-Mexico Region

5:10 – 6:00 Poster viewing and cash bar

6:00 – 7:30 Banquet, Chaired by Renyi Zhang
Remarks by Kate Miller, Dean of College of Geosciences, Texas A&M University
Environmental Program in Geosciences, Andrew Millington, Director, Texas A&M University
Presentation on Texas Air Research Center (TARC), George Talbert, Director, Lamar University

7:30 – 8:30 Poster session

Friday, April 23, 2010
Reed Arena, Room 203

8:00 – 8:30 Refreshment

Session V, Chaired by Jay Olaguer
8:30 – 8:50 Jochen Stutz, University of California –Los Angeles
Emission monitoring of HCHO and SO_2 by novel remote sensing methods during the 2009 FLAIR experiment in Houston, TX.
8:50 - 9:10 Dan Thornton, Texas A&M University
Chemical interaction between the atmosphere and ocean
9:10 – 9:30 Robert Griffins, Rice University
Particulate matter in Texas
9:30 – 10:0 Gunnar W. Schade Gunnar, Texas A&M University
Urban fluxes of air pollutants in Houston

10:00 – 10:30 Coffee Break and Poster Viewing

Session VI, Chaired by Bill Batchelor
10:30 – 10:50 Qi Ying, Civil Engineering, Texas A&M University
Regional photochemical modeling using SAPRC-07 and the Master Chemical Mechanism
10:50 – 11:10 Jerry Lin, Lamar University
Mercury pollution in air
11:20 – 11:40 John Nielsen-Gammon, Texas A&M University
Meteorology and air pollution
11:40 – 12:00 Thomas W. Tesche, Climate and Atmospheric Research Associates
Impacts of NAAQS revisions on the attainment process in Texas: Difficult decisions made even harder

12:00 - 1:30 Lunch break

Session VII – SHARP presentations, Chaired by Barry Lefer
1:30 – 1:50 Bernhard Rappenglueck, University of Houston,
Overview of meteorology and chemistry measurements during SHARP
1:50 – 2:10 Don Collins, Texas A&M University
Monitoring of Aerosol aging in Houston
2:10 – 2:30 Jun Zheng, Texas A&M University
Multi-phase processes relevant to HONO formation
2:30 – 2:50 Simon North, Texas A&M University
Measurements of nighttime N_2O_5/NO_3

2:50 – 3:30 Break

3:40 – 4:30 SHARP planning discussions
4:30 Adjourn

Poster Presentations

P.1. Hongliang Zhang, Department of Civil Engineering, Texas A&M University: *Investigating SOA Formation in Houston: What Could Be the Potential Missing Sources?*

P. 2. Jingyi Li, Department of Civil Engineering, Texas A&M University: *Comparing SAPRC99 and SAPRC07 Photochemical Mechanisms. A Case Study in Southeast Texas*

P.3. Sri Harsha Kota, Department of Civil Engineering, Texas A&M University: *Simulating Near-road Transformation of Air Pollutants using a 3D Eulerian Model*

P.4. Katie Suter, Department of Atmospheric Sciences, Texas A&M University: *Soot as Ice Nuclei: Exploring the Chemical and Physical Properties*

P.5. Andrew Glen, Department of Atmospheric Sciences, Texas A&M University: *Ice Nucleation Studies using a Continuous Flow Diffusion Chamber*

P.6. Peter Deng, Department of Atmospheric Sciences, Texas A&M University: *In-Situ Measurements and Characterization by Raman Spectroscopy of Agricultural Aerosols*

P.7. Crystal Reed, Department of Atmospheric Sciences, Texas A&M University: *Ambient Observation of the Soot Aging Process during the SHARP Intensive Field Campaign*

P.8. Buddhadeb Ghosh, Department of Chemistry, Texas A&M University: *OH Radical Initiated Oxidation of 1,3-Butadiene: Isomeric Selective Studies of the Dominant Addition Channel*

P.9. Justine Geidosch, Department of Chemistry, Texas A&M University: Ambient Measurements of N_2O_5 during SHARP using Cavity Ringdown Spectroscopy

P.10. Qingnan Liu, Department of Chemistry, Texas A&M University: *OH and HO2 Concentration Measurement by Laser Induced Fluorescence: Instrumentation of FAGE*

P.11. Wen Xu, Department of Chemistry, Texas A&M University: *Theoretical and experimental investigation of glyoxal dimerization*

P.12. Brian Hogan, Department of Mechanical Engineering, Texas A&M University: *Generation of Soot Particles Using a Shock Tube*

P.13. Christopher Aul, Department of Mechanical Engineering, Texas A&M University: *A hydrogen peroxide laser diagnostic for combustion products*

P.14. Gagan Singh, Department of Mechanical Engineering, Texas A&M University: Nanoparticle generation and real-time detection

P.15. Lin Wang, Department of Atmospheric Sciences, Texas A&M University: *Laboratory investigation on the role of organics in atmospheric nanoparticle growth*

P.16. Keun-Hee Lee, Yuan Wang, Department of Atmospheric Sciences, Texas A&M University: *Impacts of air pollution on Atlantic Hurricanes*

P.17. Alexei Khalizov, Department of Atmospheric Sciences, Texas A&M University: *Evolution in morphology, hygroscopicity, optical properties, and chemical reactivity of soot aerosol with aging*

P.18. James Tobin, Department of Atmospheric Sciences, Texas A&M University: *Meteorologically adjusted trends in Houston background and locally contributed ozone*

2011

NOVEMBER 7–10
Washington D.C.

2011 IYC O_3 Symposium on Stratospheric Ozone and Climate Change

Can lessons learned help us deal with climate changes?

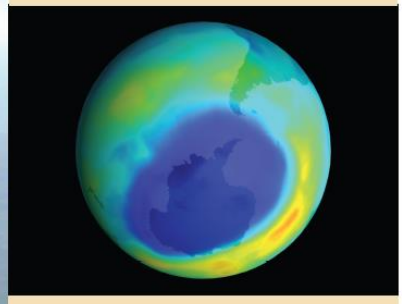
International Year of Chemistry O_3

Protecting the stratospheric ozone layer — A successful collaboration of scientists, industry, policy makers, and intergovernmental agencies

2011-IYC-O3.ORG

Primary sponsors include American Meteorological Society, American Geophysical Union, and American Chemical Society

STRATOSPHERIC OZONE



CLIMATE CHANGE

POLICY MAKING

2011 IYC O_3 Symposium Program
November 7–10, 2011
The Ronald Reagan Building and International Trade Center
1300 Pennsylvania Avenue NW
Washington, D.C. 20004

MONDAY, NOVEMBER 7, 2011
Location: Atrium Ballroom

7:00–8:00	Registration and Breakfast
8:00–9:30	**Session (O1): IYC O_3 Celebration**
Presiding	**Robert T. Watson,** Chief Scientific Adviser, U.K. Department for Environment, Food and Rural Affairs, and Strategic Director of the Tyndall Center, University of East Anglia; Chair of the Intergovernmental Panel on Climate Change (IPCC, 1997–2002)
8:00–8:10	**Mario J. Molina,** 1995 Nobel Laureate in Chemistry *Opening remarks*
8:10–8:30	**Nancy B. Jackson,** President, American Chemical Society
8:30–8:50	**Michael J. McPhaden,** President, American Geophysical Union
8:50–9:10	**Jonathan Malay,** President, American Meteorological Society
9:10–9:30	**Michel Jarraud,** Secretary General, World Meteorological Organization
9:30–10:00	Coffee Break
10:00–12:00	**Session (O2/D1): Scientific Lessons to Stratospheric Ozone and Climate Change**
Presiding	**Andrew C. Revkin,** Pace Academy for Applied Environmental Studies, Pace University; Science Writer of the *New York Times* (1995–2009)
10:00–10:20	**Susan Solomon**, University of Colorado, Boulder *The Scientific Assessments of Ozone Depletion and Climate Change: Successes, Challenges, and Some Future Directions*
10:20–10:40	**Mario J. Molina,** University of California, San Diego *Climate Science, Energy, Policy, and Economic Issues*
10:40–11:00	**Robert T. Watson,** Chief Scientific Adviser, U.K. Department for Environment, Food and Rural Affairs *Stratospheric Ozone and Climate change: Integration between Science and Policy*
11:00–12:00	Moderated Panel Discussions Moderator: **Andrew C. Revkin** Panelists: **Susan Solomon, Mario J. Molina,** and **Robert T. Watson**
12:00–1:30	Lunch Break
1:30–3:00	**Session (O3/D2): Montreal Protocol I: Stratospheric Ozone Layer Protection**
Presiding	**Drusilla Hufford,** Director of Stratospheric Protection Division, U.S. Environmental Protection Agency
1:30–2:20	Overviews (10 minutes by each panelist)
2:20–2:45	Moderated Panel Discussions
2:45–3:00	Questions and Answers

Key: D=discussion, O=oral, P=poster

Panelists: **A.R. Ravishankara,** Director, Chemical Sciences Division,
Earth System Research Laboratory, NOAA
Phillip Lapin, Chairman of the Board of the Alliance for Responsible Atmospheric Policy
David Doniger, Natural Resources Defense Council
Paul Horwitz, Deputy Executive Secretary, Ozone Secretariat, U.N. Environmental Program
Drusilla Hufford, U.S. Environmental Protection Agency
Moderator: **Steve Seidel**
(Organizers: Drusilla Hufford and Steve Seidel)

3:00–3:30 Coffee Break

3:30–5:00 Session (O4/D3): Montreal Protocol II: Climate Protection

Presiding **Steve Seidel,** Vice President for Policy Analysis and General Counsel, Pew Center on Global Climate Change

3:30–4:20 Overviews (10 minutes by each panelist)
4:20–4:45 Moderated Panel Discussions
4:45–5:00 Questions and Answers
Panelists: **Daniel Reifsnyder,** Deputy Assistant Secretary for Environment, U.S. Department of State
Guus Velders, Netherlands Environmental Assessment Agency
Mack McFarland, DuPont Chemical and Fluoroproducts
Durwood Zaelke, President of the Institute for Governance and Sustainable Development
Moderator: **Steve Seidel**
(Organizers: Drusilla Hufford, Mack McFarland, and Steve Seidel)

TUESDAY, NOVEMBER 8, 2011
Location: Atrium Ballroom

7:00–8:00 Registration and Breakfast

8:00–9:30 Session (O5): Current Stratospheric Research I

Presiding **A.R. Ravishankara,** NOAA, and **Paul A. Newman,** NASA

8:00–8:20 **Richard S. Stolarski,** Johns Hopkins University
Satellite Detection of Global Ozone Trend and Polar Ozone Depletion

8:20–8:40 **Samuel J. Oltmans,** University of Colorado at Boulder
Tracking Stratospheric Ozone Recovery from Ground-based Measurements: Yes We Need Them

8:40–9:00 **Owen B. Toon,** University of Colorado at Boulder
Polar stratospheric Clouds and Aerosols and their Impact on the Ozone Layer

9:00–9:20 **Paul A. Newman,** GSFC NASA
The World Avoided by the Montreal Protocol

9:20–9:30 Discussions
(Organizer: Paul A. Newman)

9:30–10:00 Coffee Break

10:00–12:00 Session (O6/D4/D5): The 1990 Clean Air Act Amendments (CAAA): History, Implementation, and Impacts

Presiding **Ann O'M. Bowman,** The Bush School of Government and Public Service, Texas A&M University

10:00–10:10 The Honorable George Bush, 41st President of the United States
Video presentation

10:10–10:30 Keynote Address: C. Boyden Gray, Boyden Gray & Associates, LLP; White House Counsel (1989–1993); U.S. Ambassador to the European Union (2006–08)

10:30–11:30 Moderated Panel Discussions: Political History of the CAAA of 1990
Moderator: **C. Boyden Gray**
Panelists: **Michael R. Deland,** Attorney at Law; Chair, Council on Environmental Quality (1989–1993)
Robert E. Grady, Partner, Cheyenne Capital Fund; Associate Director (1989–1991) and Executive Associate Director (1991–93) of the Office of Management and Budget (OMB); Deputy Assistant to the President (1991–1993)
Fred Krupp, Executive Director (1984–2002) and President (2002–present) of the Environmental Defense Fund
Roger B. Porter, IBM Professor of Business and Government, Harvard University; Assistant to the President for Economic and Domestic Policy (1989–1993)

11:30–12:00 Moderated Panel Discussions: Implementation and Impacts of the CAAA of 1990
Moderator: **Ann O'M. Bowman,** The Bush School of Government and Public Service, Texas A&M University
Panelists: **Robert N. Stavins,** Albert Pratt Professor of Business and Government, and Director of the Harvard Environmental Economics Program, John F. Kennedy School of Government, Harvard University
William G. Rosenberg, President, E3 Ventures, LLC; Former Assistant Administrator for Air and Radiation, U.S. Environmental Protection Agency (1989–1993)
(Organizers: **Jeryl Mumpower** and **Ann O'M. Bowman**)

12:00–1:30 Lunch Break

Presiding	**Andrew H. Card, Jr.,** Acting Dean, The Bush School of Government and Public Service, Texas A&M University; White House Chief of Staff (2001-2006)
12:30–1:00	Keynote Address: **William K. Reilly,** Administrator, U.S. Environmental Protection Agency (1989–1993) *Confronting the Clean Air Roll Back: Where and How?* (Organizers: **Jeryl Mumpower** and **Ann O'M. Bowman**)
1:30–3:00	**Session (O7/D6): Congressional Accomplishments and Challenges to Ozone Protection and Climate Change: Past and Present**
Presiding	**Nikki Roy,** Vice-President, Federal Government Outreach, Pew Center on Global Climate Change
1:30–2:10	Overviews (10 minutes by each panelist)
2:10–2:45	Moderated Panel Discussions
2:45–3:00	Questions and Answers Panelists: **Steve Shimberg,** former Chief Counsel and Staff Director, Senate Committee on Environment and Public Works (under Sen. John Chaffee, R-RI) **Jeffrey Burnham,** former Staff to Senate Committee on Agriculture (under Sen. Richard Lugar, R-IN) and former Deputy Assistant Secretary of State for Environment, Bureau of Oceans and International Environmental and Scientific Affairs, Department of State **David Banks,** Deputy Staff Director, Senate Committee on Environment and Public Works (under Sen. James Inhofe, R-OK) **Ana Unruh Cohen,** Deputy Staff Director, House Natural Resources Committee (under Rep. Edward Markey, D-MA) Moderator: **Nikki Roy** (Organizer: Steve Seidel)
3:00–3:30	Coffee Break
3:30–5:00	**Session (O8/D7): Climate Research: Current Status, Uncertainty, and Challenges**
Presiding	**Alan K. Betts,** Atmospheric Research, and Yangang Liu, Brookhaven National Laboratory
3:30–3:35	**Alan K. Betts** *Introduction*
3:35–3:47	**Gerald R. North,** Texas A&M University *The context from Past Climates*
3:47–3:59	**Stephen E. Schwartz,** Brookhaven National Laboratory *Fossil Energy, CO_2, Climate Change, and the Aerosol Problem*
3:59–4:11	**V. Ramaswamy,** GFDL, Princeton University *Advances in the Understanding of Climate Forcings and Responses*
4:11–4:23	**David Randall,** Colorado State University *Future Climate Modeling and Parameterization Development*
4:23–4:35	**Michael G. Bosilovich,** NASA GMAO *Reanalysis for climate*
4:35–5:00	Moderated Panel Discussions Moderator: **Alan Betts** (Organizers: Yangang Liu and Alan K. Betts)
5:30–7:00	**Symposium Reception**

WEDNESDAY, NOVEMBER 9, 2011
Location: Pavilion

7:00–8:00	Registration and Breakfast
8:00–9:30	**Session (O9): Industrial Environmental Chemistry: Search for new low GWP alternatives**
Presiding	**Mario J. Nappa,** DuPont Chemical and Fluoroproducts
8:00–8:12	**Mario J. Nappa,** DuPont Chemical and Fluoroproducts *Challenges facing the chemical industry in developing new low GWP alternatives*
8:12–8:24	**Mark W. Spatz,** Honeywell International *Low GWP Refrigerants for Stationary Air Conditioning and Refrigeration Applications*
8:24–8:36	**Brett Van Horn,** Arkema Inc. *Next Generation Low GWP Fluid Development*
8:36–8:48	**M.P. Sulbaek Andersen,** T.J. Wallington, O.J. Nielsen, M.D. Hurley and S. P. Sander, NASA Jet Propulsion Laboratory, California Institute of Technology *Atmospheric Chemistry of trans-$CF_3CH=CHCl$*
8:48–9:00	**O.J. Nielsen,** T.J. Wallington, M.P. Sulbaek Andersen, and M.D. Hurley, University of Copenhagen *Atmospheric Chemistry of $CF_3CF=CH_2$ (HFO-1234yf)*
9:00–9:12	**David J. Williams,** Honeywell *Low GWP, High Performance Blowing Agents For Closed Cell Rigid Foam Applications*
9:12–9:24	**Cindy Newberg,** U.S. Environmental Protection Agency *Paving the Way to Safer Substitutes with EPA's SNAP Program*
9:24–9:30	Discussions
9:30–10:00	Coffee Break
10:00–12:00	**Session (O10): Monitoring and Regulation of Halogens and Greenhouse Gases**
Presiding	**Jim Butler,** NOAA, and **Shari Yvon-Lewis,** Texas A&M University
10:00–10:10	**Jim Butler,** Global Monitoring Division, Earth System Research Laboratory, NOAA *Opening Remarks*
10:10–10:30	**Dave S. Godwin,** U.S. Environmental Protection Agency *Considerations for Bottom-up Modeling of Hydrofluorocarbon Emissions*
10:30–10:50	**Stephen A. Montzka**, G. Dutton, B.D. Hall, J.W. Elkins, J.H. Butler, P. Newman, Earth System Research Laboratory, NOAA *Monitoring the Progress of the Montreal Protocol and Implications for Effectively Controlling Greenhouse gases*
10:50–11:10	**Ray Weiss,** Scripps Institution of Oceanography, University of California, San Diego *The Case for Verifying Emissions from Atmospheric Measurements*
11:10–11:30	**Lori M. Bruhwiler,** Global Monitoring Division, NOAA Earth System Research Laboratory *The Atmospheric Budgets and Trends of CH_4 and N_2O Revealed by Multi-decadal Observations from the NOAA ESRL Global Cooperative Air Sampling Network*
11:30–11:50	**Matthew Rigby,** Joint Program on the Science and Policy of Global Change, Massachusetts Institute of Technology *Using Models to Derive Emissions from Atmospheric Measurements on Global and National Scales*
11:50–12:00	**Jim Butler**, Global Monitoring Division, Earth System Research Laboratory, NOAA *Concluding Remarks* (Organizers: **Jim Butler** and **Shari Yvon-Lewis**)
12:00–1:30	Lunch Break

1:30–3:00	**Session (O11): Current Stratospheric Research II**
Presiding	**Paul A. Newman,** GSFC NASA
1:30–1:50	**William H. Brune,** Penn State University *Impacts of Aircraft and Balloon Observations on Ozone Depletion Research*
1:50–2:10	**Stanley P. Sander,** NASA Jet Propulsion Laboratory, California Institute of Technology *Evaluation of Kinetic and Photochemical Data for Stratospheric Research*
2:10–2:30	**Theodore G. Shepherd**, University of Toronto *The Ozone Layer of the Future, Where Are We Going?*
2:30–2:50	**Darryn W. Waugh**, John Hopkins University *The Antarctic Ozone Hole and Southern Hemisphere Climate and Weather*
2:50–3:00	Discussions (Organizer: **Paul A. Newman**)
3:00–3:30	Coffee Break
3:30–5:00	**Poster Session I (P1)**

THURSDAY, NOVEMBER 10, 2011
Location: Pavilion

7:00–8:00 Registration and Breakfast

8:00–9:30 Session (O12): Stratospheric Ozone, Climate, and Policy

Presiding **Ross J. Salawitch,** University of Maryland at College Park

8:00–8:12 **Tim Canty,** Nora R. Mascioli and Ross Salawitch**,** University of Maryland
The Impact of Volcanoes and Ocean Circulation on Globally Averaged Surface Temperature

8:12–8:24 **John S. Daniel,** S Solomon, T. J. Sanford, M. McFarland, J. S. Fuglestvedt, and P. Friedlingstein, ESRL Chemical Sciences Division, NOAA
Limitations of Single-basket Trading: Lessons from the Montreal Protocol for Climate Policy

8:24–8:36 **Zhanqing Li,** University of Maryland
Long-term and Global Impacts of Aerosols on Clouds and Precipitation

8:36–8:48 **Judith L. Lean,** Naval Research Laboratory
Total Atmospheric Ozone: Past and Future

8:48–9:00 **Howard K. Roscoe,** British Antarctic Survey
The Increase of Southern Ocean Winds and SAM is Caused by the Ozone Hole Rather than by Increased Greenhouse Gases

9:00–9:12 **Michelle L. Santee,** Gloria L. Manney, Nathaniel J. Livesey, Markus Rex
Unprecedented Arctic Ozone Loss in 2011: Context Based on Seven Years of Global Aura Microwave Limb Sounder Observations

9:12–9:24 **Rolf Müller,** Marc von Hobe, Fred Stroh, and the RECONCILE science team, Forschungszentrum Jülich (IEK-7), Germany
How Complete is our Understanding of Polar Ozone Depletion?

9:24–9:30 Discussions

9:30–10:00 Coffee Break

10:00–12:00 **Poster Session II (P2)**

12:00–1:30 Lunch Break

Presiding **Chuck Kolb,** President, Aerodyne Research, Inc.

12:30–1:00 Luncheon Keynote: Ralph Cicerone, President of National Academy of Sciences
Stratospheric Ozone Lessons Learned and their Relevance to Climate Change
(Organizer: Chuck Kolb)

1:30–3:00 Session (D8): Education, Outreach, and Communication: Telling the Stories of Stratospheric Ozone Layer and Climate Change

Presiding **Ming-Ying Wei,** NASA Headquarters

1:30–1:40 Video presentation from NASA
1:40–2:10 Overviews (5 minutes by each panelist)
2:10–2:45 Moderated Discussions
2:45–3:00 Questions and Answers
Panelists: **Don Wuebbles,** University of Illinois at Urbana-Champaign
Erik Conway, NASA Jet Propulsion Laboratory, California Institute of Technology
Jill Karsten, National Science Foundation
Elliott Jacks, NOAA
Drusilla Hufford, U.S. EPA

(Organizer: Ming-Ying Wei)

3:00–3:30 Coffee Break

3:30–5:00 Session (O13): Young Scientist Forum

Presiding **Jiwen Fan,** Pacific Northwest National Laboratory; **Trude Storelvmo,** Yale University; **AnnMarie Carlton,** Rutgers University

3:30–3:50 **Susan Solomon,** University of Colorado, Boulder
Promotion of Science among Women and Youths

3:50–4:00 **Keynyn Brysse,** Princeton University
Learning to Assess Ozone Depletion

4:00–4:10 **Olga Suminska-Ebersoldt,** Research Centre Juelich, Germany
ClOOCl Photolysis at High Solar Zenith Angles: Analysis of the RECONCILE self-match flight

4:10–4:20 **Harald E. Rieder,** Columbia University
Evidence for the Effectiveness of the Montreal Protocol to Protect the Ozone Layer

4:20 – 4:30 **Birgit Hassler,** NOAA
Twenty-five Years of Ozonesonde Measurements at South Pole: An Assessment of Changing Loss Rates

4:30–4:40 **Jiwen Fan,** Pacific Northwest National Laboratory
How Aerosols Impact Deep Convection and Large-scale Circulation?

4:40–4:50 **Ines Engel,** ETH Zurich, Switzerland
PSC Observations in the Arctic winter 2009–10 Suggest Heterogeneous Nucleation of NAT and Ice

4:50–5:00 **Jonathan Petters,** AAAS Science and Technology Fellow
Changes in Aerosol State on Stratiform Cloud Systems: Implications for the Earth's Radiative Budget and Climate

5:00 Adjourn

Poster Session I

Wednesday November 9
3:30–5:00 pm
Location: Pavilion Prefunction

P1.1 Yukimasa Tsubota, J. F. Oberlin Univeristy, Japan
The Practice of an Outreach Program for the Ozone-Depletion Science

P1.2 Rolf Müller, Forschungszentrum Jülich (IEK-7), Germany
Brief history of stratospheric ozone research

P1.3 Li Shuanglin, Institute of Atmospheric Physics, China
A comparison of polar vortex trend induced by ozone depletion and tropical ocean warming and its implication

P1.4 Chaim Garfinkel, Johns Hopkins University
Improvement of the GEOS-5 AGCM upon updating the Air-Sea Roughness Parameterization

P1.5 Jane J. Liu, David Tarasick, Vitali Fioletov, Chris McLinden, Guiping Liu, Christopher Sioris, Huixia He, Jinjian Jin, Environment Canada, Canada
A Stratospheric Ozone Climatology From Global Ozone Soundings and Trajectory Statistics

P1.6 L. E. Flynn, D. Loyola, F-X Huang, W-H Wang, D. Rault, C.T. Beck, C. Long, S. Kondragunta, NOAA
Operational Ozone Sensors

P1.7 LIU Yi (1), LU ChunHui (1), KYRÖLÄ Erkki (2). 1 - Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing, China, and 2 - Finnish Meteorological Institute, Earth Observation, Helsinki, Finland
The quasi-biennial and semi-annual oscillation features of tropical O3, NO2, and NO3 revealed by GOMOS satellite observations

P1.8 J.-U. Grooß(1), K. Brautzsch (1), R. Pommrich (1,2), S. Solomon (3), and R. Müller (1). 1 - Forschungszentrum Jülich, Germany, 2 - Universite de Toulouse, France, and 3 - University of Colorado, Boulder, CO, USA
Stratospheric ozone chemistry in the Antarctic: what controls the lowest values that can be reached and their recovery?

P1.9 Catherine Middlecamp (1), Marta Gmurczyk (2), and Michael T. Mury (2). 1- University of Wisconsin-Madison, and (2) Education Division, American Chemical Society
In the Classroom: Stratospheric Ozone and Climate Change

P1.10 Christopher Blaszczak-Boxe, California Institute of Technology
An Inexpensive, Widely Available Material for 4 wt% Reversible Hydrogen Storage Near Room Temperature

P1.11 Lei Hu, Shari Yvon-Lewis, Yina Liu, Thomas S. Bianchi, Texas A&M University
The Ocean Appears to Be Near Equilibrium with Atmospheric CH3Br

P1.12 Yina Liu, Shari Yvon-Lewis, Thomas Bianchi, Lisa Campbell, Richard Smith and Li Shen, Texas A&M University
Sources of Polybrominated Very Short Lived Substances in the Eastern Pacific Ocean

P1.13 Eric Chan, Texas A&M University
Methane Production and Destruction: Theoretical and Experimental Reevaluation of Methane Isotope Kinetics

P1.14 Mengran Du, Texas A&M University
Using Dissolved Oxygen Anomalies to Assess the Spatial and Temporal Variability of Hydrocarbon Respiration in Response to the Oil Spill Event

P1.15 Laura Revell, Greg Bodeker, Petra Huck, Dan Smale, Bryce Williamson, Ross Salawitch and Tim Canty, University of Canterbury, The Netherlands
The chemical sensitivity of stratospheric ozone to nitrous oxide and methane

P1.16 Geoff Dutton, Brad Hall, David Nance, Debbie Mondeel, James Elkins, NOAA/CIRES
Three decades of continuous monitoring of long-lived halocarbons

P1.17 F. L. Moore, D. Chen, E. Ray, J.W.Elkins, P.P. Tans, A Karion, C. Sweeney,
NOAA Earth System Research Laboratory; and Cooperative Institute for Research in Environmental Sciences, University of Colorado.
Inexpensive Stratospheric Profiling as Basis of Stratospheric Transport Monitoring Program

P1.18 Jooil Kim, Shanlan Li, Kyung-Ryul Kim*, Sunyoung Park,Jens Mühle, Andreas Stohl, and Ray Weiss, School of Earth and Environmental Sciences, Seoul National University
Measurements of Halogenated Compounds at Gosan (Jeju Island, Korea) for Validation of Emissions from East Asia

P1.19 Andrew Orr, British Antarctic Survey
Effects of ozone depletion on the seasonal evolution of the Southern Hemisphere polar vortex and climate

P1.20 B. J. Johnson (1), S. J. Oltmans (2), J. H. Butler (1), and I. Petropavlovskikh (2). 1 - NOAA/ESRL Global Monitoring Division; 2 - CIRES, University of Colorado
Ozonesonde Profiles Measured at South Pole Station During the 2011 Ozone Hole

P1.21 R. Evans (1), G. McConville (2), S. Oltmans (1), I. Petropavlovskikh (2), D. Quincy (2). 1 - NOAA Earth System Research Laboratory; 2 - Cooperative Institute for Research in Environmental Sciences, University of Colorado
NOAA Dobson Ozone Network as part of the WMO Global Atmospheric Watch Program

P1.22 Masato Shiotani and SMILES Mission Team, Kyoto University
Superconducting Submillimeter-Wave Limb-Emission Sounder (SMILES) - Middle Atmospheric Observations from the International Space Station

P1.23 James W. Elkins, Fred L. Moore, Geoff S. Dutton, J. David Nance, Eric J. Hintsa, and Brad D. Hall, NOAA/ESRL/GMD and University of Colorado CIRES
Improving our understanding of ozone depleting substances in the upper atmosphere

P1.24 Margaret M. Hurwitz, Paul A. Newman, and Chaim I. Garfinkel, GESTAR, Morgan State University, NASA Goddard Space Flight Center
Understanding late winter variability in the Arctic: How unusual was 2011?

P1.25 Yanni Ding, Zhanqing Li, University of Maryland, College Park
Dependence of aerosol effect on meteorological variables

P1.26 U.K. Singh, V. Kumar and Joong-Bae Ahn, APEC Climate Center (APCC)
El-Nino and its Relationship to Changing Background Conditions in Ocean and

Poster Session II

Thursday, November 10
10:00 – 12:00
Location: Pavilion Prefunction

P2.1 Bo Dong, John D. Lenters, School of Natural Resources, University of Nebraska- Lincoln
Trends in Surface Solar Radiation from Satellite Observations and its Implications for Evaporative Demand

P2.2 Meilu He, Suzanne Paulson, Arthur Winer, Suresh Dhaniyala, UCLA
Measurement and Parameterization of Pollutant Distribution near a highway

P2.3 Yuan Wang, Renyi Zhang, Ramalingam Saravanan, Guohui Li, Texas A&M University
Quantification of the Impacts of Asian pollution on Pacific Storm Track

P2.4 Maria Cazorla, Tom Hanisco, NASA GSFC
Tracking boundary layer pollution at high altitude: LIF formaldehyde detection approach

P2.5 Cameron R. Homeyer, Texas A&M University
Dynamical and Chemical Characteristics of Tropospheric Intrusions during START08

P2.6 K. Muni Krishna, Andhra University, India
Is climate change boosting the Phet cyclone to intensify into Category 4 in the Arabian Sea?

P2.7 Chunsong Lu (1,2), Yangang Liu (1), Seong Soo Yum (3), Shengjie Niu (2), Satoshi Endo (3). 1- Brookhaven National Laboratory, NY, (2) - Nanjing University of Information Science and Technology, Nanjing, China, and (3) - Yonsei University, Seoul, Korea
A New Approach for Estimating Entrainment Rate in Cumulus and Parameterization in Models

P2.8 Peres, Lucas Vaz; Pinheiro, Damaris Kirsch; Anabor, Vagner; Leme, Neusa Paes; Crespo, Natalia; Kall, Elenice, Space Science Laboratory of Santa Maria, Federal University of Santa Maria – UFSM, Santa Maria, RS, Brazil,
TWENTY YEARS OF INFLUENCE OF THE ANTARCTIC OZONE HOLE OVER SOUTH OF BRAZIL

P2.9 Yi Wang, Paul C. Bethke, University of Wisconsin-Madison,
Impacts of Climate Change on Global Food Production

P2.10 Vagner Anabor, Damaris Kirsch Pinheiro, Lucas Vaz Peres, UFSM - Universidade Federal de Santa Maria, Brazil
Synoptic patterns associated with secondary effects of the Antarctic Ozone Hole over Southern South America

P2.11 Tao Wang, Andrew Dessler, Texas A&M University
Cirrus in the tropical tropopause level - observational and model analysis

P2.12 Anthony K. Cochran, James M. Roberts, Mary C. Barth, Ranajit Talukdar, Patrick Veres, Solomon Bililign, North Carolina A&T State University, Greensboro, NC; NOAA Earth System Research Laboratory, Boulder, CO; CIRES at University of Colorado, Boulder, CO; National Center for Atmospheric Research, Boulder, CO; Now at Max Planck Institute for Chemistry, Mainz Germany
Measurement and Modeling of Isocyanic in the Troposphere

P2.13 Yunqian Zhu, Owen Brian Toon, University of Colorado,
Microphysical Simulation of Polar Stratospheric Clouds Using the WACCM/CARMA Model

P2.14 Tianle Yuan, Lorraine A. Remer, Huisheng Bian, Jerald R. Ziemke, Rachel Albrecht, Kenneth E. Pickering, Lazaros Oreopoulos, Steven J. Goodman, Hongbin Yu, Dale J. Allen, Univ.ersity of Maryland / NASA GSFC
Aerosol indirect effect on tropospheric ozone via cloud lightning

P2.15 Annmarie G. Carlton, Rutgers University
Atmospheric Brown Clouds (ABCs): predicting the vertical profile of particulate carbon

P2.16 Timothy Logan, University of North Dakota
A Modified Aerosol Classification Scheme Derived from Asian AERONET Data

P2.17 Hongliang Zhang and Qi Ying, Texas A&M University,
Investigating the radiative impact of atmospheric aerosols in Southeast Texas using WRF-Chem model

P2.18 T. Wegner, J.-U. Grooß, M. von Hobe, F. Stroh, M. Volk and R. Müller, National Center for Atmospheric Research / Forschungszentrum Jülich, Germany
Chlorine activation on binary aerosol

P2.19 José I. Huertas, María E. Huertas, Sebastian Izquierdo, Enrique D. González, Tecnológico de Monterrey, Mexico
Air quality impact assessment of multiple open pit coal mines in northern Colombia

P2.20 Guiting Song, Jagabandhu Panda, Nanyang Technological University
Exchange of ozone between troposphere and stratosphere through Sumatra Squall

P2.21 Jonathan M. Vogel, Yuan Wang, and Renyi Zhang, Texas A&M University
Simulation of aerosol-cloud interaction in the WRF model at the Southern Great Plains site

P2.22 Nora Mascioli, Ross J. Salawitch, Tim Canty, University of Maryland, College Park
Impact of Aerosols, Ocean Circulation, and Internal Feedbacks on Global Climate

P2.23 Chen Zhou, Andrew Dessler, Texas A&M University
Study of the short-term cloud feedback with MODIS

P2.24 V. Aquila, L. D. Oman, R. S. Stolarski, P. R. Colarco, P. A. Newman, NASA Goddard Space Flight Center
The interaction between Mt. Pinatubo aerosols and the stratosphere

P2.25 Jessica Garzon (1), M. Huertas (1), J. Zheng (2), and R. Zhang (2). 1 - Tecnológico de Monterrey, Mexico, and 2 - Texas A&M University
VOC measurements and source analysis by PMF at the San Diego - Tijuana border during the CalMex 2010 campaign

P2.26 Tim Arnold, Jens Mühle, Peter K. Salameh, Christina M. Harth, Diane J. Ivy, and Ray F. Weiss, Scripps Institution of Oceanography, UC San Diego
Nitrogen trifluoride (NF3): Improved monitoring of an emerging greenhouse gas

P2.27 Eric McWilliams, University of Maryland, College Park
River Basin Scale Water Balance Using GRACE

P2.28 Virginia Sawyer, Zhanqing Li, Ellsworth J. Welton, University of Maryland, College Park; NASA-GSFC
Validation of boundary layer detection by ground-based aerosol lidar

P2.29 Chunhua Deng, Sarah D. Brooks, German Vidaurre, Daniel C.O. Thornton, Department of Atmospheric Sciences, Texas A&M University
A link between cloud nucleation ability and chemical composition of marine aerosols

P2.30 Shiliang Wu, Huanxin Zhang, Michigan Technological University
Effects of Stratospheric Ozone Change on Photochemistry and Air Quality in the Troposphere

Abstracts Booklet

November 7-10, 2011
The Ronald Reagan Building and International Trade Center
1300 Pennsylvania Avenue NW
Washington, D.C. 2004

Session 1: Policy/regulation relevant to stratospheric ozone and climate change. Integration between science and policy. Communication of climate change to the public

The Practice of an Outreach Program for the Ozone-Depletion Science

Yukimasa Tsubota
J.F. Oberlin University

The Practice of an Outreach Program for the Ozone-Depletion Science

We developed and are running a one-day seminar on ozone depletion during summer vacations since 2009. More than 60 high school students and 20 science teachers have attended our seminar which consists of four 'blocks'. The first block is a lecture about the science of ozone depletion. The second block is a lab activity that produces ozone via UV light and destroying ozone via chlorofluorocarbons CFCs. The third block is ambient UV-light measurement out in the field where participants determine the quality of sunscreen lotions and UV-restricting sunglasses. The fourth block is a computer simulation of future ozone concentrations in the stratosphere.

The main objectives of our seminar are to teach scientific and contemplative methodologies for global environmental-assessment. For example, theoretical and experimental methods are explained in our seminar; after which the participants perform laboratory and field measurements. Moreover, participants learn environmental modeling and experience computer simulation. Through these activities, participants enhance their understanding and appreciation of scientific research.

The effects of our seminar were assessed by the pre- and post questionnaires. The results were positive on the understanding of ozone depletion science but the individual responses were not so simple. We found that some participants changed their selections from correct ones to wrong ones on the post-questionnaires. We conclude that our outreach program is an effective measure of dissemination; but careful instruction and text should be prepared for more-effective results.

In the Classroom: Stratospheric Ozone and Climate Change

Catherine Middlecamp
University of Wisconsin-Madison

Both in the college and in the high school chemistry curriculum, the topics of stratospheric ozone and climate change are important vehicles not only to engage students in learning about the issues, but also to teach fundamental principles of chemistry. Two projects of the American Chemical Society (ACS) , Chemistry in Context (CiC) and Chemistry in the Community(ChemCom), have a track record that spans over 25 years. The college text, Chemistry in Context, now is reaching over 25,000 students yearly in its 7th edition. The high school text, Chemistry in the Community, has reached over 2.2 million students and teachers in its six editions. Chemistry in Context features full-length chapters on the ozone hole and on climate change. Chemistry in the Community interweaves the atmosphere and climate change throughout the unit that teaches students about gases and developing scientific investigations around the topic of air. This presentation describes the approach of the ACS in developing chemistry-literate and science-literate citizens by presenting chemistry in the context of real-world issues, particularly those that relate to sustainability.

Climate Impacts of Ozone-depleting Substances and their Replacements Resulting from the Montreal Protocol

Guus J.M. Velders, David W. Fahey, John S. Daniel, Mack McFarland, Stephen O. Andersen

The 1987 Montreal Protocol on Substances that Deplete the Ozone Layer is a landmark agreement that has successfully reduced the global production, consumption and emissions of ozone-depleting substances. These gases are also greenhouse gases that contribute to the radiative forcing of climate change. The climate protection already achieved by the Montreal Protocol alone is far larger than the reduction target of the first commitment period of the Kyoto Protocol. The consumption and emissions of hydrofluorocarbons (HFCs) are projected to increase substantially in the coming decades

in response to regulation of ozone-depleting substances under the Montreal Protocol. The projected increases result primarily from sustained growth in demand for refrigeration, air-conditioning and insulating foam products in developing countries assuming no new regulation of HFC consumption or emissions. New HFC scenarios are constructed based on current hydrochlorofluorocarbon (HCFC) consumption in leading applications, patterns of replacements of HCFCs by HFCs in developed countries, and gross domestic product growth. Global HFC emissions significantly exceed previous estimates after 2025 with developing country emissions as much as 800% greater than in developed countries in 2050. Global HFC emissions in 2050 are equivalent to 9–19% (CO2-eq. basis) of projected global CO2 emissions in business-as-usual scenarios and contribute a radiative forcing equivalent to that from 6–13 years of CO2 emissions growth near 2050.

Limitations of Single-Basket Trading; Lessons from the Montreal Protocol for Climate Policy

John S. Daniel, S. Solomon, T.J. Sanford, M. McFarland, J.S. Fuglestvedt, and P. Friedlingstein
NOAA ESRL Chemical Sciences Division

The Kyoto Protocol adopted a single-basket trading approach to limit increases in greenhouse gas emissions. It allows for trading emission reductions of one greenhouse gas with reductions of others, with the trade "price" determined by an agreed metric, the 100-yr Global Warming Potential. In contrast, to protect the ozone layer the Montreal Protocol also dealt with controlling many compounds, but essentially adopted a multi-basket scheme, in which trading was allowed with compounds in the same basket, but not with compounds in different baskets. This approach has been highly successful as evidenced by the observed declining concentrations of ozone-depleting substances and by the cessation of falling ozone levels. We show that if the Montreal Protocol had used a single-basket approach, its near-term success could have been at risk due to the non-unique relationship between controls and environmental impacts when using a single basket. Building on the ozone policy example, we illustrate some of the ambiguities associated with a single-basket climate control policy and show that a multi-basket approach leads to a more straightforward relationship between regulations and climate impacts. We conclude with some implications of this research for different options regarding the regulation of hydrofluorocarbons (HFCs).

Space Transportation, Geoengineering, and Global Change

Martin N. Ross and Darin W. Toohey
The Aerospace Corporation and University of Colorado

Space travel plays an integral part in human activities. In coming decades, space sector growth will be characterized by more frequent launches, increasing commercialization, greater use of hydrocarbon (HC) rocket engines, and establishment of new missions, such as space tourism. Thus the amounts of rocket emissions are likely to increase, possibly to the point of causing discernable changes in the global atmosphere. Rocket emissions consist mainly of CO2, H2O, chlorine compounds, and particles in different combinations according to engine type. HC and solid rocket motor (SRM) engines are of particular interest since they emit submicron black carbon (BC) and Al2O3 (alumina) particles, respectively, that accumulate in the stratosphere over many years of launches, absorbing and scattering solar and terrestrial radiation. Recent research shows that for HC rockets, the radiative forcing from BC emissions exceeds the forcing from CO2 and H2O by several orders of magnitude and that the net forcing by alumina particles may be positive or negative, depending on yet to be discovered details of alumina microphysics. Interestingly, BC and alumina particles have been proposed as climate geoengineering agents, utilizing their optical properties and long stratospheric lifetimes to control radiation flows in the atmosphere. Rocket emissions then, by similarity of function, might be viewed as a type of low intensity geoengineering experiment that could help our understanding of geoengineering processes in the stratosphere. At the same time, the similarity could potentially bring rockets under future regulation regarding intentional injections of particles into the stratosphere. It is very important therefore to fully understand rocket emissions, their global impacts, and rockets' relationship with purposeful modification of the stratosphere. Here we review rocket emissions, their global impacts, the putative similarity with geoengineering, and propose a program of measurement and modeling intended to avoid any entanglement between space launch and geoengineering.

Brief History of Stratospheric Ozone Research

Rolf Müller
Forschungszentrum Jülich (IEK-7)

Ozone is one of the most important trace species in the atmosphere. Therefore, also the history of research on ozone has received much attention. A short overview of ozone research (with a focus on the stratosphere) is given, starting from the first atmospheric measurements and ending with current developments. It is valuable to study the history of ozone research, because much can be learned for current research from an understanding how relevant previous discoveries were made. Moreover, since the 1970s, the history of ozone research encompasses also the history of the human impact on the ozone layer and thus the history of policy measures taken to protect the ozone layer, in particular the Montreal protocol and its amendments and adjustments. The history of this development is particularly important because it may serve as a prototype for the development of policy measures for the challenging question on how to protect the Earth's climate.

Building on the Success of the Montreal Protocol

Mack McFarland
DuPont Chemicals and Fluoroproducts

The Montreal Protocol is well known for its ongoing success in protecting both stratospheric ozone and climate. Key to that success is a predictable regulatory structure that fosters innovation within industry to provide alternative technologies and products to meet the societal needs previously served by ozone depleting substances. The ODP weighted reduction schedules that are modified in response to both improved scientific information and technological developments provide the certainty that businesses need to develop and deploy new products. Parties to the Protocol now have the opportunity to build on the success by amending the Protocol to cap and reduce HFCs on a GWP-weighted basis.

The Long-term Trend Of Airborne Measurements from 1996 to 2011: O3 and its Precursors in Mid-Atlantic Region

Hao He, Jeffery Stehr, Lackson Marufu, Konstantin Vinnikov, and Russell Dickerson
Dept. of Atmospheric and Oceanic Science, University of Maryland

During the O3 season (June 1st to September 30th) for the last 15 years, the Regional Atmospheric Measurements, Modeling and Prediction Program (RAMMPP) at the University of Maryland conducted research flights to observe the tropospheric O3 and its precursor (CO) over Mid-Atlantic region. Preliminary results indicated the decreasing trend of tropospheric O3 and CO columns, which agreed with the reported surface observation trend and emission trend. Good correlation between surface O3 concentrations and column O3 contents was observed. Under the Clean Air Act, the emission data from power plants monitored by USEPA demonstrated significant decrease in major air pollutants during the last decade, and we used the high resolution emission data to investigate their effects on tropospheric O3 production. The reduction of air pollutant emissions up stream, especially NOx, plays an important role in tropospheric O3 reduction in Mid-Atlantic region. Statistical analysis of large number of airborne measurements revealed that the tropospheric O3 columns were correlated to the temperature, when the O3 column contents were normalized for surface temperature. Under the climate change scenario, the climate penalty of tropospheric O3 observed in our study is crucial for the public policy in future.

Science, Policy and Scientific Societies

Michael J. McPhaden
NOAA Pacific Marine Environmental Lab

Stratospheric ozone depletion and climate change are two great challenges in Earth science that have profound societal consequences.

Policy debates about how to address problems like these benefit from a clear articulation of the underlying scientific issues. Scientific societies have an important role to play through engaging with the public and policy makers as honest brokers of authoritative scientific information. This presentation discusses recent efforts by the American Geophysical Union to become more

engaged on issues related to Earth science, particularly in regards to climate change.

Welcoming Remarks from the American Meteorological Society

Jonathan T. Malay
American Meteorological Society

The president of the AMS welcomes attendees to the 2011 IYC Symposium on Strospheric Ozone and Climate Change. Among the 14,000 members of the AMS, there are professionals in the academic, government, and private sectors who are deeply engaged in the scientific challenges being addressed in this conference. Atmospheric physicists and chemists, climate research and operational prediction specialists, information technology developers, satellite remote sensing scientists and engineers, government policy makers, and even social scientists all come together under the AMS roof to collaborate, publish, and apply knowledge toward understanding the complex topics we are addressing here in Washington. And so we are grateful for this opportunity to discuss the work of the AMS in promoting comprehensive and responsible science and effective communication among the scientific community and with society, which is increasingly and profoundly affected by our ever-changing climate.

Stratospheric Ozone and Climate Change: Integration between Science and Policy

Bob Watson
Chief Scientific Advisor, Defra Strategic Director of the Tyndall Center, UEA

Human activities have changed the abundance of stratospheric ozone and are changing the Earth's climate. The Montreal Protocol and its amendments and adjustments have effectively eliminated the emissions of ozone-destroying gases (chlorinated and brominated halocarbons), where-as little or no progress is being made in limiting the emissions of greenhouse gases. Hence, while the stratospheric ozone layer is expected to recover in the decades ahead, further human-induced climate change is inevitable. The question is not will the Earth's climate change in response to human activities, but where, when and by how much. Projected changes in climate during the 21st century will occur faster than in at least the past 10,000 years.

International assessments of stratospheric ozone and climate change have been influential in national and international policy formulation by providing credible, peer-reviewed knowledge as the basis for informed policy formulation, identifying what is known, what is unknown, what is controversial and what is uncertain. In each case the assessments addressed: (i) the underlying science, i.e., the physical and chemical processes controlling stratospheric ozone layer, and the Earth's climate: (ii) the impacts of stratospheric ozone, and climate change, on socio-economic sectors, ecological systems and human health; and (iii) the economics of, and technological approaches to, reduce stratospheric ozone depletion, and climate change. The assessments were policy relevant but not policy prescriptive.

The major challenge is to simultaneously limit the rate and magnitude of human-induced climate change by reducing greenhouse gas emissions from all sectors and to reduce the vulnerability of socio-economic sectors, ecological systems and human health to climate variability and change by integrating climate concerns into sectoral and national economic planning.

The challenge is to negotiate a long-term global equitable regulatory framework which can reduce emissions at a level limiting the increase in global mean surface temperature to as close as possible to 2oC above pre-industrial levels. However, we must recognize that the world is currently on a course that will lead to an increase of 3-5oC.

SESSION 2: RESEARCH IN CLIMATE CHANGE: CURRENT STATUS, UNCERTAINTIES, AND CHALLENGES

A Comparison of Polar Vortex Trend Induced by Ozone Depletion and Tropical Ocean Warming and its Implication

Li Shuanglin
Institute of Atmospheric Physics

Atmospheric circulation changes during boreal winter of the second half of the twentieth century exhibited a deepening trend in both the northern and southern polar vortex. This has occurred in concert with other trends in the climate system, most notably ozone depletion in the polar stratosphere over the Antarctic as well as a warming of the tropical Indian-Pacific Ocean. This study explores whether the tropical Indian-Pacific Ocean warming played a role in forcing these polar vortex trends, and also compares the influences with those induced by radiative cooling due to ozone depletion. Five different atmospheric general circulation models (AGCMs) are forced with an idealized, transient warming of Indian-Pacific Ocean sea surface temperature anomalies (SSTA); the results indicate that the warming in both the Indian and Pacific Ocean offset the deepening tread of the southern polar vortex. The result implies that the tropical Indian-Pacific Ocean warming may have partly cancelled the influence of the stratospheric ozone depletion over the southern polar area, which itself forced a deepening trend of the southern polar vortex. This explains that the modeled ozone-depletion induced atmospheric cooling in previous studies is stronger than the observed. Diagnosis of the physical mechanisms for the polar vortex responses indicates that the direct impact of the diabatic heating induced by the Indian-Pacific Ocean warming does not account for the response in the polar vortex. Instead, interactions between the forced stationary wave anomalies and transient eddies in the troposphere and the upward propagation of quasi-stationary planetary wave are key for the formation of polar vortex responses.

The Imprint of Atmospheric Composition and Other Radiative Forcings on the Stratospheric Temperature Evolution and Vertical Profile of Temperature Change

V. Ramaswamy, M. D. Schwarzkopf, J. Austin, L. Horowitz, and H. Levy
NOAA/ GFDL

Using GFDL's latest global coupled chemistry-climate model (CM3), we analyze the influence of atmospheric composition on the stratospheric temperatures through the 20th Century and the anticipated effects over the 21st Century, with the objective being to delineate the contributions by the different radiative forcing agents. The CM3 model has a coupled atmosphere-ocean system, and represents a significant advancement from the GFDL model used in IPCC AR4 (2007). The atmospheric component comprises interactive chemistry, radiation, convection and dynamics from the surface to 60 km, and is able to simulate the prognostic changes in ozone from the past to the present and under the emission scenarios in the future. The model also accounts for aerosol microphysics and aerosol-cloud interactions, with prognostic equations for the important chemical tracers, aerosols and clouds. Using the recently available stratospheric temperature observations, we diagnose the roles of the natural and anthropogenic forcings in the different parts of the stratosphere. We also analyze their role in determining the structure of the change in the vertical profile of global temperatures, in particular the contrast between the tropospheric and stratospheric evolution. The analysis is performed for the period during which ozone has declined, its behavior in the present times, and its evolution into the future under the scenarios. We compare the latest findings with earlier model results, and also evaluate the consistency between the ozone and temperature fields on the annual and seasonal, and global and zonal scales. We investigate the extent to which the stratosphere has responded radiatively, and the role of dynamics in responding to the radiative perturbations.

Improvement of the GEOS-5 AGCM Upon Updating the Air-Sea Roughness Parameterization

Dr. Chaim Garfinkel
Johns Hopkins

The impact of an air-sea roughness parameterization over the ocean that more closely matches recent observations of air-sea exchange is examined in the NASA Goddard Earth Observing System, version 5 (GEOS-5) atmospheric general circulation model. Surface wind biases in the GEOS-5 AGCM are decreased by up to 1.2m/s. The new parameterization also has implications aloft as improvements extend into the stratosphere. Many other GCMs (both for operational weather forecasting and climate) use a similar class of parameterization for their air-sea roughness scheme. We therefore expect that results from GEOS-5 are relevant to other models as well. These results highlight the continued need to improve climate models.

Long-term and Global Impacts of Aerosols on Clouds and Precipitation

Zhanqing Li, Feng Niu, Jiwen Fan,
Yangang Liu, Daniel Rosenfeld, Yanni Ding
University of Maryland

Aerosol has been widely recognized as a key climate agent that can alter both energy and water cycles and thus impinges significantly upon earth's climate. To a large extent, its impact on the water cycle is unclear. It can affect clouds and precipitation in a variety of ways that can either suppress or foster its development depending on individual conditions but the overall effect is poorly known. Using a 10-year dataset of extensive Atmospheric Radiation Measurements (ARM) collected in the U. S. Southern Great Plains and global A-Train satellite observations, the long-term and global impact of aerosols on cloud and rainfall frequency is revealed and various effects are sorted out under different meteorological and cloud conditions. Cloud top height and thickness are found to increase (most significantly in summer) with aerosol concentration measured near the ground for warm-based mixed-phase clouds of tops below -4°C, but little changes are found for pure liquid or ice clouds, and for clouds with high cloud bases. The response of precipitation depends on cloud liquid water content: increasing for deep clouds with high water content and decreasing for clouds with low water content. The observational findings are reproduced with a cloud-resolving model. They provide unprecedented evidence of strong long-term net effects of aerosols on clouds and precipitation and confirm the underlying fundamental physical mechanisms. These findings have significant implications for anthropogenic influences on Earth's climate and its changes, and even for sustainable economic development.

El-Niño and its Relationship to Changing Background Conditions in Ocean and Atmosphere

U. K. Singh1, V. Kumar2 and Joong-Bae Ahn3
APEC Climate Center (APCC)

This study addresses the question of whether the decadal changing background conditions in ocean and atmosphere is consistent with global warming and increasing extreme weather events. Simple theories suggest that global warming will reduce the strength of the mean tropical atmospheric circulation. Observed Indo-Pacific sea level pressure reveals a weakening of the Walker circulation. The size of this pattern is consistent with theoretical predictions, is accurately reproduced by climate model simulations. Our analysis uses high-quality satellite and in situ ocean data combined with wind data from atmospheric reanalyses for the past 30 years (1981-2010). We find contrast decadal changes in background conditions for sea surface temperature (SST), wind at 850 hPa, sea level pressure (SLP) velocity potential at 200 hPa with East-West ascending and descending branches of Walker circulation that are opposite to what is expected. A plausible interpretation of these results is that the character of El Niño over the past 30 years has varied naturally and that these variations projected onto changes in the background state because of the asymmetric spatial structures of central Pacific and Eastern Pacific El Niño's.

The Impact of Volcanoes and Ocean Circulation on Globally Averaged Surface Temperature

Tim Canty, Nora R. Mascioli and Ross Salawitch
University of Maryland

We examine globally averaged surface temperature, from 1900 to present, in terms of the historical change in external factors that drive radiative forcing at the tropopause, such as greenhouse gases, anthropogenic aerosols, solar irradiance, volcanic aerosols, and sea surface temperature. We show remarkably close consistency between modeled and measured surface temperature can

be achieved when the temporal variation in the exchange of heat between the atmosphere and ocean is considered. We find that perturbations to stratospheric aerosol loading by injection of sulfate aerosols following the eruptions of Mt. Pinatubo and other volcanoes during the modern instrument record have a much smaller influence on global temperature than has previously been found by analyses that did not consider exchange of heat between the oceans and atmosphere. If we are to use the eruption of Mt. Pinatubo as an analog for the geo-engineering of climate, then a much larger mass injection of sulfur to the stratosphere will be needed to achieve a particular level of cooling than is commonly described in most geo-engineering studies.

Dependence of Aerosol Effect on Meteorological Variables

Yanni Ding, Zhanqing Li
University of Maryland, College Park

Generally, aerosols influence cloud development and precipitation process through suppression effect on shallow clouds and invigoration effects on deep convective clouds. However, it is not always the case if the meteorological variables change. Previous studies have shown the possibility of anti-Twomey effect. And some model simulations have shown that wind shear and relative humidity (RH) can regulate aerosol's invigoration effects. This study attempts to identify and evaluate the dependence of aerosol effects on meteorological variables using long-term observational data in ARM SGP site. Various factors such as RH, wind shear, column water vapor, and surface fluxes will be investigated.

Effects of Ozone Depletion on the Seasonal Evolution of the Southern Hemisphere Polar Vortex and Climate

A. Orr (1), T. J. Bracegirdle (1), J. Scott Hosking (1), W. Feng (2), H. R. Roscoe (1), J. D. Haigh (3), and T. Phillips (1)
1 - British Antarctic Survey, UK; 2 - University of Leeds, UK; 3 - Imperial College London, UK

Both reanalyses data and a HadGEM3-A model simulation forced by prescribed ozone depletion and reanalyses data show, by separating the temperature tendency into radiative and dynamical contributions, that the substantial late spring/early summer (i.e., November-December) cooling of the polar stratosphere associated with the Antarctic ozone hole is primarily controlled by dynamical heating. During November when the temperature anomaly is greatest, there is a strong increase in radiative cooling above ~200 hPa in response to ozone depletion, which is: i) almost cancelled out above ~100 hPa by an increase in dynamical heating, and ii) enhanced between ~300 and ~100 hPa by a decrease in dynamical heating; giving a net cooling. During December when the anomalous cold temperatures weaken, the increase in radiative cooling in response to ozone depletion diminishes and only partly cancels an increase in dynamical heating, giving a net warming. The changes in dynamical heating are driven by the Brewer-Dobson circulation arising from the dissipation of both resolved and parametrized sub-grid scale waves. These results help to explain the effect of ozone depletion on the seasonal evolution of the Southern Hemisphere (SH) polar vortex and will help to enable improved simulation of the SH climate.

Fossil Energy, CO2, Climate Change, and the Aerosol Problem

Stephen E Schwartz
Brookhaven National Laboratory

Climate change due to increasing atmospheric carbon dioxide differs from stratospheric ozone depletion, regional air pollution, and acid deposition, because emission of CO2 is intrinsically coupled to production of the energy on which our industrial society relies. Unlike chlorofluorocarbons there are no readily available substitutes, and unlike sulfur or nitrogen oxides and hydrocarbons, CO2 can be removed from the waste stream only with difficulty and great expense (energy penalty). Consequently, until alternative energy sources are developed or a practical means of sequestering CO2 is developed, we are faced with continued CO2 emissions. Determining how much more CO2 can be emitted into the atmosphere consistent with a given allowable increase in global temperature above preindustrial, e.g., 2°C, requires knowledge of Earth's climate sensitivity, the increase in global temperature per increase in radiative forcing, which is uncertain by about a factor of 2. The observed increase in temperature over the twentieth century is well less than that which would be expected from radiative forcing by incremental greenhouse gases alone together with the current best estimates of climate sensitivity and planetary energy imbalance. Possible explanations are a lower climate sensitivity and/or partial offset of the greenhouse gas forcing due to cooling forcing by tropospheric aerosols; as aerosols, unlike CO2, are short-lived in the atmosphere, reduction of emission of aerosols and precursor gases

would reveal the committed warming that has been masked by the aerosol cooling forcing. Allowable future CO2 emissions so as not to commit the planet to a temperature increase of 2ºC above preindustrial are at most a few decades at present emission rates; the possibility that Earth is already committed to such a temperature increase cannot be ruled out. These considerations conspire to make climate change a challenging scientific problem and an enormously difficult societal issue.

The Context from Past Climates

Gerald R. North
Texas A&M University

There is convincing evidence that the earth's climate has changed many times over the ages. Analysis of reliable evidence suggests that the warming of the past century is very unusual when seen in the bigger picture. The recent warming is unlikely to be due to internal mechanisms, leaving human activities the most likely cause of global warming. Understanding past climates comes from analysis of data from a surprising variety of sources and then reconciling the empirical findings with our physics-based computer models of the climate system. Understanding climate changes across the deep past helps us to put climate change into perspective. The same computer models used in the next century's climate forecasts are being tested on the past.

Retrospective-analyses and the Changing Observing System

Michael G. Bosilovich
NASA GSFC Global Modeling and Assimilation Office

Retrospective-analyses (or reanalyses) blend the irregularly distributed global observing network with the latest Earth system models to produce globally continuous fields of data. While the techniques were developed and continue to provide initial conditions for weather and more recently seasonal predictions, reanalyses have become widely used in evaluating the present understanding of the state of the climate and climate variability. However, as the observing system changes, new instruments are developed and old technology fades, a fundamental limitation in reanalyses is revealed where the the observations that are assimilated have a profound affect on the climate. As the observing system changes, the reanalysis climate also changes, thereby limiting their use for climate change studies. Here, we stress the need for a diverse and continuous Earth observing system, as demonstrated through the impact that observations have on reanalyses.

Climate Models of the Future

David Randall
Colorado State University

Climate models of the future will have much higher spatial resolution than today's models. In addition to providing more regional detail, higher resolution makes it possible to parameterize less, so that the models are more closely linked to the basic physics of the climate system. Future models will also incorporate additional processes, including ice sheets, biology, and possibly human affairs. Future models will be tested in part through weather forecasting. These developments will require a larger scientific workforce, with higher costs. Uncertainties in the representation of physical processes will decrease, but our climate predictions will still be limited by uncertain emissions scenarios.

Session 3: Current research in stratospheric chemistry and dynamics

Total Atmospheric Ozone: Past and Future

Judith L. Lean
Naval Research Laboratory

Understanding and forecasting long term changes in atmospheric ozone requires reliable knowledge of both the natural and anthropogenic processes that influence stratospheric temperature, composition and dynamics. These include solar and volcanic activity, internal oscillations such as the quasi-biennial oscillation, anthropogenic chlorine gases that deplete ozone chemically and anthropogenic greenhouse gases that cool the stratosphere.

By using multiple linear regression to decompose the long-term space-based records of total atmospheric ozone and lower stratospheric temperature into individual variability components, it is possible to reconstruct total ozone and stratospheric temperature during the past century, and to forecast levels in the future century for adopted scenarios of the natural and anthropogenic influences. Such an analysis indicates that global total ozone was at an historical maximum in the late 1950?? and subsequently declined to minimum levels in mid 1990. Global ozone is now increasing and expected to reach 1980 levels during 2025-2035, following which levels will continue increasing throughout the remainder of the century. Around 2040 the amount of global total ozone will exceed all values in the prior century.

Declining global ozone from the mid 1950s to the mid1990s accompanied a long-term decline in lower stratosphere temperature. But whereas ozone is forecast to increase steadily during the 21st century, global stratospheric temperature is forecast to remain approximately constant because stratospheric warming associated with declining chlorine gases counters cooling by increasing greenhouse gases.

Thus, around 2040, when global atmospheric ozone levels are expected to exceed historical levels, the biological consequences of anthropogenic ozone change will reverse; concern about reduced surface UVA and UVB radiation, with consequent vitamin D deficiencies that compromise bone, cancer, autoimmune and mental health, will motivate radically different health policies than those of past decades that seek to mitigate the biological impacts of excess solar UV light associated with anthropogenic ozone depletion.

Understanding Late Winter Variability in the Arctic: How Unusual was 2011?

Margaret M. Hurwitz, Paul A. Newman and Chaim I. Garfinkel
GESTAR, Morgan State University

The Arctic stratosphere is highly variable in winter. Though El Niño/Southern Oscillation (ENSO) and the phase of the quasi-biennial oscillation (QBO) are known to modulate the strength of the Arctic vortex in mid-winter, the influence of ENSO and the QBO does not persist into March. The role of climate change, among other factors, is poorly constrained. Better understanding the causes of late winter variability will improve predictions of Arctic ozone loss and the interpretation of long-term trends.

Despite the record ozone loss observed in late winter 2011, dynamical conditions in the Arctic stratosphere were unusual but not unprecedented. Weak planetary wave driving in February preceded cold anomalies in the polar lower stratosphere in March and a relatively late breakup of the Arctic vortex in April. Similar conditions were observed in 1997. Observations show that Arctic lower stratospheric temperatures in March are anti-correlated with sea surface temperature (SST) in the North Pacific: SST anomalies were strongly positive in both 1997 and 2011. The Goddard Earth Observing System Chemistry-Climate Model, Version 2 (GEOS V2 CCM) simulations are used to substantiate this finding. Two GEOS V2 CCM ensembles consist of many forecasts of the Northern Hemisphere winter and early spring. The ensembles differ only by the SST boundary conditions north of 20??N, isolating the impact of North Pacific SSTs on dynamics and ozone in the Arctic stratosphere in late winter.

A Stratospheric Ozone Climatology from Global Ozone Soundings and Trajectory Statistics

Jane J. Liu, David Tarasick , Vitali Fioletov, Chris McLinden, Guiping Liu, Christopher Sioris, Huixia He, Jinjian Jin
Environment Canada

An understanding of the stratospheric ozone distribution is a critical step to assess the impact of its variability on climate change. In earlier studies, stratospheric ozone climatologies have been generated in

3-D (latitude, longitude, and altitude) or 4-D (latitude, longitude, altitude, and time) from either satellite data or photochemical models. In this study, a domain-filling trajectory method is explored to generate a global ozone climatology from ozonesonde data. The trajectory technique provides a powerful tool to integrate sparse ozonesonde measurements. The objectives are to create an ozone climatology for model and satellite retrieval a priori, trend analysis, tropospheric-stratospheric exchange research, and ozone-climate interaction studies.

We employ over 45,000 ozone soundings at 116 stations over 44 years (1965-2008) from the World Ozone and Ultraviolet Radiation Data Centre (WOUDC). Forward and back- trajectories are performed for 4 days each from each sounding, driven by NCEP reanalysis data using the HYSPLIT (Hybrid Single Particle Lagrangian Integrated Trajectory Model) from the NOAA Air Resources Laboratory. The resulting global ozone climatology is archived for five decades from 1960s to 2000s with a grid size of 5 by 5 degrees and 1 kilometer vertically.

This climatology dataset is tested at selected stations by comparing the actual ozone sounding profile with that found through the trajectory technique, using the ozone soundings at all the stations except one being tested. The two sets of profiles are in reasonable agreement with maximum differences about 20% in the stratosphere.

This ozone climatology is independent of any photochemical model. It reveals strong longitudinal variation in ozone and covers higher latitudes than current satellite data. We will show results using this data set as the a priori in a photochemical model at Environment Canada. Variability in ozone on seasonal and decadal scales will be discussed.

The Ozone Layer of the Future: Where Are We Going?

Theodore G. Shepherd
University of Toronto

Over the rest of this century, the ozone layer is expected to recover from the effects of the ozone-depleting substances controlled by the Montreal Protocol and its amendments and adjustments. However at the same time the ozone layer will be affected by other anthropogenic perturbations to the atmosphere, including changes in the abundances of other gases that deplete stratospheric ozone, the cooling of the stratosphere from increasing carbon dioxide, and changes in the stratospheric circulation driven by tropospheric climate change. These processes can either increase or decrease the stratospheric ozone abundance, with marked regional differences. This talk will provide an overview of the various factors that will determine the ozone layer of the future, and our best estimate of how these factors will play out quantitatively.

The Increase of Southern Ocean Winds and SAM is Caused by the Ozone Hole Rather than by Increased Greenhouse Gases

Howard K Roscoe
British Antarctic Survey

The amplitude of the Southern Annular Mode of variability in sea level pressure has increased significantly since station records began in the late 1950s. As expected, this has led to an increase in surface winds over the Southern Ocean in meteorological analyses. Roscoe and Haigh (2007), using data to 2006, showed that the increase in SAM correlated at high significance with both the ozone hole and the increase in greenhouse gases. The correlation with the ozone hole was more significant, but it was difficult to quantify the meaning of this greater significance without esoteric statistical concepts. In this update to 2010 and using the more familiar statistics of Student's t-test, it is clear that correlation with the ozone hole is highly significant whereas correlation with increased greenhouse cases has negligible significance.

The Impact of the Antarctic Ozone Hole on the Troposphere and Surface Climate

Darryn Waugh
Johns Hopkins University

The impact of stratospheric ozone depletion on Southern Hemisphere climate and weather is examined using meteorological analyzes together with a hierarchy of models, ranging from idealized general circulation models to realistic chemistry-climate models. Data show robust changes over the last thirty years in the summertime atmospheric circulation, with changes occurring from the polar regions to the subtropics, and from the stratosphere to the surface. Examples include a poleward intensification of the westerly jet, a poleward expansion of the Hadley cell, and an increase in mid-latitude Rossby wave breaking and cut-off lows. It shown that consistent changes occur in simulations using climate

models with (either prescribed or simulated) ozone depletion, but not in simulations that differ only in their greenhouse gas concentrations and sea surface temperatures. This indicates that the observed changes in the SH circulation are predominantly due to the formation of the stratospheric ozone hole. Possible mechanisms causing these changes, as well as model projections for the 21st century, are also discussed.

Operational Ozone Sensors

L. E. Flynn, D. Loyola, F-X Huang, W-H Wang, D. Rault, C.T. Beck, C. Long, S. Kondragunta
NOAA

The last two decades have seen exceptional advances in research sensors and data products for atmospheric chemistry studies. These advances are moving forward into the operational arena. This poster will present information on the measurements, capabilities and applications for the new set of ozone sensors operated by meteorological agencies concentrating on those making solar backscatter measurements in the Ultraviolet. The instruments covered include the NOAA/NASA Ozone Mapping and Profiler Suite (OMPS–with the first suite scheduled for launch on the NPP spacecraft in October 2011), the EuMetSat Global Ozone Monitoring Experiment (GOME-2–on MetOp-A and scheduled for launch on MetOp-B in April 2012), the CMA Solar Backscatter Ultraviolet Sounders and Total Ozone Units (SBUS and TOU–on FY-3a and FY-3b), and the NOAA Solar Backscatter Ultraviolet instruments (SBUV/2–on POES-16, 17, 18, and 19 and previously on POES-9, -11, and -14 as follow ons to NASA NIMBUS-7 SBUV).

The OMPS Nadir Mapper and Nadir Profiler are designed to continue the total column ozone and ozone profile Climate Data Records of the heritage SBUV(/2) series of instruments over the next two decades. These data record extend unbroken from 1979 to the present. New and improved products, including estimates of atmospheric NO2 and SO2 concentrations from GOME-2, are providing key information for air quality monitoring studies. The BUV instruments are also continuing to document global properties of cloud and aerosols in the Ultraviolet.

The Quasi-biennial and Semi-annual Oscillation Features of Tropical O3, NO2, and NO3 Revealed by GOMOS Satellite Observations

LIU Yi (1), LU ChunHui (1)and KYRÖLÄ Erkki (2)
(1)Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing, China;(2)Finnish Meteorological Institute, Earth Observation, Helsinki, Finland

The Quasi-Biennial Oscillation (QBO) and Semi-Annual Oscillation (SAO) characteristics of O3, NO2, and NO3 from 2002 to 2008 were analyzed using Global Ozone Monitoring by Occultation of Stars (GOMOS) satellite observations. From investigations of the vertical and latitudinal structures of interannual anomalies for O3 and the vertical velocity of the residual circulation (w-star), we conclude that dynamic transport is the principal factor controlling the QBO pattern of O3. Under the influence of vertical transport, the QBO signals of O3 originate in the middle stratosphere and propagate downward along with the w-star anomalies over the equator. The residual circulation has a significant role in tropical regions, regardless of altitude, while in extratropical regions, dynamic effects are important in some years in the lower stratosphere. In the middle stratosphere, dynamic transport is most efficient in the Southern Hemisphere. We also analyzed NO2 anomalies and found that their QBO pattern was deep and stationary in the middle and upper stratosphere over the equator. This was due to the large depth over which w-star was anomalous. The latitudinal structure of NO2 was asymmetric in extratropical areas in the middle stratosphere, but in the upper layers, the QBO pattern and dynamic influences were only observed in tropical zones. The interannual anomalies of NO3 had an apparent SAO pattern in the tropical upper stratosphere because of different dynamic and chemical effects in different SAO phases. Chemical reactions may also have contributed to the QBO-type distribution of NO2 and the SAO-type distribution of NO3.

Stratospheric Ozone Chemistry in the Antarctic: What Controls the Lowest Values That Can Be Reached and Their Recovery?

J.-U. Grooß(1), K. Brautzsch (1), R. Pommrich (1,2), S. Solomon (3), and R. Müller (1)
(1) Forschungszentrum Jülich, Germany, (2) Universite de Toulouse, France, (3) University of Colorado, Boulder, CO, USA

Balloon-borne observations of ozone from Antarctic stations have been reported to reach ozone mixing ratios as low as about 10 ppbv at the 70 hPa level by late September. After reaching a minimum, ozone mixing ratios then increase to the ppmv level by late December. While the basic mechanisms causing the ozone hole have been known for more than 20 years, the detailed chemical processes controlling how low the local concentration can fall, and how it recovers from the minimum have not been explored so far. Both of these aspects are investigated here by analysing results from the Chemical Lagrangian Model of the Stratosphere (CLaMS). We discuss the processes responsible for stopping of the catalytic ozone depletion. We show that an irreversible chlorine deactivation into HCl can occur either when ozone drops to very low values or by temperatures increasing above the PSC threshold in these simulations. As a consequence, the timing and mixing ratio of the minimum depends sensitively on model parameters including the ozone initialisation.

The subsequent observed ozone increase between October and December is linked not only to transport, but also to photochemical ozone production, caused by oxygen photolysis and by the oxidation of carbon monoxide and methane.

Polar Stratospheric Clouds and Aerosols and their Impact on the Ozone Layer

Owen B. Toon
University of Colorado

Polar stratospheric clouds have been recorded for more than a century in both the Arctic and Antarctic. The clouds are often beautiful, colored like the insides of an abalone shell, and therefore sometimes called "Mother of Pearl" or nacreous clouds. While it was long suspected that these clouds are composed of frozen water, as indeed the clouds most easily seen from the ground are, a visually fainter, but geographically more wide spread set of clouds is composed or nitric acid. Clouds of sulfuric acid also occur throughout the stratosphere, and are particularly abundant, even visually obvious, after large volcanic eruptions. Each of these various types of clouds can impact the ozone layer, because chemical reactions occur on their surfaces that drive most of the chemistry that lies behind global stratospheric ozone loss. Some of these clouds are also involved in climate change. For instance, volcanic sulfuric acid clouds cause short term climate changes that have had significant impacts on society, such as causing the "year without a summer" in 1816 after the Tambora eruption. Some suggest humans should create artificial stratospheric sulfuric acid clouds to "Geo-Engineer" the climate, and cool it to oppose the greenhouse effect. Uncertainties abound in our understanding for these particle systems. Some issues touched upon in this talk include: What role do polar stratospheric clouds play in the climate system? Which of these various types of clouds is most important for Arctic ozone loss? How will these clouds change as the Earth? surface warms, and the stratosphere cools due to added greenhouse gases?

Tracking Stratospheric Ozone Recovery From Ground-based Measurements - Yes We Need Them

Samuel J. Oltmans, I Petropavlovskikh, B. Hassler, B. Johnson. D. Tarasick, J. Staehelin, H. Claude, R. Stubi, R. Evans, J. Harris
CIRES, University of Colorado

Continuous ground-based measurements of total column ozone (primarily stratospheric ozone) have been made from Arosa, Switzerland from the 1920s. Geographically comprehensive measurements exist from the 1960s including measurements from Antarctica. The longest continuous in situ records of the ozone profile also date from the 1960s. These long measurement records provide a unique perspective on the perturbation to the ozone layer resulting from the addition of long-lived halogen substances that led to stratospheric ozone loss dating primarily from the 1980s. The marked decline, bottoming out, and hints of recovery of ozone in the stratosphere are well represented by these long-term records. In the Antarctic where the dramatic loss of ozone in the spring continues as an annual occurrence to the still susceptible Arctic, the ground-based measurements, particularly the profile observations, elucidate the roles of chemical loss and atmospheric dynamical variability. Without these key ground-based observations the future development of stratospheric ozone change will be less well described and understood.

How Complete is Our Understanding of Polar Ozone Depletion?

Rolf Müller, Marc von Hobe, Fred Stroh, and the RECONCILE science team
Forschungszentrum Jülich (IEK-7)

The effects of the Montreal Protocol will highly likely result in ozone recovery over the next decades. In the long run, climate change and possible geoengineering ventures to mitigate climate change may radically alter the temperature, circulation patterns and chemical composition in the stratosphere. To realistically predict the response of the ozone layer to these changes and the future evolution of Arctic ozone, a complete and correct representation of all relevant processes in chemistry climate models is necessary. However, full quantitative understanding of polar ozone depletion is still lacking, and important questions are not yet fully answered, including:

What is the exact rate of ClO dimer photolysis, the most critical kinetic parameter driving the above-mentioned catalytic ozone destruction cycles?

What is the role of chlorine activation on cold liquid binary aerosol?

By what exact mechanisms, on what material, and at what exact rates does NAT nucleate, and how does this impact the formation of very large NAT particles—the so-called NAT rocks—and denitrification?

How fast is transport and mixing at the vortex edge, and how does this influence various methods of estimating vortex ozone loss?

The EU project RECONCILE aims to answer these and other important questions quantitatively. This presentation will give a concise overview of—here we stand—in our efforts to complete our understanding of polar ozone depletion and implement it in large scale chemistry climate models (CCMs).

The Chemical Sensitivity of Stratospheric Ozone to Nitrous Oxide and Methane

Laura Revell, Greg Bodeker, Petra Huck, Dan Smale, Bryce Williamson, Ross Salawitch and Tim Canty
University of Canterbury

The sensitivity of the evolution of stratospheric ozone through the 21st century to different emissions scenarios for N2O and CH4 has been assessed. N2O and CH4, the two primary anthropogenic greenhouse gases after CO2, cause ozone depletion when they are converted to active nitrogen oxides (NOx) and active hydrogen oxides (HOx), respectively. Projected increases in N2O and CH4 emissions through the 21st century are expected to lead to changes in ozone. Eight simulations for the period 2015 to 2100 were performed with the Niwa-SOCOL chemistry-climate model (CCM). The greenhouse gas emissions boundary conditions generally follow the IPCC SRES A1B scenario. For four simulations, the prescribed N2O emissions were replaced with each of the four representative concentration pathway (RCP) emission scenarios for N2O. For the other four simulations, the CH4 emissions were replaced with each of the four RCP scenarios for CH4. For each simulation, the contributions of 15 catalytic chemical cycles to ozone destruction (including three nitrogen cycles and five hydrogen cycles) were accumulated into daily means within each model grid cell. The effects of cycles on ozone loss are typically examined as functions of latitude and altitude. The results from this study are likely to be relevant for assessing the effects on ozone of different greenhouse gas emission mitigation strategies.

Unprecedented Arctic Ozone Loss in 2011: Context Based on Seven Years of Global Aura Microwave Limb Sounder Observations

Michelle L. Santee, Gloria L.. Manney, Nathaniel J. Livesey, Markus Rex
Jet Propulsion Laboratory

Since the emergence of the Antarctic "ozone hole" in the 1980s and subsequent elucidation of the chemical mechanisms and meteorological conditions involved in its formation, the likelihood of extreme ozone depletion over the Arctic has been debated. Similar processes are at work in the polar lower stratosphere in both hemispheres, but differences in the evolution of the winter polar vortex and associated polar temperatures have in the past led to vastly disparate degrees of springtime ozone destruction in the Arctic and Antarctic. In the 2010/2011 Arctic winter/spring, however, the lower stratosphere was characterized by an anomalously prolonged continuously cold period. The persistence of a strong, cold polar vortex from December 2010 through March 2011 was unmatched in the 32-year observational record. As a consequence, chemical ozone loss in spring 2011 far exceeded any previously observed over the Arctic. For the first time, sufficient loss occurred to reasonably be described as an Arctic ozone hole. The

Microwave Limb Sounder (MLS) on NASA's Aura satellite provided a comprehensive view of the processes that led to this unprecedented Arctic ozone loss. The MLS data are used to describe in detail the progression from polar stratospheric cloud formation to chlorine activation to chemical ozone loss over the 2010/2011 Arctic winter/spring. The evolution of various trace gases is compared to that observed by MLS in previous Arctic winters as well as to the corresponding evolution in the Antarctic, including in the 2011 Antarctic ozone hole season that is just concluding.

Superconducting Submillimeter-Wave Limb-Emission Sounder (SMILES) - Middle Atmospheric Observations from the International Space Station

Masato Shiotani and SMILES Mission Team
Kyoto University

The Superconducting Submillimeter-Wave Limb-Emission Sounder (SMILES) was developed to be aboard the Japanese Experiment Module (JEM) on the International Space Station. It is a cooperative project of the Japan Aerospace Exploration Agency (JAXA) and the National Institute of Information and Communications Technology (NICT). The key concept of SMILES is its high-sensitivity measurement of minor species in the middle atmosphere by a receiver using superconductor-insulator-superconductor (SIS) mixers which are cooled to 4.5 K by a mechanical cryocooler. SMILES was successfully launched on September 11, 2009, and started atmospheric observations on October 12. Unfortunately, SMILES observations had been suspended since April 21, 2010 due to the failure of a critical component in the submillimeter local oscillator. Furthermore, the cooler stopped its operation due to the failure of the JEM thermal control system on June 5, 2010.

The mission objectives are as follows: i) To demonstrate a 4-K mechanical cooler and superconducting mixers in the environment of outer space for submillimeter limb-emission sounding in the frequency bands of 624.32-626.32 GHz and 649.12-650.32 GHz and ii) To measure atmospheric minor constituents in the middle atmosphere globally (O3, HCl, ClO, HO2, HOCl, BrO, O3 isotopes, HNO3, CH3CN, etc.) in order to get a better understanding of factors and processes controlling the stratospheric ozone amounts and those related to climate change. Though future states of the ozone layer have been investigated using coupled chemistry-climate model, there are still considerable uncertainties in factors affecting ozone levels, especially the bromine budget and inorganic chlorine chemistry. The SMILES mission can contribute to the detailed halogen chemistry by providing useful constraints for these issues. In this presentation, we will give a brief description of the SMILES observations, and present some preliminary results that demonstrate SMILES abilities to observe the atmospheric minor constituents in the middle atmosphere.

Ozone Profiles Measured at South Pole Station During the 2011 Ozone Hole

B.J. Johnson1 , S.J. Oltmans2, J.H. Butler1, and I. Petropavlovskikh2
1NOAA/ESRL Global Monitoring Division, 2CIRES, University of Colorado

Vertical profiles of ozone and temperature have been measured by NOAA/ESRL Global Monitoring Division for 26 consecutive years at Amundsen Scott South Pole Station using balloon-borne electrochemical concentration cell (ECC) ozonesondes. The measurements have made an important contribution to understanding and monitoring the yearly development of the springtime ozone hole over Antarctica. Each year from early September to mid October ozone declines rapidly, especially within the main ozone layer at altitudes from 14-21 kilometers above sea level. The 2011 springtime Antarctic ozone hole was the 10th lowest as total column ozone dropped to 102 Dobson Units (DU) on October 9, 2011. This represents a 60% loss compared to the July/August pre-ozone hole value of 256 DU. The main ozone layer (14-21 kilometer) loss was similar to other severe ozone hole years showing 98% ozone destruction. Balloon flights are done each week during the entire year, with 2 to 3 per week flown during the ozone hole period in September and October. The severity of ozone depletion each season depends on active chlorine concentrations in the stratosphere, wintertime stratospheric temperatures, and the stability of the polar vortex.

NOAA Dobson Ozone Network as Part of the WMO Global Atmospheric Watch Program

R. Evans1, G. McConville2, S. Oltmans1, I. Petropavlovskikh2, D. Quincy2
1NOAA Earth System Research Laboratory, 2Cooperative Institute for Research in Environmental Sciences, University of Colorado

The Dobson instrument has been used for the determination of Total Ozone Column (TOC) since the mid-1920s, and the part of the record prior to 1979 is almost exclusively from measurements with the Dobson instrument. Measurements of the total-column ozone over South Pole have been made for 50 years with the NOAA Dobson spectrophotometer. The instrument measures the difference between the intensity of UV Solar light at selected wavelength pairs in the 300-340 nm spectral range from which the total ozone column is derived. The NOAA/OAR/ESRL Cooperative Dobson Network operates 16 of these instruments throughout the world, which is a significant portion of the global Dobson network making ground-based, column-ozone measurements. Global Monitoring Division in Boulder, CO also serves as the Central Calibration Laboratory for the measurements with Dobson instrument. All GMD network stations and almost all of the global network stations are linked to the world calibration standard maintained by GMD. Six of the Dobson instruments are automated to provide ozone vertical profiles using the Umkehr technique in addition to eight balloon-borne ozonesonde stations, including the South Pole, that provide ozone profiles to an altitude of ~32 km. From this strong complement of ozone-measuring techniques, it has been possible to measure the decline in ozone over the past two decades at mid-latitudes of the northern hemisphere and the tropics and to characterize the dramatic ozone depletion over Antarctica.

Impacts of Aircraft and Balloon Observations on Ozone Depletion Research

William Brune
Pennsylvania State University

Chemical sensors on balloons and aircraft were first to observe ozone depletion at work. Satellites, which provide a global view, came later, building on the understanding obtained with these in situ measurements. Why did balloons and aircraft have such an important role in ozone depletion research? First, we were able to quickly transform laboratory measurement concepts into critical chemical sensors loaded onto balloons and platforms. Second, by measuring tens of atmospheric chemical constituents simultaneously from these platforms, we could fit together all the pieces of the ozone depletion puzzle. Third, we were able to test how chemical constituents are related to each other by flying these platforms through regions that had rapid variations in atmospheric constituents. Even today, in situ chemical measurements from balloons and aircraft provide rich detail in stratospheric chemistry and dynamics that cannot be obtained any other way.

The World Avoided by the Montreal Protocol

Paul A. Newman
NASA Goddard Space Flight Center

The Montreal Protocol on Substances that Deplete the Ozone Layer was negotiated in 1987 and by 2010 had been signed by all of the nations of the world. In this presentation we use a fully coupled radiation-chemical-dynamical model to simulate a future world where ozone depletion substances (ODSs) were never regulated. In this "world avoided" simulation, ODS levels increase by 3% per year. From 1980 to 2020 we find that 17% of the globally average column ozone is destroyed, and from 1980 to 2065 67% is destroyed. Severe polar depletions (e.g., the Antarctic ozone hole) become year-round rather than just seasonal. Ozone levels in the tropical lower stratosphere remain constant until about 2053 and then collapse to near zero by 2058 as a result of heterogeneous chemical processes (as currently observed in the Antarctic ozone hole). The tropical cooling that triggers the ozone collapse is caused by an increase of the tropical lower stratospheric upwelling. In response to ozone changes, ultraviolet (UV) radiation increases, tripling the erythemal (sunburn) radiation in the northern summer mid-latitudes by 2065.

Session 4: Policy/regulation relevant to stratospheric ozone and climate change. Integration between science and policy. Communication of climate change to the public

The Ocean Appears to Be Near Equilibrium with Atmospheric CH3Br

Lei Hu, Shari Yvon-Lewis, Yina Liu, Thomas S. Bianchi
Texas A&M University

Saturation-anomaly measurements of methyl bromide (CH3Br) were made in the eastern Pacific (30 March – 27 April, 2010) and the eastern Atlantic (25 October – 24 November, 2010) to assess the oceanic saturation state as the phaseout of non-Quarantine and Pre-Shipment uses of CH3Br nears completion. These cruises took place 16 years after the Bromine Latitudinal Air-Sea Transect (BLAST) cruises which were conducted in the same regions and first established the widespread oceanic net sink for atmospheric CH3Br. Results suggest that saturation anomalies in the surface ocean became less negative over the past 16 years. Biological loss rate constant measurements conducted in the eastern Atlantic show similar results as those from the overlapped areas in the previous studies, suggesting small temporal variability. Including all the previous studies and this study, the mean global biological loss rate constant is well constrained. Global extrapolation on the observed fluxes suggests that the ocean appears to be near equilibrium with atmospheric CH3Br.

Sources of Polybrominated Very Short Lived Substances in the Eastern Pacific Ocean

Yina Liu, Shari Yvon-Lewis, Thomas Bianchi, Lisa Campbell, Richard Smith and Li Shen
Texas A&M University

Brominated very short lived substances (VSLSs), which comprise primarily bromoform (CHBr3), dibromomethane (CH2Br2), chlorodibromomethane (CHClBr2), and dichlorobromomethane (CHBrCl2) are important halogenated gases that can participate in tropospheric and lower stratospheric ozone destruction cycles. These gases are capable of contributing ~ 5.0 ppt of inorganic bromine (Bry) to the stratosphere. Since bromine radicals are 50–100 times more efficient in depleting ozone (O3) than chlorine radicals, these gases are receiving increasing attention regarding their global distributions and various source strengths. They are thought to be produced mainly by phytoplankton in the open ocean.

The Halocarbon Air-Sea Transect—Pacific (HalocAST—P) cruise departed from Punta Arenas, Chile on March 29, and arrived at Seattle, WA, United States on April 29 2010. During this cruise we examined the distributions of these VSLSs in the upper water column of the East Pacific Ocean to improve the understanding of their latitudinal variations and their sources in the marine environment. Since the sources of these VSLSs are primarily biogenic at the top water column, samples were also collected for a series of biological parameters including pigment concentration, dissolved organic carbon (DOC) concentration and picoplankton counts.

At the surface and the water column, these gases are generally elevated when the chlorophyll a concentrations are elevated, such as at the coast, in the equatorial region and at the deep chlorophyll maximum. The mean surface concentrations for these gases are 3.5 pM, 1.7 pM, 0.69 pM and 0.34 pM for CHBr3, CH2Br2, CHClBr2, and CHBrCl2 respectively. Correlation with pigment concentrations indicates that diatoms may be one of the sources of these gases in the surface waters of the open ocean. However, in coastal areas, more phytoplankton groups could also contribute to the production of these gases.

Methane Production and Destruction: Theoretical and Experimental Reevaluation of Methane Isotope Kinetics

Eric Chan
Texas A&M University

Methane, a potent greenhouse gas, influences the concentration of OH radicals in the troposphere and water vapor in the stratosphere. Ocean sediments, which included methane hydrates and hydrocarbon seeps, contain the largest reservoir of methane globally and have been implicated to play a role in past climate change. Despite significant efforts, the temporal and spatial variability of methane production and destruction rates in the oceans are poorly constrained, mainly due to the specialized and labor intensive nature of the

measurement techniques. Measurements of natural stable isotopes can provide a more user friendly technique, however, the fundamental behavior of isotopic fractionation factors is poorly constrained. Thus we are clarifying use of fundamental isotopic theory for identification and characterization of sources and sinks of methane as well as rates associated with both processes. To do this we developed a more robust and real-time method to measure kinetic isotopic parameters associated with microbial mediated production and consumption of methane. The design incorporates two microbial culturing vessels: one serves as the main culture vessel with substrate delivery and mixing and the other serves as an analytical chamber where the product gases are measured continuously and nondestructively using Cavity-Ringdown Spectroscopy (CRDS). Here we detail our work (1) deriving new isotopic models to be used with natural isotopic data collected at sea for source, sink, and rate determination and (2) characterizing the isotopic fractionation factors in the laboratory fundamental to these models.

Using Dissolved Oxygen Anomalies to Assess the Spatial and Temporal Variability of Hydrocarbon Respiration in Response to the Oil Spill Event

Mengran Du
Texas A&M University

The Deepwater Horizon oil spill event released gigamole quantities of methane to the deep Gulf of Mexico (1, 2). This methane did not escape into the atmosphere (3), but stayed dissolved and suspended in discrete intrusion layers in the deep ocean (4). Reductions of dissolved oxygen within these discrete intrusion layers support the hypothesis that all released methane was respired by aerobic methanotrophs thus prohibiting its eventual release to the atmosphere (5). To better define the spatial and temporal evolution of the hydrocarbon respiration, here we present dissolved oxygen data collected at 966 stations throughout the Deepwater Horizon event covering an area of 115,780 km2 and a time period from May 11th 2010 until October 16th 2010. The high temporal and spatial resolution of the data enables the estimation of rates of environmental release and respiration for the spilled hydrocarbons in addition to the magnitude, location, and timing of the highest dissolved oxygen anomaly. Combined with the end-member chemical composition analysis of the well fluids (2), a dissolved oxygen anomaly is found large enough to account for the respiration of all released methane as well as most of the additional hydrocarbons in the deep ocean waters.

Three Decades of Continuous Monitoring of Long-lived Halocarbons

Geoff Dutton, Brad Hall, David Nance, Debbie Mondeel, James Elkins
NOAA/CIRES

In the mid-1970s, the National Oceanic and Atmospheric Administration's (NOAA) Geophysical Monitoring for Climate Change (GMCC) program made a commitment to measure and monitor trace gases including carbon dioxide, methane, nitrous oxide (N2O) and chlorofluorocarbons (CFCs). Over the next three decades GMCC grew into a division of NOAA/ESRL, and many trace gas measurement programs evolved into separate projects with different instrumentation. Multiple measurements of the same gases at identical locations (e.g., using both in situ instruments and grab samples) can sometimes lead to confusion when determining what measurement to use for analysis. We present a statistical method developed to combine measurements from independent NOAA measurement programs to construct continuous long-term global records for the following ozone-depleting substances: CFC-11, CFC-12, CFC-113, methyl chloroform (CH3CCl3) and CCl4. The combining technique takes advantage of co-located measurements and accounts for systematic differences between measurement programs. We also use two different statistical approaches to characterize uncertainties in hemispheric and global means. The combined data sets and uncertainties can be used in global growth rate and top down emission estimates of these important gases.

Inexpensive Stratospheric Profiling as Basis of Stratospheric Transport Monitoring Program.

F. L. Moore, D. Chen, E. Ray, J.W.Elkins, P.P. Tans, A Karion, C. Sweeney.
NOAA Earth System Research Laboratory; and Cooperative Institute for Research in Environmental Sciences, University of Colorado.

Climate change drives change in tropospheric weather. This modifies generation of wave activity, the major driver of stratospheric circulation. Coupled chemistry-climate models predicted that stratospheric circulation has been strengthening in recent decades,

[e.g. Butchart et al., 2010]. Knowledge of the strength of the stratospheric circulation and how it may change is of significant importance. Examples are the recovery of ozone [Butchart, et al., 2010] and the concentration of stratospheric water vapor, both influencing climate [Solomon et al., 2010]. Climate-monitoring programs will benefit substantially by having a stratospheric-circulation monitoring component to track the coupling of these two regimes.

To validate model predictions of change in stratospheric circulation requires high quality, long-term measurements. The trace gases, SF6, N2O, CFC-12, CFC-113, CFC-11, and halon-1211, are uniquely influenced by stratospheric circulation, through changes in the "age" of stratospheric air [Waugh and Hall, 2002], and stratospheric path and recirculation which manifests in both age distributions and, the "maximum path height" distributions [Hall, 2000] through photolytic loss. A recent study by Engel et al. [2009] and extended by Ray et al. [2010] pieced together available balloon based SF6 and CO2 measurements over the past three decades to show that the mean age of stratospheric air had increased, in apparent opposition to the decreased mean age predicted by models that have increase in stratospheric circulation.

This study highlighted the role long-lived trace gas measurements can play in helping to understand model predictions, but also clearly revealed the limitations of the currently available stratospheric measurements. Recent laboratory studies have proven the feasibility of using the low cost AirCore techniques of Tans [2009] coupled with our fast chromatograph, Moore et al. [2003], to acquire such stratospheric data. We demonstrate that data quality and cost is such that a sustainable long-term monitoring program for stratospheric circulation is feasible.

The Case for Verifying Emissions from Atmospheric Measurements

Ray F. Weiss
Scripps Institution of Oceanography, University of California, San Diego

Greenhouse gas (GHG) emissions reduction legislation currently relies upon prescribed accounting methods to calculate "bottom-up" inventories of industrial and biogenic emissions at their sources. In addition to carbon dioxide, other GHGs, many of which have global warming potentials that are tens to tens of thousands of times greater than carbon dioxide per unit mass emitted, represent roughly 35% of current GHG emissions on a carbon equivalent basis and account for much of the current emissions trading market. Yet even for relatively well-constrained long-lived industrial GHG emissions, "top down" emission estimates based on measurements of rates of accumulation in the atmosphere show that actual global emissions agree poorly with reported values. For emissions reduction legislation to be effective it is essential that these discrepancies be resolved. Because emissions are regulated nationally or regionally, not globally, top-down estimates must also be determined at these scales. High-frequency atmospheric GHG measurements at well-chosen station locations record "pollution events" above the background values that result from regional emissions. By combining such measurements with atmospheric transport and chemistry models using inverse methods, it is possible to map and quantify regional emissions. Even with the sparse current network of measurement stations and current inverse modeling techniques, it is possible to rival the accuracies of regional "bottom-up" emissions estimates for some GHGs. Meeting the verification goals of emissions reduction legislation will require major increases in the density and types of atmospheric observations, as well as expanded inverse modeling capabilities. But on the positive side, this effort would be minor in cost compared to current investments in carbon-equivalent trading, would reduce the volatility of that market and increase investment in emissions reduction, and would strengthen international incentives for accurate emissions reporting.

Monitoring the Progress of the Montreal Protocol and Implications for Effectively Controlling Greenhouse Gases

S.A. Montzka 1, G. Dutton 2, B.D. Hall 1, J.W. Elkins 1, J.H. Butler 1, P. Newman 3
1 NOAA/ESRL, 2 CIRES, Univ. of Colorado, 3 NASA GFSC

Long-term atmospheric measurements of ozone-depleting substances (ODSs) provide a direct way to assess the effectiveness of the Montreal Protocol. They indicate that this international Protocol has been successful at dramatically reducing global emissions of most ODSs. The decline in atmospheric concentrations of these substances has been less dramatic because the most abundant ODSs respond on long timescales to emission reductions—i.e., the timescales for ODS removal from the atmosphere are as long as 100 years. Despite this, the sum of atmospheric ozone-depleting halogen peaked and began decreasing within a decade after the initial Protocol was signed. Our data show that the fairly quick turnaround was ensured by controls on short-lived

ODSs; the decline is now sustained, however, by controls on long-lived gases that were put in place over a decade ago. These findings have implications for controlling the warming influence of greenhouse gases, given that they also have a range of atmospheric lifetimes.

In this presentation we will discuss the magnitude of the decline in ozone-depleting halogen to date, the underlying factors responsible for this decline, and what the initial success of the Montreal Protocol suggests about effective strategies for controlling increases in radiative forcing from greenhouse gases.

Measurements of Halogenated Compounds at Gosan (Jeju Island, Korea) for Validation of Emis-sions from East Asia

Jooil Kim, Shanlan Li, Kyung-Ryul Kim*, Sunyoung Park,Jens Mülhle, Andreas Stohl, and Ray Weiss
School of Earth and Environmental Sciences, Seoul National University

With increased economic growth in East Asia, emissions of many anthropogenically produced and emitted halogenated compounds in this region now constitute a substantial fraction of the global totals. Here, we report recent findings from measurements of a wide range of chlorofluo-rocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), hydrofluorocarbons (HFCs), perfluoro-carbons (PFCs), SF6 and other halogenated compounds at Gosan, on the southwestern tip of Jeju Island, Korea, as part of the Advanced Global Atmospheric Gases Experiment (AGAGE). Gen-eral wind patterns at Gosan bring air masses from the surrounding countries, regions, and the open ocean, allowing for monitoring of both clean baseline and polluted air masses. We have analyzed our measurements since November 2007 to identify country-specific emission ratios and correlation patterns among measured species. In addition, both an interspecies correlation method and an inversion method based on the FLEXPART Lagrangian particle dispersion model have been used to estimate regional emissions. Our results show that emissions of halogenated compounds in East Asia account for over 20% of global emissions, both in terms of ozone deple-tion potential (ODP) and global warming potential (GWP), and emphasize the importance of atmospheric measurements in this region.

Using Models to Derive Emissions from Atmospheric Measurements on Global and National Scales

Matthew Rigby
Massachusetts Institute of Technology

To support international climate treaties, there is a pressing need to develop "top-down" verification of trace gas emissions on global and national scales. Emissions estimates can be made using atmospheric measurements, provided that appropriate monitoring networks and computer models exist. Numerous models have been developed at institutions across the world to simulate pollutant transport, many of which use "analyzed" meteorological fields from weather forecasting centers. These transport models are combined with atmospheric measurements using statistical methods such as Bayesian optimization to refine or provide independent estimates of inventory emissions. Relatively simple models can reliably determine global emissions of greenhouse gases and ozone depleting species. These estimates are often found to be significantly different to those calculated from the bottom-up. In recent years, increasingly sophisticated modeling tools and denser monitoring networks have allowed us to infer emissions on national scales in certain regions, with promising results and often large discrepancies with inventory estimates. However, much uncertainty remains on these fine scales, and improvements to monitoring networks, bottom-up estimates, transport models and techniques for uncertainty quantification will be required in the coming years to make top-down methods suitable for national emissions verification.

Improving Our Understanding of Ozone Depleting Substances in the Upper Atmosphere

James W. Elkins, Fred L. Moore, Geoff S. Dutton, J. David Nance, Eric J. Hintsa, and Brad D. Hall
NOAA/ESRL/GMD and University of Colorado CIRES

NOAA and cooperative institute scientists began recording mixing ratios of the nitrous oxide, chlorofluorocarbons (CFCs) and other halocarbons in the atmosphere above the ground with in situ airborne instrumentation in 1989. The primary reason for these vertical profiles was that these human activity influenced gases were destroyed in the upper atmosphere. Our understanding of these sinks and atmospheric

transport was limited. New technologies and miniaturization were used to fit the large bench top laboratory gas chromatographs into the small confines of aircraft, where environment conditions change significantly during the flight. New instruments included electron capture detection and mass selective detectors and gas chromatographs that operated on manned aircraft, balloons, and unmanned aircraft systems. These measurements lead to a better understanding of their atmospheric lifetimes, upper atmospheric mixing, trends and distributions. This work will highlight new measurements of ozone depleting gases with the Unmanned Aircraft System NASA Global Hawk and a recent seasonal study over three years of the upper troposphere and lower stratosphere with the NCAR GV.

The Atmospheric Budgets and Trends of CH4 and N2O Revealed by Multi-decadal Observations from the NOAA ESRL Global Cooperative Air Sampling Network

Lori Bruhwiler
NOAA Earth System Research Laboratory

Methane (CH4) and nitrous oxide (N2O) play important roles in the chemistry and radiative balance of the atmosphere. N2O is the main source of ozone-destroying reactive nitrogen to stratosphere, while CH4 oxidation leads to formation of water and reactive hydrogen. ODP-weighted emissions of N2O dominate the other O3-depleting substances since they are now controlled by the Montreal protocol. CH4 and N2O are potent greenhouse gases, with GWP's of ~25 and ~300 over a 100-year horizon. Anthropogenic sources are thought to account for ~60% of the global CH4 budget. Emission from wetlands is the largest contribution from natural sources, while agriculture (rice, ruminants) and waste dominate anthropogenic emissions. Fugitive emissions from fossil fuel extraction make up about 20% of the global atmospheric CH4 budget. Natural emissions from microbial sources in oceans and soils are the most important contributions to the global N2O budget, and the main anthropogenic contributions come from agriculture and livestock. Since pre-industrial times, the atmospheric abundance of N2O is thought to have increased by about 15%.

After declining over the past decades, the global growth rate of CH4 has started to increase again, and the cause and persistence of this trend is not currently understood. Climate-driven increases in wetland emissions likely played a role, especially in the tropics and the Arctic. Atmospheric observations provide no current evidence of a rapid increase in Arctic emissions. Anthropogenic emissions estimated with economic data have also been increasing, especially for the rapidly expanding Asian economies although it is difficult to reconcile this with network observations.

The seasonal cycle of N2O is very small, but measurable. Exchange with the stratosphere is an important source of variability even at the surface, complicating efforts to use surface network observations to constrain the distribution of surface sources because models must accurately represent stratosphere-troposphere exchange processes.

Considerations for Bottom-up Modeling of Hydrofluorocarbon Emissions

David S. Godwin, P.E.
U.S. Environmental Protection Agency

Since the initial signing of the Montreal Protocol on Substances that Deplete the Ozone Layer in 1987, hydrofluorocarbons (HFCs) have been used as substitutes for ozone-depleting substances (ODS)—primarily chlorinated and/or brominated halogens—in a wide variety of industrial sectors or applications. HFCs and the ozone-depleting chemicals they replace are potent greenhouse gases, causing radiative forcing on the order of thousands of times that of carbon dioxide, on a mass basis over a 100 year integrated time horizon.

Estimating HFC emissions generally involves modeling the introduction and use of these chemicals and others as they replace ODS in several different applications (e.g., refrigeration and air conditioning, insulating foam production) and scores of sub-applications (e.g., home refrigerators, motor vehicle air conditioners, supermarket refrigeration systems). Within any particular sub-application, these models must account for the number of products introduced each year and the chemical(s) used (e.g., a particular ODS or HFC) as well as other changes in technologies and practices that may increase or decrease consumption and emission levels over time. These "bottom-up" models thus require large data sets covering a wide variety of sub-applications and, for each sub-application, the estimation of several critical factors that are most often highly uncertain and difficult to measure.

In this presentation we will describe the Vintaging Model used to estimate HFC emissions as part of the United States' national communications under the United Nations Framework Convention on Climate Change (UNFCCC), focusing on one important sub-

application as an example. We will also discuss how chemical sales data can be used to some degree to improve the accuracy of these models. Finally, we will reflect on the limitations inherent in the model that would likely lead to discrepancies between model estimates and atmospheric measurements on both regional and global levels.

SESSION 5: INDUSTRIAL ENVIRONMENTAL CHEMISTRY: SEARCH FOR NEW LOW GWP ALTERNATIVES

Atmospheric Chemistry of Trans-CF3CH=CHCl

M.P. Sulbaek Andersen, T.J. Wallington, O.J. Nielsen, M.D. Hurley and S. P. Sander
Jet Propulsion Laboratory, California Institute of Technology

FTIR-smog chamber techniques were used to study the kinetics and mechanisms of the reactions of Cl atoms, OH radicals and O3 with trans-3,3,3-trifluoro-1-chloro-propene, t-CF3CH=CHCl, in 700 Torr total pressure at 295 ± 2 K. The rate constants k(Cl + t-CF3CH=CHCl) = (5.22 ± 0.72) X 10-11, k(OH + t-CF3CH=CHCl) = (4.40 ± 0.38) X 10-13 and k(O3 + t-CF3CH=CHCl) = (1.46 ± 0.12) X 10-21 cm3 molecule-1 s-1, were established. The atmospheric lifetime of t-CF3CH=CHCl is determined by reaction with OH radicals and is approximately 26 days. The reactions of Cl atoms and OH radicals with t-CF3CH=CHCl occur via addition to the >C=C< double bond; chlorine atoms add 15 ± 5 % at the terminal carbon and 85 ± 5 % at the central carbon, OH radicals add approximately 40% at the terminal carbon and 60% at the central carbon. The major products in the Cl atom initiated oxidation of t-CF3CH=CHCl were CF3CHClCHO and CF3C(O)CHCl2, minor products were CF3CHO, HCOCl and CF3COCl. Chemical activation plays a significant role in the fate of CF3CH(O)CHCl2 and CF3CClHCHClO radicals. In addition to reaction with O2 to yield CF3COCl and HO2 the major competing fate of CF3CHClO is Cl elimination to give CF3CHO (not C-C bond scission as previously thought). Reaction with OH radicals leads to the formation of CF3CHCHClOH and CF3CH(OH)CHCl radicals. Chlorine atom elimination giving the enol, CF3CH=CHOH, appears to be the sole atmospheric fate of the CF3CHCHClOH radicals. The fate of CF3CH(OH)CHCl radicals is formation of CF3CH(OH)CHClO which undergoes decomposition followed by reaction with O2 to give CF3CHO and HCOCl. At the anticipated levels in the environment, the atmospheric oxidation products of t-CF3CH=CHCl are not of concern. The contribution of t-CF3CH=CHCl to stratospheric ozone depletion is expected to be negligible and the 100-year global warming potential of t-CF3CH=CHCl is approximately 7.

Next Generation Low GWP Fluid Development

Brett Van Horn
Arkema Inc.

Hydrofluorocarbons (HFCs) have replaced CFCs and HCFCs as non-ozone depleting fluids in many applications, including as refrigerants, solvents, aerosols, and blowing agents for insulating foams. However, some HFCs have relatively high global warming potential (GWP) and are coming under closer scrutiny due to the increasing concern over global climate change. The focus now is the search for the next generation of environmentally sustainable working fluids with negligible direct environmental impact in terms of both ozone depletion and global warming potential.

Development of low-GWP options should be balanced with respect to safety, performance, ease of use, and energy efficiency. Indeed, greenhouse gas emissions come not only from direct emissions but also largely from indirect sources based on energy consumption. It is therefore important that energy efficiency remain a primary consideration when implementing low-GWP solutions, as replacing a high-GWP fluid with a lower GWP, but less efficient option may actually increase greenhouse gas emissions, thereby degrading the overall LCCP (life cycle climate performance).

Hydrofluoroolefins (HFOs), such as HFO-1234yf (2,3,3,3-tetrafluoropropene), offer many of the benefits of HFCs but with the added benefit of very low GWP. This comes from the extremely short atmospheric lifetimes of these compounds resulting from their olefinic structure. As such, HFOs are attractive next-generation solutions offering excellent environmental profile and performance.

To address future needs, Arkema is developing low GWP fluids to offer safe and efficient options for next generation refrigerants and blowing agents for insulating foams. This presentation will highlight recent advances in low GWP fluid development including an overview of hydrofluoroolefin developments.

Measurement and Parameterization of Pollutant Distribution Near a Highway

Meilu He, Suzanne Paulson, Arthur Winer, Suresh Dhaniyala
UCLA

Considering the air quality and human health in neighborhoods near highways, field measurements were conducted at four different sites in south California. Due to the extent of human exposure and less traffic from local roads, the campaign was made during pre-sunrise time. To study the effect of inversion layer on pollutant decay rate and pollutant level, the four measurement sites have different distance to the Pacific Ocean coast. The wind speed, direction, temperature, relative humidity, and pressure were measured from a tethered balloon up to 200 m. Using the tethersonde data together with the data from the stations of South California Air Quality Management District (AQMD), the inversion layer can be decided. A mobile platform was applied to measure particle and gas concentrations near a highway. Particle number concentration was measured by condensation particle counter (CPC, TSI 3007) and fast mobility particle sizer spectrometer (FMPS, TSI 3091). The particle size distribution is reported by FMPS every second. Dusttrack was applied to measure PM2.5 and PM10 particles. Carbon dioxide, carbon monoxide, nitric oxide, and polycyclic aromatic hydrocarbon were also measured. Based on the measured results, a parametric model will be established to predict pollutant level and decay based on the given weather conditions.

Challenges Facing the Chemical Industry in Developing New Low GWP Alternatives

Mario Nappa
E. I. duPont de Nemours and Company

F-Gas regulations adopted in Europe call for the elimination of high global warming potential automobile refrigerants (GWP >150) in "new type" vehicles beginning in 2011, and in "all new vehicles" beginning in 2017. This mandate is similar to what the chemical industry experienced with the Montreal Protocol and the reduction of CFCs for their high ozone depletion potential nearly two decades ago. This regulation has been a stimulus for the chemical industry to look for low global warming alternatives for all of its fluorochemical offerings. The need for the automobile industry to switch refrigerants has led DuPont and others to search for new low GWP environmentally acceptable offerings to replace HFC-134a (CF3CH2F) which has been in service since the early 90s. This presentation will focus on the challenges facing the chemical industry of developing these new types of molecules for a variety of markets such as refrigerants, foam expansion agents, fire extinuishants, solvents and other high performance fluids.

An Inexpensive, Widely Available Material for 4 wt% Reversible Hydrogen Storage Near Room Temperature

Christopher Blaszczak-Boxe
California Institute of Technology

The search for cheap, renewable energy sources to replace fossil fuels has identified hydrogen gas (H2) as the most promising, particularly for transportation. However, despite intense research efforts to find reliable storage materials, current practical technologies store only 1.3 wt % H2 at 270 K, far short of the U.S. DOE targets. We report that hexagonal ice, the ordinary form of ice in snow, may be an efficient hydrogen storage material, achieving 3.8 wt % H2 storage and 42 g L_1 at 150K and that after loading at 150 K, the 3.8 wt % H2 can be kept at 270 K and then released upon heating by a few degrees Kelvin. This leads us to propose the ice-fixed melt-triggered (IFMT) strategy for hydrogen storage and utilization with ice as the median. The implications of these investigations have the potential to attain a more physically- and economically-sustainable and renewable energy source, mitigate global warming and global warming-induced effects on the atmospheric state of ozone (O3).

Low GWP Refrigerants for Stationary Air Conditioning and Refrigeration Applications

Mark W. Spatz
Honeywell International

Due to the growing global concerns around the use of working fluids with relatively high global warming potential, new working fluids with the positive attributes of both high thermal performance and low environmental impact are currently in development. These materials maintain the high level of system efficiency we are accustomed to with fluorocarbon refrigerants but with significantly lower global warming impact than current refrigerants. They also exhibit significantly

lower flammability characteristics than the much more flammable hydrocarbons. Replacements for refrigerants used in both stationary air conditioning and refrigeration applications will be discussed. Chemical and physical properties as well as experimental results in representative equipment will be presented.

Low GWP, High Performance Blowing Agents For Closed Cell Rigid Foam Applications

David J. Williams
Honeywell

Globally, industry, government regulators, and NGOs are continually striving for a low environmental impact energy efficiency improvement solution across all applications, including thermal insulation for household refrigerators, construction, and cold chain applications. Improving the efficiency of the thermal insulation in all these applications is a major component in reducing the overall environmental impact of the manufacture, consumer use, and end of lifetime management of these products.

Historically, the most effective and efficient thermal insulation for these applications has been rigid, closed cell polyurethane, polyisocyanurate, or extruded polystyrene foam that contains a fluorocarbon blowing agent. The presence of the fluorocarbon blowing agent in the foam's cells improves the thermal insulation characteristics of these materials compared to non-fluorocarbon blowing agents. In addition, because many fluorocarbons are non-flammable and of low toxicity, they are safe to use and compatible with most existing foam processes.

One drawback to the historical fluorocarbon blowing agents is their environmental impact, especially their impact on ozone depletion and climate change. To overcome these environmental issues, Honeywell has developed and is commercializing a fourth generation of fluorocarbons that do not impact the ozone layer, have extremely low global warming potential, and produce foam with thermal insulation properties that, in many cases exceed that of their predecessors.

This presentation will summarize the performance of these new blowing agents in three major application areas, household refrigerators/freezers, spray foam used for construction applications, and in panel foams used for construction and cold chain transportation applications.

A FTIR-smog Chamber Study to Assess the Environmental Impacts Of Trans-CF3CH=CHF

O.J. Nielsen, T.J. Wallington, M.P. Sulbaek Andersen, and M.D. Hurley
University of Copenhagen

Long path length FTIR-smog chamber techniques were used to measure k(Cl + t-CF3CH=CHF) = (4.64±0.59) x 10-11, k(OH + t-CF3CH=CHF) = (9.25±1.72) x 10-13, and k(O3 + t-CF3CH=CHF) = (2.81±0.21) x 10-21 cm3molecule-1s-1 in 700 Torr of air diluent at 296 K. The atmospheric lifetime of t-CF3CH=CHF is determined by its reaction with OH and is approximately two weeks. t-CF3CH=CHF has an integrated IR absorption cross section (650–2000 cm-1) of (1.94±0.10) x 10-16 cm molecule-1 and a global warming potential of approximately 6 (100-year time horizon). The products and mechanisms of the OH radical and Cl atom initiated oxidation of trans-CF3CH=CHF were quantified in 700 Torr of N2/O2 diluent at 295 K. Hydroxyl radical initiated oxidation leads to the formation of CF3CHO and HC(O)F in yields which were indistinguishable from 100% and were not dependent on the O2 partial pressure. Chlorine atom initiated oxidation gives HC(O)F, CF3CHO, CF3C(O)Cl, and CF3C(O)CHFCl. The yields of CF3C(O)Cl and CF3C(O)CHFCl increased at the expense of HC(O)F and CF3CHO as the O2 partial pressure was increased over the range 5–700 Torr. The results are discussed with respect to the atmospheric chemistry and environmental impact of trans-CF3CH=CHF.

Atmospheric Chemistry of CF3CF=CH2 (HFO-1234yf) and Other Hydrofluoroolefins

Ole John Nielsen
University of Copenhagen

Long path length FTIR-smog chamber techniques were used to measure k(Cl + CF3CF=CH2) = (7.03±0.59) x 10-11, k(OH + CF3CF=CH2) = (1.05±0.17) x 10-12, and k(O3 + CF3CF=CH2) = (2.77±0.21) x 10-21 cm3molecule-1s-1 in 700 Torr of air diluent at 296 K. The atmospheric lifetime of CF3CF=CH2 is determined by its reaction with OH and is approximately 11 days. CF3CF=CH2 has an integrated IR absorption cross section (800–2000 cm-1) of (1.63±0.09) x 10-16 cm molecule-1. The products

and mechanisms of the OH radical and Cl atom initiated oxidation of CF3CF=CH2 were quantified in 700 Torr of N2/O2 diluent at 295 K. Hydroxyl radical initiated oxidation gives CF3CHO in a molar yield of 91±6%. Chlorine atom initiated oxidation of CF3CF=CH2 gives CF3CHO in a molar yield which was indistinguishable from 100% and independent of [O2] and HC(O)Cl in a molar yield which increased from 30% to 59% as [O2] was increased from 3 to 700 Torr.

The ozone depletion potential of CF3CF=CH2 is for all practical purposes zero. The photochemical ozone creation potential of CF3CF=CH2 was estimated to be 7; CF3CF=CH2 is not expected to make a significant contribution to tropospheric ozone formation. CF3CF=CH2 has a global warming potential of approximately 4 (100-year time horizon) and will not contribute significantly to radiative forcing of climate change. The atmospheric oxidation of CF3CF=CH2 gives CF3C(O)F which hydrolyzes to give CF3C(O)OH (trifluoroacetic acid, TFA) in a molar yield of essentially 100%. No significant environmental impact is expected for additional environmental TFA burden associated with expected volumes of CF3CF=CH2 use.

A short summary of the atmospheric chemistry of hydrofluoroolefins will be given.

SESSION 6: SESSION 6: YOUNG SCIENTIST FORUM: RESEARCH IN STRATOSPHERIC OZONE AND CLIMATE CHANGE AND INTEGRATION BETWEEN SCIENCE AND POLICY

Twenty-five Years of Ozonesonde Measurements at South Pole: An Assessment of Changing Loss Rates

B. Hassler, J.S. Daniel, B.J. Johnson, S. Solomon, S.J. Oltmans
NOAA

In 2010, 25 years of continuous, year-round ozone soundings at South Pole station, Antarctica, were completed. These measurements provide unique information about ozone depletion in the polar stratosphere at high vertical resolution. We analyzed these ozone soundings to learn more about the onset time of the seasonal ozone depletion, the observed loss rates, and their changes since the measurement series began. During the last 25 years the seasonal onset of ozone loss at South Pole has moved forward significantly. The fastest highest loss rates occur between the end of August and end of September near 50 hPa to 30 hPa. Loss rates at these pressure levels increased from the late 1980s to the late 1990s and have remained roughly stable since then. To estimate a time frame when a reduction in ozone loss rates will be observable outside the range of annual variability at the South Pole, we scale the estimated loss rates to the future projected concentrations of equivalent effective stratospheric chlorine (EESC). We project that ozone loss rates will first be significantly reduced between 2016 and 2020.

Quantification of the Impacts of Asian Pollution on Pacific Storm Track

Yuan Wang, Renyi Zhang, Ramalingam Saravanan, Guohui Li
Texas A&M University

Atmospheric aerosols have profound impacts on climate through substantial contribution to radiative forcing. Indirectly aerosols may influence climate by altering cloud development, lifetime, albedo, and precipitation efficiency. Current scientific understanding of the aerosol indirect effect remains highly uncertain, constituting the greatest uncertainty in climate prediction (+0.8/-1.5 Wm-2). Increasing pollution levels in Asia and associated outflows have raised considerable concerns because of their potential impact on regional and global climate. The principal component analysis of NCEP reanalysis data about meridional heat flux and wind variance exhibits a strengthening trend of the storm track intensity over the northwest (NW) Pacific from 1980 to the present. The cloud-resolving Weather Research and Forecasting (CR-WRF) model with a two-moment bulk microphysical scheme has been used to conduct a two-month numerical simulation of the NW Pacific storm track. Model results have been validated with satellite measurement and other observation data. Sensitivity studies of the aerosol effect on the Pacific storm track mainly consider two aerosol scenarios, including maritime clean case and the polluted case with Asian pollution outflow. Comparative analysis between the two cases suggests that because of favorable cloud dynamical and microphysical conditions, the wintertime NW Pacific may be highly vulnerable to the aerosol-cloud interaction in terms of enhanced cloud optical thickness, increased precipitation and strengthened convection with high aerosol concentrations. As the quantification index of the Pacific storm track intensity, the poleward heat flux increase by 7% under high aerosol loading, supporting the notion that the storm track can be intensified by anthropogenic pollution from the Asian continent. In addition, about 10% decrease of the poleward moisture is found in the polluted case implying the variation of the Pacific storm track under the influence of Asian pollution outflow likely impacts the global general circulation.

Tracking Boundary Layer Pollution at High Altitude: LIF formaldehyde Detection Approach

Maria Cazorla, Tom Hanisco
NASA GSFC

Boundary layer (BL) pollutants can modify the chemistry and composition of the upper troposphere (UT) and lower stratosphere (LS) by altering the distribution of ozone and aerosols at high altitudes. Such changes influence the radiative balance in this region, which ultimately has an impact on climate change.

Ground level VOCs undergo chemical transformations mainly via reactions with the hydroxyl radical (OH) and via photolysis. A byproduct of these reactions is formaldehyde. The lifetime of formaldehyde in the

atmosphere is in the order of several hours to a day. Deep convection transports contaminants vertically from the BL to high altitudes. Given its chemical origin and lifetime, measurements of formaldehyde at high altitude can be used to detect recent transport of boundary layer pollution into the UT/LS region. NASA requires in situ measurements of formaldehyde in the 12-20 km altitude range as a validation method for satellite measurements. Hence, the sensitivity requirement for the aircraft-based instrument is such that background levels (~10 pptv) of formaldehyde at high altitude can be detected. In addition, the new instrument needs to comply a size requirement in order to be deployed on board of high altitude aircrafts such as the Global Hawk. An instrument that meets these requirements is being developed at NASA GSFC. The new instrument uses laser-induced fluorescence (LIF) of the formaldehyde molecule with excitation wavelength of 353.16 nm. A tunable pulsed fiber laser is the source of excitation. This work will explain specifics of the new instrument and how its measurements will help gain insight regarding the transport and chemical transformation of BL pollutants into the UT/LS region.

Dynamical and Chemical Characteristics of Tropospheric Intrusions during START08

Cameron R. Homeyer
Texas A&M University

Intrusions of air from the tropical upper troposphere into the extratropical stratosphere above the subtropical jet potentially have a significant impact on the composition of the lowermost stratosphere (the stratospheric part of the "middleworld"). We present an analysis of tropospheric intrusion events observed during the Stratosphere-Troposphere Analyses of Regional Transport 2008 (START08) experiment using kinematic and chemical diagnostics. The transport processes operating during each event are discussed using high-resolution model analyses and backward trajectory calculations. Each intrusion observed during START08 can be related to a Rossby wavebreaking event over the Pacific Ocean. Trajectory analysis shows that the intruding air masses can be traced back to the tropical upper troposphere and lower stratosphere. In situ chemical observations of the tropospheric intrusions are used to estimate the mixing timescales of the observed intrusions through use of a simple box model and trace species with different photochemical lifetimes. We estimate that the timescale for an intrusion to mix with the background stratospheric air is 5 to 6 days. Detailed analysis of small-scale features with tropospheric characteristics observed in the stratosphere suggests frequent irreversible transport associated with tropospheric intrusions. Trace gas distributions and correlations are consistent with the dynamics of the high-resolution NCEP GFS analyses, suggesting that these features are captured by the GFS assimilation and forecast system.

Is Climate Change Boosting the Phet Cyclone to Intensify Into Category 4 in the Arabian Sea?

K. Muni Krishna
Andhra University

Arabian Sea is less vulnerable to severe cyclonic storms compared with Bay of Bengal in the North Indian Ocean. The formation of severe cyclonic storms in the Arabian Sea is rare during southwest monsoon season, but in the global warming scenario as sever cyclonic storm Phet is proving, just because these storms are rare doesn't mean that they can't be powerful. Phet is the second strongest storm (first one is Gonu in 2007) and long track to hit first at the Arabian Peninsula. In the present study I want to investigate the ocean-atmosphere role for its intensification and long track and also find out the upper ocean changes in and around the Phet cyclone track (31st May – 7 June 2010) by using NCEP-NCAR reanalysis data, merged microwave remote sensing and Argo observations. The results indicate pre-existing high sea surface temperature anomaly (SSTA) located at the right side of the storm track. I accentuate that high SST which is transpired at the right time and right place was conducive to the cyclone intensification. SST right before the storm was above ~32°C along the Gulf coast and storm track and much warmer than the long-term mean in June. The vertical temperature in the upper ocean layers is also favorable to intensifying the Cyclone storm into category 4. Surface latent heat flux increase anomalously prior to landfall as compared to when the Phet was at its maximum intensity (category 4). Warm SST exists at the location of the maximum latent heat flux (LHF), and increases the LHF, enhances the effect of the LHF, and therefore may have played an important role in intensification of the Phet cyclone.

Evidence for the Effectiveness of the Montreal Protocol to Protect the Ozone Layer

Harald E. Rieder (1,2), Joerg A. Maeder (2), Johannes Staehelin (2), Thomas Peter (2), Dominik Brunner (3), Werner A. Stahel (4)
(1) Columbia University, Department of Applied Physics and Applied Mathematics, (2) ETH Zurich, Institute for Atmospheric and Climate Science, (3) Swiss Federal Institute for Materials Science and Technology, (4) ETH Zurich, Seminar for Statistics

The release of man-made ozone depleting substances (ODS, including chlorofluorocarbons and halons) into the atmosphere has led to a near-linear increase in stratospheric halogen loading since the early 1970s, which leveled off after the mid-1990s and then started slowly to decline, in response to the ban of many ODS by the Montreal Protocol (1987). In this work we apply multiple linear regression models to test whether this already had a measurable effect on total ozone values observed using the global network of ground-based stations (WOUDC). The model includes explanatory variables describing the influence of various modes of dynamical variability and of volcanic eruptions (most important covariates are selected by systematic backward elimination). In order to describe the anthropogenic influence a first version of the model contains a linear trend (LT) term, whereas a second version includes a term describing the evolution according to Equivalent Effective Stratospheric Chlorine (EESC). By comparing the explained variance of these two model versions we tested, which of the two terms better describes the observed ozone evolution. We argue that the dynamical proxies, in particular the equivalent latitude proxy, can represent dynamical changes in a sufficient way not to confuse the discrimination between a linear trend and an EESC trend. The results show that for a significant majority of the stations, the EESC proxy fits the long term ozone evolution better than the linear trend term. Therefore, we conclude that the Montreal Protocol has started to show measurable effects on the ozone layer more than twenty years after it became legally binding, demonstrating the success of international cooperation between science and politics.

A New Approach for Estimating Entrainment Rate in Cumulus and Parameterization in Models

Chunsong Lu, Yangang Liu, Seong Soo Yum, Shengjie Niu, Satoshi Endo
Brookhaven National Laboratory (BNL), NY; Nanjing University of Information Science and Technology (NUIST), Nanjing, China; Yonsei University, Seoul, Korea

Entrainment of dry air into clouds is essential to many cloud processes, affecting cloud microphysical properties, cloud radiative properties, and evaluation of aerosol indirect effects, but it is still poorly understood and represented in atmospheric models. In an effort of the FASTER project to integrate aircraft measurements into model evaluation and parameterization development, here we present a new approach for estimating fractional entrainment rate in cumulus clouds from aircraft observations. This approach is based on the definition of fractional entrainment rate and the mass ratio of the adiabatic cloudy air to the dry air entrained during the ascent from cloud base to aircraft observation level. The essence of this approach is that the mass ratio is not calculated directly from the air masses, but is determined indirectly from the microphysics and thermodynamics along the observation level. This approach is applied to one flight of the RICO (Rain in Cumulus over the Ocean) where entrainment rate was calculated in a previous study with a traditional approach. Comparison between the results from these two approaches shows substantial consistency in terms of the vertical trend of entrainment rate. The average entrainment rate of all observation levels from this approach is comparable to the results in other previous studies. This approach has a potential to straightforwardly connect the studies of entrainment rate and microphysical effect of entrainment-mixing process (homogeneous/inhomogeneous entrainment-mixing mechanisms), improving the parameterization of entrainment-mixing process in models.

Twenty Years of Influence of the Antarctic Ozone Hole Over South of Brazil

Peres, Lucas Vaz; Pinheiro, Damaris Kirsch; Anabor, Vagner; Leme, Neusa Paes; Crespo, Natalia; Kall, Elenice
Space Science Laboratory of Santa Maria, Federal University of Santa Maria – UFSM, Santa Maria, RS, Brazil

The Antarctic Ozone Hole is a cyclical phenomenon which occurs over the Antarctic region from August to November each year. The polar vortex turns it into a restricted characteristic dynamics for this region. However, when the polar vortex begins to weaken in October, air masses with low ozone concentration could escape and reach regions of lower latitudes. This study presents the influence of the Antarctic Ozone Hole over the South of Brazil in the last 20 years from 1990 to 2010. To verify the events of influence, it was used data of ozone total column from Brewer Spectrophotometer installed at the Southern Space Observatory (29.42 º S, 53.87 º W), in São Martinho da Serra, South of Brazil, TOMS and OMI Spectrometer overpass data for the same location. In addition to Brewer, TOMS and OMI data, it was analyzed potential vorticity maps using GrADS (Grid Analysis and Display System) generated with the NCEP data reprocessed, and backward trajectories of air masses, using the HYSPLIT model of NOAA. Ozone total column for the days with lower ozone was compared with the climatological average of twenty years for September and October. For statistical reasons, it was analyzed only the days with ozone total column lower than climatological monthly average minus 1.5 times the standard deviation. Considering only the days with decreased ozone, increased absolute potential vorticity and backward trajectories indicating the origin of polar air masses, it was observed 13 events in September, 20 events in October and 04 events in November, with an average decreased about 7,9 ± 3,1 % when compared with climatological average.

Learning to Assess Ozone Depletion

Keynyn Brysse
Princeton University

Scientific concerns about the depletion of stratospheric ozone by man-made chemicals began in the early 1970s. Several countries produced national assessments of ozone science in the late 1970s and early 1980s, and the first truly international assessment of ozone depletion was published in the mid 1980s (WMO 1986). It is widely credited with influencing successful ozone policy, as are the later international assessments that followed it (e.g. Parson 2003; Litfin 1994). Despite this recognition, however, little study has been made of the ozone assessment process (as opposed to the policy negotiation process). I will explore the processes by which ozone depletion science was produced, and scientific assessments of ozone depletion were created. Some of the questions that arise from this study are: How did ozone scientists decide what particular research opportunities to pursue, in a field where observations are often sparse, laboratory experiments can be extremely challenging, and models are difficult (or even impossible [Oreskes 1998]) to validate? How did assessments weigh the various types of evidence when one or all three of these components (modeling, experiment, observation) was lacking? How do scientists assess their colleagues' research, evaluate its reliability, understand its limits and degrees of uncertainty, and come to consensus (or not)? How do scientists respond to the subtle or overt pressures that arise when they know that their conclusions will be widely disseminated, beyond the community of peer experts? It is important to ask these questions in the context of the ozone history, precisely because it is generally perceived as a successful model that should be emulated in future assessments and policy negotiations surrounding global change. Exploring these questions in the ozone case should therefore yield important lessons applicable to future climate science and policy.

Impacts of Climate Change on Global Food Production

Yi Wang, Paul C. Bethke
University of Wisconsin-Madison

Global warming is caused by emissions of anthropogenic long-lived greenhouse gases (GHG), including carbon dioxide and CFCs, which have increased significantly since pre-industrial times. The presence of GHGs in the atmosphere exerts positive radiative forcing on the climate, leading to higher average global temperatures and increased weather variability [IPCC, 2007]. The observed climate patterns include greater warming over land than over the oceans and more frequent temperature extremes. Projections for the 21st century predict a rise of 2.8 to 6.4°C in the global average surface temperature with doubling of the atmospheric carbon dioxide level [IPCC, 2007]. These changes are expected to have catastrophic impacts on worldwide human population, ecosystem, and food production. Potato is the

world`s fourth most important food crop after rice, wheat and maize, and its production is of invaluable importance for the diets and livelihoods of millions of people worldwide. Potato is grown in many different environments, but it is best adapted to temperate climates. A rise in temperature can lead to increased transpiration in the potato plants, thus raising their demand for water. In many of the drier potato growing regions this will cause water stress, leading yields to decline. The effect will be further aggravated by changes in rainfall distribution. Furthermore, the ideal nighttime temperature range for potatoes is between 15°C and 18°C, and overnight temperatures above 22°C can severely hamper tuber development, leading to great yield decrease later on. The goal of our research is to investigate the roles of heat wave and drought stress in the yield decrease and other physiological parameter changes of chipping potatoes under controlled environment greenhouse and in the field plot. Our results so far showed that the effects are statistically significant especially those of heat waves.

Synoptic Patterns Associated with Secondary Effects of the Antarctic Ozone Hole Over Souther South America

Vagner Anabor, Damaris Kirsch Pinheiro, Lucas Vaz Peres
UFSM-Universidade Federal de Santa Maria

During 2009, two Antarctic ozone hole secondary effect were registered over South Brazil by using a Brewer total column spectrophotometer, located at the Souther Space Observatory, São Martinho da Serra, South Brazil (29.42ºS, 53.87ºW). TOMS and OMI spectrometer overpass data, potential vorticity and upper level flow data derivate from NCEP/NCAR reanalysis data were complementary used. The air masses back trajectories were obtained from HYSPLIT/ NOAA model. In these two events the ozone total column were 256,5UD (03/09/2009) and 270,2UD (29/ 09/2009), what is respectively 13,17% and 8,46% lower, if compared to September climatological value (295,2UD). HYSPLIT/NOAA model shows the poor ozone air masses being advected toward Southern South America. In the upper levels, at 200mb wind field, a large area of subsidence is present at the equatorial entrance of upper level jet region. Both cases also present a cold front region coupled with the upper level flow. Thus, the large scale sinking motion, cause poor ozone air intrusion, through the frontal layer toward low and mid-levels of atmosphere. The synoptic analysis evidences the ozone hole secondary effect as a result of the poor ozone mass advection from Antarctic region in association with an intense subsidence area related with upper level jet dynamics. The poor ozone air intrusion through the frontal layer under the upper level jet reducing significantly the total ozone column over South American mid-latitudes.

Cirrus in the Tropical Tropopause Level– Observational and Model Analysis

Tao Wang, Andrew Dessler
Texas A&M University

Cirrus in the tropical tropopause layer (TTL) play a significant role in the radiative budget of the TTL by regulating both longwave and shortwave radiation and in the transport of trace constituents, particularly water vapor, into the stratosphere. By analyzing ice water content (IWC) and water vapor (H2O) measurements, we identify TTL cirrus that contain too much ice to have been formed in situ — and therefore must be of convective origin. Over the entire tropics, we found convective cirrus occur more frequently during boreal winter-spring than boreal summer-fall, more frequently at the tropopause and less frequently at other levels. As a complementary work to support those observation results, we developed a new 3-D domain filling, forward trajectory model to examine how air is processed in the upper troposphere and stratosphere, which includes the extent of ice saturation to form cirrus, the global dehydration processes that control stratospheric water vapor, and the contribution of methane oxidation to water vapor abundances. Model results essentially reproduce the consistent results as the observation implies. Besides, this model allows us to track parcel ages and paths and to qualitatively depict the spatial patterns of dehydration locations. Overall, this model work will not only serve as a necessary supplementary to our previous analysis of cirrus formation but also provide insights into water vapor's role in global climate change.

PSC Observations in the Arctic winter 2009/2010 Suggest Heterogeneous Nucleation of NAT and Ice

I. Engel, B. P. Luo, C. R. Hoyle, F. G. Wienhold, M. C. Pitts, L. R. Poole, J.-U. Grooß, and T. Peter
ETH Zurich

Shortly after the discovery of the Antarctic ozone hole, anthropogenic halogen compounds were identified as responsible ozone depleting substances and the

key role of polar stratospheric clouds (PSCs) in activating these substances was recognized. However, details of PSC formation remain uncertain. The nucleation mechanisms of nitric acid trihydrate (NAT) and ice particles are presently put to test by the EU-project RECONCILE, which encompassed a field campaign including aircraft, balloon-borne, and ground-based measurements in the Arctic winter 2009/2010, systematically complemented by lidar measurements from the CALIPSO satellite. We analyzed these measurements by extensive trajectory and microphysical box model calculations. The results are at odds with the previous laboratory-based understanding of NAT nucleation, namely that ice would be the first solid, nucleating homogeneously within liquid aerosol particles, and that NAT nucleates only subsequently on the ice, whereas direct heterogeneous NAT nucleation on preexisting solid particles would be unlikely. In contrast, fields of NAT particles frequently appear already in the early phase of the winter, clearly before the first mountain-wave induced ice was present in the polar vortex. Hence, there must have been ample supply of heterogeneous NAT nuclei, possibly of meteoritic origin. In a later phase of the winter exceptional widespread ice PSCs occurred, and again model agreement requires similar heterogeneous nucleation mechanisms as for NAT. In the Arctic, synoptic scale ice observations are quite rare, and it is unclear whether it was the required low synoptic-scale temperature or the special heterogeneous nuclei that differed from previous winters, or both. Stratospheric temperatures might possibly drop further as a consequence of climate change, whereas the origin of the heterogeneous NAT and ice nuclei – let alone their future evolution – remains speculative.

The Response of Stratocumulus to Meteorological Aerosol Perturbations: A Comparative Study

Jonathan Petters
AAAS S&T Fellow

Changes in aerosol state (i.e. aerosol indirect effects, or AIEs) have the potential to change the role stratiform cloud systems play in the Earth's radiative budget and climate. However, changes in the meteorological environment in which such cloud systems reside can also induce changes in their evolution, and previous observational and modeling studies of AIEs do not comprehensively account for these meterological changes. In this study we investigate the response of daytime stratiform cloud systems to variations in meteorological environment and aerosol state, and evaluate the comparative importance of these variations.

For this study we use the Regional Atmospheric Modeling System in large-eddy simulation mode. We first created an observationally-based simulation of non-drizzling stratocumulus as a model base case. Our observations were acquired from the CIRPAS Twin Otter during the VOCALS Regional Experiment. During this day a well-mixed, non-drizzling stratus-topped boundary layer was observed. Aerosol concentrations were elevated (~600 cm^-3) from what is expected for clean maritime conditions.

We determined perturbations in the meteorological context from ECMWF Re-analysis Interim data centered on the observational region and time of year. We computed standard deviations of potential temperature and moisture jumps across the cloud top interface to use as realistic variations in meteorology. Aerosol concentrations were multiplied by factors of 0.50 and 0.25 to give a reasonable variation in those concentrations for coastal stratocumulus.

We then perturbed the initial states of these meteorological and aerosol properties from our model base case one at a time, creating experimental simulations of daytime stratocumulus evolution. From these simulations we computed the sensitivities of cloud radiative forcings and optical depth to our perturbations. Our simulations and computed sensitivities suggest that realistic variations in meteorological context can elicit changes in cloud radiative forcing and optical depth that are comparable to those changes due to AIEs.

ClOOCl Photolysis at High Solar Zenith Angles: Analysis of the RECONCILE Self-match Flight

Olga Suminska-Ebersoldt
Research Centre Juelich, IEK-7, Germany

The photolysis frequency of dichlorine peroxide (ClOOCl) JClOOCl is a critical parameter in catalytic cycles destroying ozone in the polar stratosphere. In the atmospherically relevant wavelength region (λ>310 nm), published laboratory measurements of ClOOCl absorption cross sections and spectra do not agree and therefore significant discrepancies in JClOOCl do remain. Previous investigations of the consistency of published JClOOCl with atmospheric observations of chlorine monoxide (ClO) and ClOOCl have focused on the photochemical equilibrium between ClOOCl formation and photolysis, and thus could only constrain the ratio of JClOOCl and the ClOOCl formation rate

constant krec. Here, we constrain the atmospherically effective JClOOCl independent of krec using ClO measured in the same air masses before and directly after sunrise. Over sunrise, when the ClO/ClOOCl system comes out of thermal equilibrium and the influence of the ClO recombination reaction is negligible, the increase in ClO concentrations is significantly faster than expected from JClOOCl based on the absorption spectrum proposed by Pope et al. (2007), but does not warrant cross sections larger than recently published values by Papanastasiou et al. (2009). In particular, the existence of a significant ClOOCl absorption band longwards of 420 nm is effectively ruled out by our observations. Furthermore, night-time ClO observations show that the ClO/ClOOCl thermal equilibrium constant cannot be significantly higher than the one proposed by Plenge et al. (2005).

Measurement and Modeling of Isocyanic in the Troposphere

Anthony K. Cochran, James M. Roberts, Mary C. Barth, Ranajit Talukdar, Patrick Veres, Solomon Bililign
North Carolina A&T State University, Greensboro, NC, USA
NOAA Earth System Research Laboratory, Boulder, CO, USA
CIRES at University of Colorado, Boulder, CO, USA
National Center for Atmospheric Research, Boulder, CO,USA
Now at Max Planck Institute for Chemistry, Mainz Germany

A recent study of biomass fires and some field measurements have revealed that isocyanic acid (HNCO) can reach levels as high as 600 ppbv near fires and up to 200 pptv in ambient air. After the solubility was measured for the first time, potential human health effects of HNCO from smoke related products were recognized. HNCO is highly soluble in the human body given that the physiological pH = 7.4, and there exists an increased risk for atherosclerosis, cataracts, and rheumatoid arthritis via protein carbamylation. Negative-ion proton-transfer chemical ionization mass spectrometry (NI-PT-CIMS) was used in the fire studies, field measurements, and also to make the first measurement of HNCO solubility (Henry's constant H). Preliminary results show that at a pH of 3.0 ± 0.1 and room temperature (T = 25 ± 1°C), H was found to be 21.1 ± 2.7 M/atm with the first order loss rate k = 6.3 ± 1.6 x10-4 s-1 (in solution). The rate constant k is in good agreement with previous measurements therefore we are confident in the solubility measurement. First results of a numerical cloud model currently in development to characterize the transport of HNCO in the troposphere will also be reported.

How Aerosols Impact Deep Convection and Large-scale Circulation?

Jiwen Fan
Pacific Northwest National Laboratory

Aerosol-cloud interaction is recognized as one of the key factors influencing cloud properties and precipitation regimes. For deep convection clouds (DCCs), the vertical distribution of latent heating could be significantly changed through aerosol microphysical effects, which could impact large-scale circulation. We explored how aerosols can invigorate convection and impact the latent heating profiles and then the circulation with modeling simulations. Long-term observations are also analyzed and supportive results are seen. We found that vertical wind shear plays a key role in determining if aerosol can invigorate DCCs. Increasing wind shear could reverse the aerosol impact on convective strength: from invigoration under weak wind shear to suppression when wind shear gets stronger. This finding enhances our understanding of aerosol-deep convection interactions and provides the scientific basis to better parameterize aerosol effects on convection and large-scale circulation for large-scale models.

Microphysical Simulation of Polar Stratospheric Clouds Using the WACCM/CARMA Model

Yunqian Zhu, Owen Brian Toon
University of Colorado

Polar stratospheric clouds (PSCs) form in the lower stratosphere during the polar night due to the cold temperature inside the polar vortex. PSCs are important to understand because they are responsible for the formation of the Antarctic ozone hole and the "mini" ozone hole over the Arctic.

In this work, I explore the formation and evolution of liquid phase PSC particles (Super-cooled Ternary Solution, a.k.a. STS) using the WACCM/CARMA model. My goals are: 1) add STS particles into the model as the first step in developing a suitable microphysics model for PSC formation coupled to the ozone

chemistry and transport modules in WACCM; and 2) verify the model by comparing with observations (CALIPSO, ACE, in-situ data, etc.) and chemistry model parameterization results.

An STS model has been successfully built in the WACCM/CARMA framework.

We find we are able to run a fully coupled model with STS kinetics included using modest computational resources. The tests that have been done using the new kinetic scheme for condensational growth in our model suggest that it is questionable to treat

STS as being in equilibrium as other current PSC models have done. The STS microphysical characteristics (particle volumes, size distribution, STS coverage) match the observations well. However, the WACCM 3 model has a poor representation of temperature and gas concentrations making careful comparisons with data difficult. Therefore, SD-WACCM, which is driven by observed winds and temperatures, will be used in the next step of my research. Following the move to SD-WACCM I will add NAT, SAT, ice and other types of PSCs to the model.

Aerosol Indirect Effect on Tropospheric Ozone Via Cloud Lightning

Tianle Yuan, Lorraine A. Remer, Huisheng Bian, Jerald R. Ziemke, Rachel Albrecht, Kenneth E. Pickering, Lazaros Oreopoulos, Steven J. Goodman,Hongbin Yu, Dale J. Allen
Univ. Of Maryland/ NASA GSFC

Tropospheric ozone (O3) is a major anthropogenic greenhouse gas and its radiative forcing is still uncertain. The unresolved difference between modeled and observed natural background O3 concentrations is a key source of the uncertainty. Here we demonstrate remarkable sensitivity of lightning activity to aerosol loading with lightning increasing more than 30 times per unit of aerosol optical depth. Corroborating satellite data analyses and model simulations reveal high sensitivity of O3 concentration to aerosol loading via increasing lightning and resultant nitrogen oxides. This aerosol-lightning-ozone link provides a physical mechanism to resolve the model-observation difference in background O3 concentration and suggests a significantly stronger O3 radiative forcing. Aerosol forcing thus has a warming component via its effect on O3 production. Significant implications and challenges for obtaining a quantitative global estimate of this effect are discussed.

Atmospheric Brown Clouds (ABCs): Predicting the Vertical Profile of Particulate Carbon

Annmarie G. Carlton
Rutgers University

Atmospheric Brown Clouds (ABCs) are composed of submicrometer aerosols, including black carbon and other constituents (e.g., sulfate, organics). Globally, ABCs are a major agent of climate change and long range pollution transport. Single particle mass spectra indicate ABC particles in size ranges that efficiently scatter (e.g., 0.2-1.0 μm) are comprised predominantly of internal mixtures that include organic carbon. The vertical profile of organic carbon is not well simulated in atmospheric models and this contributes substantially to uncertainty in climate projections because radiative scattering is altitude dependent. Changes in emissions, SOA partitioning parameters, (among other efforts) do not improve model-predicted vertical profiles, but inclusion of aqueous phase organic chemistry (e.g., cloud processing of VOCs) does.

Organic "brown" carbon, often associated with humic-like substances (HULIS) is ubiquitous in the atmosphere. Sources are thought to include multi- or mixed-phase atmospheric processes (e.g., aqueous phase chemistry in cloud droplets). It has been demonstrated in recent laboratory experiments that products of aqueous phase oxidation of water soluble atmospheric gases such as, glyoxal, methylglyoxal and phenols include HULIS and other light-absorbing products. In this work I explore how inclusion of aqueous phase chemistry in clouds in 3-dimensional atmospheric models changes the predicted vertical profile of particulate carbon. Inclusion of multiphase atmospheric chemistry improves closure with measurements of short-lived climate forcers (SLCFs), particularly aloft .

A Modified Aerosol Classification Scheme Derived from Asian AERONET Data

Timothy Logan
University of North Dakota

Natural and anthropogenic aerosols within the Asian continent have been studied over recent decades and continue to be an important topic due to their spatial and temporal variabilities. The compositions of these aerosols are influenced by their modes of generation (anthropogenic vs. natural) and can be either epi-

sodic (e.g. mineral dust and biomass) or continuous (e.g. industrial or urban). Hence, their physical and chemical properties are often difficult to measure directly and thus needs to be inferred by using some techniques/methods. In the Logan et al. (2010) study, we used spectral curvature (i.e. slope of Angström Exponent (a)) to help classify Asian dust events based solely on their physical properties. From our current study, we will present some preliminary results using a modified aerosol classification scheme which combines the spectral variation technique with one based upon the absorption AE (aabs) and absorption spectral variation (daabs) of Asian aerosols. The purpose of this new classification scheme is to reduce ambiguities in aerosol composition as aabs is strongly correlated with aerosol type. We will use the daabs (i.e. slope of aabs) to (a) illustrate the scattering and absorbing nature of aerosols and (b) report the rate at which aerosol composition varies. Using AERONET observation data, preliminary results from 3 years of data over Tibet (clean region), 6 years of data over Xianghe (urban region), 5 years of data over Taihu (urban region), and 14 years data over Dalanzadgad (desert region) have shown (a) a seasonal dependence and (b) clustering among various types of Asian aerosols as well as (c) superimposed mineral dust and pollution signatures (in particular the clean region in Tibet) which likely originated from both the Taklimakan and Gobi Deserts and Indo-Gangetic Plains.

Investigating the Radiative Impact of Atmospheric Aerosols in Southeast Texas Using WRF-Chem Model

Hongliang Zhang and Qi Ying
Texas A&M University

In addition to the adverse effect to air quality and human health, atmospheric aerosols also affect weather and climate due to their ability to directly scatter and/or absorb incoming solar radiation, and to act as cloud condensation nuclei (CCN) to indirectly influence cloud microphysics so as to the overall cloud radiative properties. Large uncertainties remain in the current estimation of the impact of anthropogenic emissions to the radiative balance of the atmosphere due to the complex interaction of gas phase chemistry, aerosol, cloud and radiation.

In this study, a two-week episode during Texas 2006 Air Quality Study is simulated to test the local and regional influence of anthropogenic and biogenic aerosols to summertime solar radiation and meteorology in Southeast Texas using the WRF-Chem model. Typical options are used for meteorology simulation. The Regional Acid Deposition Model, version 2 (RADM2) is used as gas-phase mechanism and the Modal Aerosol Dynamics Model (MADE) with the secondary organic aerosol model (SORGAM) is used as aerosol mechanism. The anthropogenic emissions are generated using U.S. EPA National Emission Inventory (NEI) 2005. The biogenic emission is calculated online using the USGS landuse classification. Wildfire, dust and sea salt emissions are also included.

The model simulated meteorological parameters and chemical concentrations as well as aerosol optical depths will be compared with observation to validate the model. The direct, semi-direct, and indirect effects of local and regional aerosols to the domainwide shortwave radiation, near-surface temperature, CCN, cloud droplet numbers as well as mean precipitation will be reported. This exercise will serve as an initial step towards developing a source and age resolved aerosol modeling framework to investigate the role of aerosols of different sources and aging status to the regional and global climate.

Chlorine Activation on Binary Aerosol

T. Wegner, J.-U. Grooß, M. von Hobe, F. Stroh, M. Volk and R. Müller
National Center for Atmospheric Research / Forschungszentrum Jülich

Chlorine activation on cold binary aerosol is evaluated with the Chemical Lagrangian Model of the Stratosphere (CLaMS) exploring its sensitivity to factors such as temperature and PSC microphysics.

We assess the potential of the background aerosol to activate chlorine by examining the reaction rates for idealized conditions, for vortex wide satellite observations and high resolution in situ data. The modeling studies show how much chlorine activation can be attributed to the different aerosol types.

The sensitivity of the reaction rates is examined in regard to temperature, microphysics and parameterization schemes. Heterogeneous reaction rates on NAT particles are very sensitive to the parameterization used and the number density, with the uncertainty spanning several orders of magnitude. Reactions on liquid aerosols, on the other hand, are most sensitive to temperature as the uptake of HNO3 and the accompanying tenfold increase in reactivity occur within 1 K.

Vortex wide satellite observations by MLS are used to constrain HCl loss rates in different Arctic winters. The observed HCl loss rates in the lower stratosphere are very similar for the examined time period (2004-

2010) while HNO3 exhibits a great inter-annual variability.

High active chlorine concentrations were observed during a flight of M55 Geophysica on 7th March 2005 with back-trajectories indicating reactivation just 40 hours prior to the flight and temperatures around the PSC formation threshold.

Chemistry Simulations along these trajectories suggest that the observed levels of active chlorine are best explained by heterogeneous processing on cold binary aerosol, with the model results being most sensitive to temperature but insensitive to NAT microphysics.

Air Quality Impact Assessment of Multiple Open Pit Coal Mines in Northern Colombia

José I. Huertas, María E. Huertas, Sebastian Izquierdo, Enrique D. González
Tecnológico de Monterrey

The coal mining region in northern Colombia is one of the largest open pit mining regions of the world. In 2009, there were 8 mining companies in operation with an approximate coal production of w70 Mtons/year. Since 2007, the Colombian air quality monitoring network has reported readings that exceed the daily and annual air quality standards for total suspended particulate (TSP) matter and particles with an equivalent aerodynamic diameter smaller than 10 mm (PM10) in nearby villages. This paper describes work carried out in order to establish an appropriate clean air program for this region, based on the Colombian national environmental authority requirement for modeling of TSP and PM10 dispersion. A TSP and PM10 emission inventory was initially developed, and topographic and meteorological information for the region was collected and analyzed. Using this information, the dispersion of TSP was modeled in ISC3 and AERMOD using meteorological data collected by 3 local stations during 2008 and 2009. The results obtained were compared to actual values measured by the air quality monitoring network. High correlation coefficients (>0.73) were obtained, indicating that the models accurately described the main factors affecting particle dispersion in the region. The model was then used to forecast concentrations of particulate matter for 2010. Based on results from the model, areas within the modeling region were identified as highly, fairly, moderately and marginally polluted according to local regulations. Additionally, the contribution particulate matter to the pollution at each village was estimated.

Using these predicted values, the Colombian environmental authority imposed new decontamination measures on the mining companies operating in the region. These measures included the relocation of three villages financed by the mine companies based on forecasted pollution levels.

Trends in Surface Solar Radiation from Satellite Observations and its Implications for Evaporative Demand

Bo Dong, John D. Lenters
School of Natural Resources, University of Nebraska-Lincoln

Global dimming and brightening refer to the recent evidence for substantial decadal variations in solar radiation reaching the Earth's surface. Previous in-situ based studies in various regions have provided clear evidence of a "dimming" period over roughly 1960s to 1980s and a "brightening" period over roughly 1980s to 2000s. Recent satellite-based studies have implied that there is a potential transition in global mean surface insolation (Rs) trend from brightening to dimming during the past two decades. In this study, Rs trends from 1984 to 2007 are studied at both global and regional scales based on the NASA/Global Energy and Water Cycle Experiment (GEWEX) Surface Radiation Budget (SRB) version 3.0 dataset. Results reveal an overall slightly deceasing rate of 0.26 W m-2 decade-1 in global mean Rs from 1984 to 2007, with a period of significant decreases as 4.51 W m-2 decade-1 over 1999 to 2007. The third order polynomial fit of Rs indicates a more rapid decreasing trend after 2004, during which the rate of dimming between 2004 and 2007 (-7.8 W m-2 decade-1) is nearly 2 W m-2 decade-1 higher than that between 1999 and 2004 (-5.86 W m-2 decade-1). Trends in Rs are also analyzed at the regional scale (North America and Upper Midwest) and they showed a different view from the global signal. The brightening during the past two decades are especially significant over the Great Lakes and the mountain regions. In addition, worldwide evaporative demands are estimated based on the Priestley-Taylor method.

Simulation of Aerosol-cloud Interaction in the WRF model at the Southern Great Plains Site

Jonathan M. Vogel, Yuan Wang, and Renyi Zhang
Texas A&M University

A change in the amount of atmospheric aerosols impacts both their direct and indirect effects on radiation. By the direct effect, aerosols can scatter and absorb incoming solar radiation, while, by the indirect effect, aerosols can serve as cloud condensation nuclei and change the cloud fraction and lifetime of clouds, the microphysical properties of cloud droplets, and the amount of precipitation while also indirectly impacting cloud radiative forcing (IPCC, 2007). The objective of this study is to assess the aerosol-cloud interaction via our two-moment microphysical scheme employed in the Advanced Research Weather Research and Forecasting (ARW) model while participating in the FASTER project. Intercomparisons will be performed between our ARW model data, at 2 km spatial and 15 minute temporal resolution, and other cloud resolving models (CRMs) participating in the FASTER project. This preliminary assessment only looks at the data from our ARW model; specifically, the impact on cloud fraction, precipitation amounts, surface solar radiation, and TOA outgoing long wave radiation by changing the vertical aerosol profile for three different events centered around the March 2000 Cloud IOP campaign at the Atmospheric Radiation Measurement (ARM) Southern Great Plains (SGP) site. The three events include clouds associated with synoptic cyclogenesis, non-precipitating clouds, and clouds associated with a cold front, respectively.

Impact of Aerosols, Ocean Circulation, and Internal Feedbacks on Global Climate

Nora Mascioli, Ross J. Salawitch, Tim Canty
University of Maryland, College Park

This study examines the globally averaged surface temperature record from 1900 to present in terms of the natural and anthropogenic factors driving surface radiative forcing. We look at the sensitivity of global temperatures to anthropogenic factors, including greenhouse gases and aerosols, and natural factors, including changes in solar irradiation, volcanic aerosols, and proxies for variations in sea surface temperatures. We show that the impact of volcanic aerosols on global temperature is sensitive to how variations in sea surface temperature are treated. As noted by Kiehl (2007) and Schwartz et al. (2007), we infer that IPCC (2007) models have been tuned to match the observed temperature record via use of either substantial feedbacks to offset large net cooling due to anthropogenic aerosols or else use of moderate internal feedbacks to offset modest aerosol cooling. The cantilever between the anthropogenic aerosol cooling and climate feedback (also known as climate sensitivity) is particularly important for projections of future temperatures. We show that in the future, as anthropogenic aerosols are removed from the atmosphere due to air quality regulations, imprecise knowledge of climate sensitivity leads to large uncertainties in projections of future climate.

The Interaction between Mt. Pinatubo Aerosols and the Stratosphere

V. Aquila, L. D. Oman, R. S. Stolarski, P. R. Colarco, P. A. Newman
NASA Goddard Space Flight Center

On June 15th, 1991 the eruption of Mt. Pinatubo in the Philippines injected about 20 Tg of sulfur dioxide in the stratosphere. The sulfur dioxide was transformed into sulfuric acid aerosol and increased the amount of background aerosol by orders of magnitude. The volcanic aerosol remained in the stratosphere for about three years, inducing a perturbation of the dynamics and chemistry of the stratosphere.

We simulate the Mt. Pinatubo eruption with the Goddard Earth Observing System (GEOS) version 5 general circulation model, coupled to the GOCART aerosol module and the StratChem stratospheric chemistry module. The total optical depth from our simulations is in good agreement with SAGE-II and AVHRR data. In our simulations, the volcanic aerosol interacts with radiation, modifying the simulated meteorology. We describe the changes in the dynamics of the stratosphere induced by the absorption of longwave radiation by the volcanic aerosol. The absorption of longwave radiation is responsible for the observed cross-equatorial transport of the volcanic cloud.

We also present a new version of GEOS5. This version includes the coupling between aerosol and chemistry, in addition to the aerosol-radiation coupling. Aerosol particles play an important role in stratospheric chemistry, providing the surface for heterogeneous chemical reactions that might lead to the depletion of ozone. The previous version of GEOS5 calculated the heterogeneous reaction rates using the aerosol area densities observed by the SAGE satellite. In particular, in the simulations that performed to determine the

dynamics perturbation, we used a clean background for the heterogeneous chemistry. The new version interactively calculates the surface available for heterogeneous reactions using the simulated sulfuric acid aerosol. This model improvement will allow for the attribution of the ozone perturbation between the radiatively induced dynamical changes and that from stratospheric chemistry.

Study of the Short-term Cloud Feedback with MODIS

Chen Zhou, Andrew Dessler
Texas A&M University

Among the climate feedback mechanisms, cloud feedback is the most uncertain, and it therefore contributes the most to our uncertainty in climate sensitivity. Thus further study of cloud feedback may allow us to better constrain the climate sensitivity. The cloud feedback values calculated from MODIS level 3 cloud products with cloud kernel are consistent with independent satellite measurements in the low latitudes (40S-40N). Results show that high clouds play the dominate role in long-wave cloud feedback, while both high clouds and low clouds are important for shortwave cloud feedback. Variation in high thin clouds, of which the optical depth cannot retrieved successfully by MODIS, has little effect on short-wave cloud feedback, while it contributes significantly to the long-wave cloud feedback. In addition, the magnitude of the cloud feedback is found to be sensitive to the general circulation, and models need to improve their simulations of this. Our results also indicate that the optical depth measured by MODIS is statistically accurate when the solar zenith angle is less than 50 degrees.

VOC Measurements and Source Analysis by PMF at the San Diego - Tijuana Border During the CalMex 2010 Campaign

Zheng, J., Garzon J., Huertas M. and Zhang R.
Texas A&M University

As part of the Cal-Mex 2010 air quality study, from 15 May to 30 June 2010 an Ionicon PTR-MS was deployed at the San Diego – Tijuana border area to measure volatile organic compounds (VOCs). The major VOCs identified during the study included oxygenated VOCs (e.g., methanol, formaldehyde, acetaldehyde, acetone, and C4-carbonyl compounds) and aromatics (e.g., benzene, toluene, C8-aromatics, and C9-aromatics). Biogenic VOCs (e.g., isoprene and pinenes) were scarce in this region due to the lack of vegetation. Using an EPA Positive Matrix Factorization (PMF) model, VOC observed in this border region can be attributed to four sources, i.e., local industrial solvent usage (58%), gasoline engine emission (19%), diesel engine emission (14%), and aged plume (9%) due to regional background. This was consistent with the results of an independent Conditional Probability Function (CPF) analysis of VOCs and wind data, in which industrial source did not show any preference of wind direction and both gasoline and diesel engine emissions were associated with air masses passing through two busy boarder crossing ports.

Exchange of Ozone Between Troposphere and Stratosphere Through Sumatra Squall

Guiting Song; Jagabandhu Panda
Nanyang Technological University

The exchange of ozone between troposphere and stratosphere associated with Sumatra Squall was studied using the Weather Research and Forecasting model with Chemistry (WRF/Chem) version 3.3. A typical Sumatra Squall event over Sumatra Island, Malacca Strait and Malay Peninsula for the period from 27 April to 5 May 2007 was investigated. The simulation results indicate that during Sumatra Squall event the amount of ozone in the upper atmosphere was reduced, but was enhanced in the lower atmosphere.

Nitrogen Trifluoride (NF3): Improved Monitoring of an Emerging Greenhouse Gas

Tim Arnold, Jens Mühle, Peter K. Salameh, Christina M. Harth, Diane J. Ivy and Ray F. Weiss
Scripps Institution of Oceanography, UC San Diego

Long term high-frequency measurements of atmospheric trace gases have proved invaluable for studying composition trends, quantifying sources/sinks and verifying the results of policy action. As a preferred substitute for perfluorocarbons in the electronics industry, NF3 (100 year global warming potential up to 16800) is under consideration as an important atmospheric trace gas, and this is spurring our effort to begin its long term monitoring.

The number and productivity of plants manufacturing NF3 is increasing in order to supply the growing demand in modern end-use applications, namely microcircuit etching and production of flat panel displays and thin-film photovoltaic cells. Although use of NF3 is escalating, little is known about global emissions of this potent greenhouse gas because it is not included in national emissions inventories reporting under the United Nations Framework Convention on Climate Change (UNFCCC). Also, due to its manufacture by multiple suppliers and its use in various industries, emissions cannot be accurately estimated from available statistics.

We use a new analytical method for continuous atmospheric measurements at La Jolla, California. Together with archive flask samples from both hemispheres spanning the last three decades, we present optimised annual emission estimates using an inverse method and 2D atmospheric transport model. Our emission estimates during 2010 of 760 +/- 130 metric tons (around 13 million equivalent metric tons of CO2) show that the annual emissions of NF3 are contributing more to radiative forcing than many compounds already listed in the Kyoto Protocol – e.g. C3F8 for which we make a 'top-down' emission estimate of around 5 million equivalent metric tons of CO2 in 2009. Emission factors of NF3 have declined significantly over the past decade due to efforts by industry to curb fugitive release. Nonetheless, the atmospheric mole fraction growth rate continues to increase due to rapid expansion of the NF3 market.

River Basin Scale Water Balance Using GRACE

Eric McWilliams
University of Maryland, College Park

The water cycle continuously provides precipitation to the land which becomes terrestrial water storage (TWS) before returning to the atmosphere via evapotranspiration or flowing into the ocean. If we are able to measure changes in TWS and have precipitation and discharge data then we can compute evapotranspiration as a residual of the water budget equation. The challenges to using this approach are obtaining accurate TWS and river discharge measurements. Numerical models are another option for assessing the water budgets of river basins but they often suffer in locations with low concentrations of in situ measurements. The Gravity Recovery and Climate Experiment (GRACE) now provide estimates of changes in TWS at a regional scales which, given the availability of river discharge data, can be used to estimate evapotranspiration through the water budget approach. In this presentation we will show water budget based time series of evapotranspiration for several large river basins and compare these with output from multiple coupled and uncoupled global models.

Effects of Stratospheric Ozone Change on Photochemistry and Air Quality in the Troposphere

Shiliang Wu, Huanxin Zhang
Michigan Technological University

Stratospheric ozone has experienced significant depletion since the late 1970s, especially over the high latitude regions and is expected to recover in the coming century. The changes in stratospheric ozone column would strongly affect photochemistry in the troposphere by affecting the solar actinic flux. An increase in ozone column implies decreased ozone photolysis rate and hence increased atmospheric lifetime of ozone in the troposphere. We examined the consequences of stratospheric ozone changes for tropospheric chemistry, surface ozone air quality as well as the intercontinental transport of tropospheric ozone with a global chemical transport model.

A Link Between Cloud Nucleation Ability and Chemical Composition of Marine Aerosols

Chunhua Deng, Sarah D. Brooks, German Vidaurre, Daniel C.O. Thornton
Texas A&M University

The purpose of this study was to better understand the role of the chemical composition of marine aerosols in aerosol-cloud interactions. Continuous measurements of aerosol concentration, cloud condensation nuclei (CCN) concentration, and particle size distributions were performed during the Halocarbon Air Sea Transect – Pacific (HaloCAST) campaign in 2010. To determine aerosol chemical composition, a PIXE streaker was used to collect the time- and location-resolved aerosol samples along the approximately 7000 mile transect from Punta Arenas, Chile to Seattle, WA. Raman microspectroscopy (RM) was used to identify the chemical composition and mixing state of individual particles present in collected samples. Single aerosol particles were first sorted into four categories according to the dominant peaks in their RM spectra: long chain

organics, soluble inorganics, insoluble inorganics and samples dominated by either humic-like substances (HULIS) or soot. According to our results, long chain organic species were frequently identified as the dominant chemical component of individual aerosol particles. In addition, the percentage of particles which contained long-chain organics as either the dominant component or a secondary component of internally mixed aerosols observed was frequently high, with values as high as 90% at certain points along the cruise track. The prevalence of long chain organics generally coincided with observations of better-than-average cloud-nucleating ability of the aerosols, according to the CCN measurements. However, in a few cases, high cloud nucleation ability was observed in the absence of long chain organics, suggesting that presence of other aerosol types may also facilitate cloud nucleation. Results will be presented and implications for climate will be discussed.

Validation of Boundary Layer Detection by Ground-based Aerosol Lidar

Virginia Sawyer, Zhanqing Li, Ellsworth J. Welton
University of Maryland, College Park; NASA-GSFC

The planetary boundary layer (PBL) governs whether aerosol emitted from the surface is able to enter long-range transport in the free troposphere, and therefore has a major effect on the lifetime in the atmosphere and chemical aging that aerosol can undergo. As a thermodynamic structure in the lower atmosphere, the PBL top height is often detected in radiosonde temperature profiles, but this method offers limited temporal resolution. Because of its effect on aerosol, however, it is possible to infer the PBL top height in measurements of the relative aerosol concentration with altitude.

Two algorithms for detecting the PBL top by the backscatter gradient in aerosol lidar are discussed and combined: wavelet covariance (Davis et al. 2000, Brooks 2003) and curve fitting by simulated annealing (Steyn et al. 1999, Hägeli et al. 2000). Lidar-derived PBL heights from the ARM SGP site and MPLNET are compared to radiosonde-derived PBL heights from the same locations. The former algorithm provides a first guess for the latter which is adaptable to a wide range of climates and weather conditions; the latter method refines the PBL height and adds an estimate of entrainment zone depth. The combined algorithm is computationally simple enough to use operationally, while successfully identifying the backscatter features associated with the PBL.

Using Multi-spectral Active and Passive Remote Sensors With Reanalysis to Examine Dust Aerosol Indirect Effects on Cirrus

George P. Kablick III
University of Maryland, College Park

This study evaluates combined observations from space-based lidar, radar, and radiometer instruments to assess the statistical significance of dust effects on cirrus clouds. Using data obtained from the nadir-viewing instruments in the A-Train constellation, multiple cases are presented that indicate the first aerosol indirect effect. Specific cases of cirrus clouds are presented that exhibit large brightening in the visible lidar backscatter with correlated decreases in radar reflectivity as compared to similar cirrus clouds in terms of infrared brightness temperature analysis, geolocation, altitude and season.

Greenhouse Warming and Aerosol Cooling: Observations Versus Modeling

Trude Storelvmo
Yale University

Global climate models (GCMs) currently predict global mean temperature increases over the next century ranging from a modest 2°C to a dramatic 6°C. Some of this uncertainty range stems from uncertainties in future greenhouse gas emissions, which in turn depend on economic growth and technological progress. However, our lack of understanding of the climate system itself, along with poor representations of the underlying chemical and physical mechanisms driving climate change in numerical models, are major sources of uncertainty. Anthropogenic activity leads to emissions of not only greenhouse gases, but also aerosol particles with a range of compositions and properties. Aerosols generally act to cool Earth's climate, either directly via their interaction with solar radiation or indirectly via their influence on clouds. Hence, aerosols are therefore thought to mask some of the warming due to increasing greenhouse gas concentrations. GCMs predict this masking effect to be anything from negligible to comparable in magnitude to the greenhouse warming, which in turn translates into a large uncertainty in the net driving force of climate change. We compare observed time series of surface air temperature and radiation to the same quantities from GCM simulations carried out for the Coupled Model Intercomparison Project (CMIP). Preliminary results

suggest that the simulated aerosol masking is weaker than suggested by the observations.

Investigation of Ambient OH and HO2 Concentrations Using the Fluorescence Assay by Gas Expansion (FAGE) technique

Qingnan Liu
Texas A&M University

We describe a new field instrument to measure ambient OH and HO2 concentrations using the Fluorescence Assay by Gas Expansion (FAGE) technique. The instrument was deployed for the first time during the Dallas - Fort Worth 2011 summer field campaign. Preliminary field data on OH and HO2 concentrations were obtained for Eagle Mountain Lake area under high VOC emission conditions, primarily from natural gas leakage. As expected OH and HO2 measurements exhibited diurnal variations that are correlated with solar UV intensity. Performance of the instrument and initial analysis of the experimental observation will be discussed. Intercomparison measurements with the results from the CIMS instrument from NCAR will also be presented. Several improvements on instrumental detection limit and inclusion of OH reactivity capability are currently underway.

Robert A. Duce Symposium

Air-Sea Exchange: Impacts on the Atmosphere and Ocean

Abstract submission deadline 1 August 2012

The 2013 Robert A. Duce Symposium recognizes Dr. Duce's leadership of the atmospheric and oceanic science community both in the United States and internationally and honors his distinguished contributions to research in Antarctica, the Arctic and all the world's oceans related to

- chemical cycles of pollutant and natural substances in the global atmosphere
- atmospheric transport of chemicals from the continents to the ocean and their impact on marine biogeochemistry
- atmospheric chemistry and climate

More info on this symposium can be found at annual.ametsoc.org. Sponsors include American Meteorological Society, National Science Foundation, and International Commission on Atmospheric Chemistry and Global Pollution.

GEOSCIENCES
TEXAS A&M UNIVERSITY

FOREWORD

Dr. Duce has pioneered research in chemical cycles of pollutant and natural substances in the global atmosphere and made fundamental contributions to atmospheric transport of chemicals from the continents, their deposition to the ocean and their impact on marine biogeochemistry and climate, with studies in Antarctica, the Arctic, and all the world's ocean. He has provided crucial leadership to the atmospheric/oceanic sciences community nationally and internationally, in particular in his role in directing major field campaigns such as Sea-Air Exchange program (SEAREX) and in establishing the Surface Ocean – Lower Atmosphere Study (SOLAS) project. Dr. Duce has also been recognized for his outstanding service through Presidency of International Association of Meteorology and Atmospheric Sciences (IAMAS), Scientific Committee on Oceanographic Research (SCOR), and Commission on Atmospheric Chemistry and Global Pollution (CACGP). He has 175 scientific publications in referred journals (h-index = 52 and total citation over 9000 from ISI Web of Knowledge).

The theme for the Robert A. Duce Symposium is "Air-Sea Exchange: Impacts on the Atmosphere and Ocean". It will honor his distinguished contributions in scientific research and his leadership to the broad atmospheric/oceanic science community. The symposium will present an integrated view of atmospheric and marine chemistry, air-sea interaction, global biogeochemical cycles, and climate change.

The Organizing Committee
Prof. Peter Liss, Chair, University of East Anglia; Prof. Renyi Zhang, Co-Chair, Texas A&M University;
Prof. Yuan Gao, Rutgers University; Dr. Alex Pszenny, University of New Hampshire; Prof. Shari Yvon-Lewis, Texas A&M University; Prof. Mitsuo Uematsu, University of Tokyo; Prof. Guoshun Zhuang, Fudan University

EDUCATIONAL BACKGROUND

1957, B.A., Chemistry, Baylor University
1964, Ph.D., Inorganic and Nuclear Chemistry, MIT
1964-1965, Post-Doctoral Fellow, Department of Geology and Geophysics, MIT

PROFESSIONAL POSITIONS

Distinguished Professor Emeritus, Departments of Oceanography and Atmospheric Sciences, TAMU, 2006-Present
Distinguished Professor, Departments of Oceanography and Atmospheric Sciences, TAMU, 2004-2006
Professor, Oceanography and Atmospheric Sciences, Texas A&M University, 1991-2004
Dean, College of Geosciences and Maritime Studies, Texas A&M University, 1991-1997
Dean, Graduate School of Oceanography and Vice Provost for Marine Affairs, Univ. of Rhode Island, 1987-1991
Associate Professor/Professor, Oceanography, University of Rhode Island, 1970-1991
Director, Center for Atmospheric Chemistry Studies, University of Rhode Island, 1981-1991
Visiting Professor, School of Environmental Sciences, University of East Anglia, Norwich, England, 1997-1998
Visiting Professor, Applied Chemistry, Keio University, Yokohama, Japan, 1985
Visiting Professor, Chemistry, University of Otago, New Zealand, 1983
Collaborateur Etranger, CFR/CNRS, Gif-sur-Yvette, France, 1976-1977
Assistant/Associate Professor, Chemistry, University of Hawaii, 1965-1970

HONORS AND AWARDS

Rosenstiel Award in Marine and Atmospheric Chemistry, 1990
Fellow, American Meteorological Society, 1984
Fellow, American Association for the Advancement of Science, 1990
Fellow, American Geophysical Union, 1991
Fellow, The Oceanography Society, 2006
Chair, NRC Ocean Studies Board, 2012 - present, member, 2001-2007
Distinguished Service Award, Sea Grant Association, 2010
National Associate of the National Academies, 2009 - present

Distinguished Professor, Departments of Oceanography and Atmospheric Sciences, TAMU, 2004 - Present
President, SCOR (ICSU Scientific Committee on Oceanic Research), 2000-2004
Chair, UN Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP), 2000-2002, Member, 1986 - present
President, International Association of Meteorology and Atmospheric Sciences (IAMAS), 1995–1999
President, The Oceanography Society, 1996 -1998
President, International Commission on Atmospheric Chemistry and Global Pollution, 1983-1990, Honorary Life Member
Citation for Excellence in Service to the American Geophysical Union (AGU), 2002

SOME OTHER PROFESSIONAL ACTIVITIES

Chair, Committee of Visitors, NSF Ocean Sciences Division, 2012 and 1995
Co-chair, WMO/GESAMP Working Group 38, The Atmospheric Input of Chemicals to the Ocean, 2007-Present
Member, Scientific Steering Committee, US GEOTRACES Program, 2009 - present
Member, Program Advisory Committee for the Ocean Observatories Initiative, Consortium for Ocean Leadership, 2008-present
Chair, National Sea Grant Office Review Committee, 2001-2002
Co-Chair, NRC Committee on Scientific Ocean Drilling, 2010 – 2011
Member, National Sea Grant College Review Panel, 2000 - 2009
Member, US National Committee for the IUGG, 2000 - 2007
Member, Executive Committee, IUGG, 1995 - 1999
Member, NSF Advisory Committee for Geosciences, 1993 – 1997
Member, AMS Council, 1987 - 1991
Member, Board of Trustees, UCAR, 1986 - 1993
Member, NRC Board on Atmospheric Sciences and Climate, 1982 - 1986; 1989 - 1993
Member, NRC Committee on Atmospheric Chemistry, 1987 - 1990
Chair AAAS, Section W, Atmospheric and Hydrospheric Sciences, 1987 - 1988
Chair, NRC Panel on Global Tropospheric Chemistry, 1982 - 1985
Chair, AMS Committee on Atmospheric Chemistry and Radioactivity, 1973 – 1974

FORMER STUDENTS/POST DOCS/RESEARCH SCIENTISTS/VISITING SCIENTISTS

<u>Ph.D. Graduate Students</u>

Jarvis Moyers, 1970; Gerald Hoffman, 1971; Fred Seto, 1971; Eva Hoffman, 1975; Gordon Wallace, 1976; Paul Walsh, 1977; William Graham, 1977; Steve Piotrowicz, 1977; Clifford Weisel, 1981; Thomas Fogg, 1983; Hal Maring, 1985; Eric Butler, 1986; Byard Mosher, 1986; Alex Pszenny, 1987; David Erickson, 1987; Thomas Patterson, 1988; Joseph Schultz-Tokos, 1989; Guoshun Zhuang, 1991; Yuan Gao, 1994; Tae Siek Rhee, 2000; Joel Seymour, 2001; Kim Mace, 2002

<u>M.S. Graduate Students</u>

Fred Seto, 1967; Barbara Ray, 1969; Eva Jernigan, 1969; Steve Piotrowicz, 1972; Clifford Weisel, 1978; Azhari Omer, 1978; Antoinette Van Neste, 1986; Yuan Gao, 1990; Linda Hansen, 1992; Margaret Peacock, 1994

<u>Post-Docs/Research Scientists/Visiting Scientists</u>

Richard Arimoto; Robert Boldi; Randy Borys; Liqi Chen; Douglas Davis; Ian Fletcher; Patrick Buat-Menard; Cecile Guieu; Patrick Harder; Andrew Hudson; Claude Lambert; Peter Liss; Hal Maring; Ray McDonald; John Merrill; Kenneth Rahn; Barbara Ray; Bernd Schneider; George Schwarze; Shigeru Tanaka; Mitsuo Uematsu; C.K. Unni; Al Woodcock; William Zoller

(2007) Robert A. Duce

(1966) With Jarvis Moyers and raindrop spectrometer in Hawaii. Jarvis Moyers was Bob's first graduate student and later became Director of the NSF's Division of Atmospheric Sciences. This work was being done on the slopes of Mauna Loa on the island of Hawaii and was investigating the chemistry of raindrops as a function of raindrop size.

(1959) Bob (far right) and his crew of a WB-66 weather reconnaissance aircraft at RAF Chelveston, England.

How's Mary?
About Bob Duce in the Early Years

Right from the beginning Bob's enthusiasm was infectious and helped me find direction.
I'll never forget our first meeting.

It was around 1960, just after a seminar I had given in the MIT chemistry department
where I had once studied, learning to become a nuclear chemist.
And early in my ten year learning curve 1956–66
to becoming a geochemist on the MIT geology department faculty.
In my talk I had described some of our neutron activation analyses
of rocks and things, using the then new MIT nuclear research reactor.
Bob came up afterward, introduced himself as a chemistry graduate student,
and said he might like to work with us.

At first I confessed that at that moment, rather than thinking about analyzing more rocks and things,
I wondered if samples of the atmosphere could somehow be analyzed.
Bob exploded with enthusiasm, saying:
"Do you realize that I spent four years in the Air Force as a meteorologist?"
With that remark he quickly got me oriented,
and my learning curve turned sharply upward into the air!

In short order we decided to start by analyzing rainwater for iodine, bromine, and chlorine
using the MIT nuclear research reactor for neutron activation.
The study site we chose was Hawaii, with lots of ocean around
to throw I, Br, and Cl into the overlying atmosphere.
Bob lost no time in collecting rain samples to irradiate with neutrons.

After irradiating the samples, our procedure involved lab work to separate their elements
and prepare them for counting neutron-induced radioactive decay.
Mary Untz, a Northeastern University work-study student, had been assigned to our group.
We put her to work helping with the separation procedure.
As I recall, Mary was especially good at shaking separatory funnels.
She and Bob worked well together, exceptionally well, in fact.

A few years later, in 1966, I was to leave MIT
and join Aksel Wiin-Nielson at the University of Michigan.
He chaired a new department, Meteorology and Oceanography,
which, as he put it, had a big "M" and a little "o".
My job was to make that a big "O",
and another learning curve -- for me to become an oceanographer.

Bob's inspiration had laid groundwork for us to look into new air and water chemistry problems.
And the U of M nuclear research reactor for neutron activation analysis
plus the department's big "M" strengths made this possible.

Between Massachusetts and Michigan, though, there was another attraction I could not resist:
Teach geochemistry for a semester in Argentina.
My one time MIT acquaintance Prof. J. A. "Pepe" Catoggio had long been urging me to come.
So Ellen and I took a long route between Cambridge and Ann Arbor,
stopping off for a semester in La Plata.

On the way south, during an overnight in Trinidad, we heard on the radio:
"A military junta has just overthrown the government of Argentina."
We continued the trip south anyway, and when we arrived in Buenos Aires Pepe was relieved.
We had not turned tail and flown back home.

The junta had already closed the universities,
but Pepe quickly arranged to hold classes in an oil company building.
And the students certainly appreciated our hanging in there with them
to forge ahead in spite of the military junta.

At semester's end in December 1966 Ellen and I decided to wend our way back north to Ann Arbor
along the west coast of South America.
By that time we had picked up enough Spanish to get around.
Eduardo Schalscha in Santiago, Chile, a friend from my Fulbright year 1955-56 in Amsterdam,
was a gracious host and an icon of growing prosperity of life in Chile.
Next, we saw Machu Picchu in Peru, an amazing archeological legacy of the Incas,
and an incredible tourist adventure.

Finally we visited two old friends, both by chance working in Cali, Colombia.
They made such a deep impression on me that it has lasted to this day.
Mike Brower, another friend from my Fulbright year 1955-56 in Amsterdam,
was on assignment to help the upper crust get set up in business.
And Mary Untz, of separatory funnel fame, was finishing a year in the Peace Corps
working with everyone else.

Mary had become deeply concerned that too many of the young did not get enough to eat.
Lack of food was stunting their growth and development.
Mike had not known Mary until our visit, but when they met he suddenly realized that
Mary was the person working with the people who really matter,
not just a privileged few like his clientele of the wealthy.

From Cali Ellen and I headed north
and arrived in Ann Arbor on schedule around Christmas time.
We took possession of our new apartment in Huron Towers a few hours ahead of the movers
who would be bringing our furniture from Massachusetts.
The apartment was completely bare, without a stick of furniture anywhere.

Except for a telephone: It had apparently just been installed
and left sitting on the middle of the living room hard wood floor.
Suddenly the phone rang.
I picked it up to see who the dickens might be calling.
It was Bob Duce calling from Hawaii
where he had recently joined the University of Hawaii faculty.
He asked:
"How's Mary?"

Jack Winchester
July 2012
Jack Winchester was Bob's major professor while he was a PhD candidate at MIT

Program for Duce Symposium Banquet
January 8, 2013
Presiding: Peter S. Liss, Univ. of East Anglia, Norwich, UK

7:30	Banquet starts- Hilton Hotel, Room 406
8:15 – 8:30	Keynote speech by Margaret S. Leinen, AGU President-elect, Florida Atlantic Univ., Fort Pierce, FL
8:30 – 8:40	Remarks by Kate Miller, Dean, College of Geosciences, Texas A&M Univ. College Station, TX
8:40 – 8:45	Remarks by Jerry North, Department of Atmospheric Sciences, Texas A&M Univ., College Station, TX
8:45 – 9:30	Open-floor Comments
9:30 – 9:40	Concluding Remarks by Robert A. Duce
9:40 – 9:45	Photo session
9:45	Adjourn

NOTES

J1.1

Spatial distribution of CO2, CH4, and N2O in the Pacific sector of the Southern Ocean and the Amundsen Sea

Tae Siek Rhee, Korea Polar Research Institute, Incheon, South Korea; K. A. Park, D. Hahm, H. C. Shin and S. H. Lee

Continuous increase of CO2, CH4, and N2O in the atmosphere is the dominant driving force to change in the global climate. The ocean plays a wide range of role in the budget of these gases in the atmosphere: as a sink for CO2 and a source for CH4 and N2O. High latitude of the Southern Ocean is particularly important as the change in the cryosphere can impact the ecological and physical settings that govern the content and flux of dissolved gases in seawater. We have visited the Pacific sector of the Southern Ocean and the Amundsen Sea during the austral summer between 2009 and 2012 to investigate the impact of the change in the cryospheric environments. In the open ocean, CO2 in the seawater was mostly undersaturated while N2O and CH4 were supersaturated with respect to that in the marine boundary layer. These typical features were not observed in the sea-ice region; CO2 in the seawater was supersaturated in 2011, but not in 2012, and CH4 in the seawater was undersaturated while dissolved N2O was supersaturated for both years. In the polynya of the Amundsen Sea, CO2 and CH4 were depleted in the seawater while dissolved N2O was supersaturated with respect to that in the atmosphere. Based on these 3-year observations during austral summer season, high latitude of the southern ocean contributes as a sink for atmospheric CO2 whilst as a source for N2O. In the case of CH4, its emission to the atmosphere is weak in the open ocean, while the sea-ice region and the polynya act as a sink.

J1.2

Quantifying Lithogenic Inputs to the North Pacific Ocean Using the Long-lived Thorium Isotopes

Christopher T. Hayes, Columbia University, Palisades, NY; R. F. Anderson, M. Q. Fleisher and R. Gersonde

Dissolved ^{232}Th is added to the ocean though the partial dissolution of lithogenic materials such as aerosol dust in the same way as other lithogenically-sourced and more biologically important trace metals such as Fe. Oceanic ^{230}Th on the other hand is sourced primarily from the highly predictable decay of dissolved ^{234}U. The rate at which dissolved ^{232}Th is released by mineral dissolution can be constrained by a Th removal rate based on ^{230}Th:^{234}U disequilibria. Calculated fluxes of dissolved ^{232}Th can in turn be used to estimate lithogenic supplies, such as aerosol dust deposition, given the concentration and fractional solubility of Th in the lithogenic material. This method applied to water column profiles from the Innovative North Pacific Experiment (INOPEX) cruise of 2009 allows estimates of dust deposition at seven sites within the subarctic Pacific, a region in which biological productivity is debatably limited by aerosol-derived Fe. We compare our dust deposition estimates to those based on satellite optical depth and surface ocean Al concentrations. The long-lived thorium isotopes offer new insights into lithogenic material transformations in the ocean which complement more traditional tracer elements.

J1.3

Estimating Reactive Oxygen Species in the Surface Ocean from Remote Sensing Data with Possible Implications for Fe Deposited from Atmospheric Dust

Leanne C. Powers, University of Georgia, Athens, GA; W. L. Miller

Reactive oxygen species (ROS), including superoxide (O2-) and hydrogen peroxide (HOOH), are implicated in a variety of important processes in both atmospheric and marine waters including redox cycling of metals, physiological impacts on aquatic micro-organisms, and degradation of natural organic matter (NOM). Photochemical production is the dominant source for O2- and HOOH in marine surface waters, thus creating a mechanistic link with UV radiation and chemical redox reactions. To examine these links over larger spatio-temporal scales (10yr regional and global), we have used the methods of Fichot and Miller (Remote Sensing Environment, 2010) to calculate HOOH photoproduction rates using modeled solar irradiance, remotely sensed ocean color and sea surface temperature, together with laboratory derived photochemical HOOH apparent quantum yield (AQY) spectra with embedded activation energies for temperature correction. Warming of the surface ocean results in higher HOOH photoproduction rates. Making assumptions for the effect of temperature on observed HOOH dark decay constants from coastal and ocean whole water samples, photoproduction rates are used to estimate in situ HOOH and O2- concentrations. These, in turn, provide insight into spatial and temporal trends for Fe redox kinetics relevant to the lifetime and thus, impact of atmospheric Fe deposited to the surface ocean.

J1.4

Aging of Soot Aerosol from OH-Initiated Oxidation of Toluene

Chong Qiu, Texas A&M University, College Station, TX; A. F. Khalizov and R. Zhang

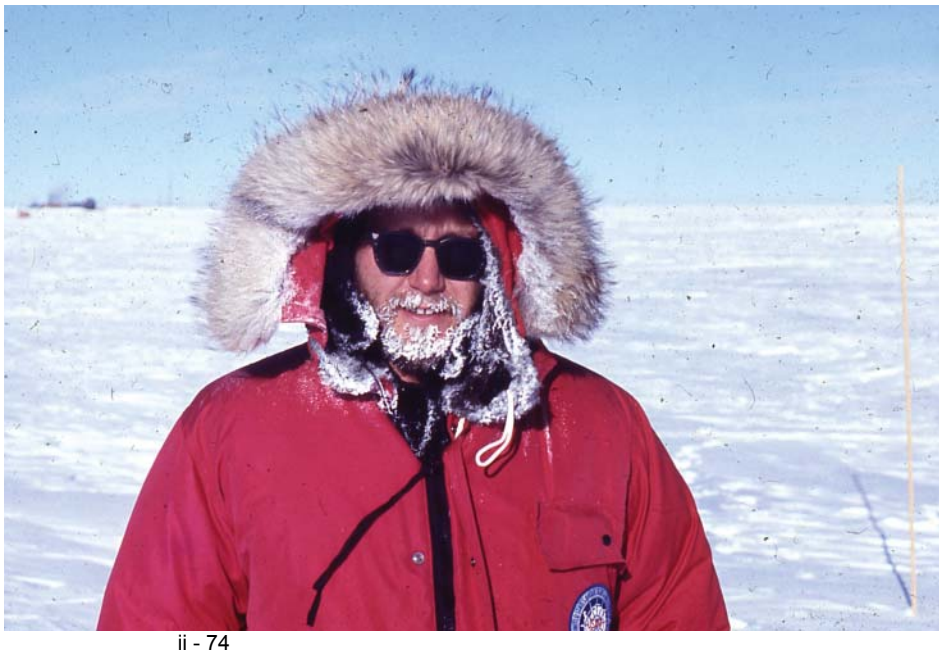
Ubiquitous in the atmosphere, soot particles interact with solar radiation and alter the cloud formation process. Aging of soot particles through interactions with other atmospheric pollutants can significantly change particle properties and hence modify impacts of soot on the climate and environment. We have investigated the role of secondary organic aerosol formation from oxidation of anthropogenic volatile organic compounds (VOCs) on the properties of soot particles. In an environmental chamber, monodisperse soot particles were exposed to products of the toluene-OH oxidation reaction. An integrated aerosol analytical system was used to simultaneously monitor the changes in the particle size, mass, organic mass faction, morphology, effective density, hygroscopicity, and optical properties. We show that properties of the aged soot particles are largely governed by the thickness of the organic coating. With the development of the organic coating, the soot core is changed from a highly fractal to compact form. The organic coating makes soot aerosol hygroscopic, causing further compaction on particles when exposed to elevated relative humidity. The scattering and absorption cross-sections and single scattering albedo are also enhanced by the organic coating. Our results suggest that oxidation products of anthropogenic aromatic VOCs can significantly alter the composition and properties of soot particles, considerably enhancing the atmospheric impacts of soot aerosol.

TJ6.1

Composition, Mixing State, and Cloud Nucleation Ability of Airborne Marine Particles

Sarah D. Brooks, Texas A&M University, College Station, TX; D. C. O. Thornton, C. Deng and G. Vidaurre

Here we use a suite of in-situ measurements to address the possible pathways through which contributions from the sea surface microlayer contribute to marine aerosol concentration, chemical composition, and cloud nucleation ability. Continuous measurements of aerosol concentration and cloud condensation nuclei (CCN) concentration were performed during the Halocarbon Air Sea Transect – Pacific (HaloCAST) campaign in 2010. To determine aerosol chemical composition, a PIXE Streaker was used to collect time- and location- resolved aerosol samples along the approximate 7000 mile transect from Punta Arenas, Chile to Seattle, WA. Raman microspectrometry (RMS) was used to identify the chemical composition and mixing state of individual particles in the Streaker samples. Chlorophyll a concentrations along the cruise track were retrieved from Sea-viewing Wide Field-of-view Sensor (SeaWiFS) satellite data. Sampled marine aerosols were categorized into four main groups according to the dominant chemical component in their Raman spectra: long chain organic compounds, humic-like substances (HULIS) or soot dominated species, water soluble inorganic salts, and insoluble inorganic minerals. The results of the measurement showed several important findings. First, long chain organic species are prevalent in the marine aerosol samples throughout the cruise. Long chain organics tended to be present in internally mixtures with other organic and inorganic components. In addition, a double peak at 1050-1620 cm-1 in Raman spectra representing either humic-like substances (HULIS) or soot was frequently observed, even in samples collected in the pristine southern Pacific Ocean. According to our measurements, Pacific marine aerosol may be generally characterized as multicomponent aerosol dominated by a high organic fraction. In addition, measured critical supersaturations required for ambient aerosols to activate as CCN are anticorrelated with chlorophyll a concentrations along the cruise track. This suggests that regions of high biological activity in the ocean produce aerosol which are more efficient and can act a CCN at lower supersaturations than background aerosols. The presence of long chain organic compounds may improve the nucleating ability of aerosols, since such surfactant molecules reduce droplet surface tension facilitating activation. However, the correlation between chlorophyll a in the surface waters and long chain organics in the aerosol is weak. At times throughout the cruise, additional factors clearly contribute to the aerosol's nucleating ability. Potential marine contributions to cloud formation will be summarized and atmospheric implications discussed.



(1970) Bob at the South Pole, Antarctica - This work at South Pole and at McMurdo represented among the first studies of aerosol chemistry, including the halogens, in Antarctica.

TJ6.2

Atmospheric inorganic nitrogen input via dry, wet, and sea fog deposition to the subarctic western North Pacific Ocean

Jinyoung Jung, Seoul National University, Seoul, South Korea; H. Furutani, M. Uematsu, S.W. Kim and S. C.Yoon

Aerosol, rainwater, and sea fog water samples were collected during the cruise conducted over the subarctic western North Pacific Ocean in the summer of 2008, in order to estimate dry, wet, and sea fog deposition fluxes of atmospheric inorganic nitrogen (N). During sea fog events, mean number densities of particles with diameter larger than 0.5 μm decreased by 12–78%, suggesting that particles with diameters larger than 0.5 μm could act preferentially as condensation nuclei (CN) for sea fog droplets. Mean concentrations of nitrate (NO_3^-), methanesulfonic acid (MSA), and non sea-salt sulfate (nss-SO_4^{2-}) in sea fog water were higher than those in rainwater, whereas those of ammonium (NH_4^+) in both sea fog water and rainwater were similar. These results reveals that sea fog scavenged NO_3^- and biogenic sulfur species more efficiently than rain. Mean dry, wet, and sea fog deposition fluxes for atmospheric total inorganic N (TIN; i.e., $NH_4^+ + NO_3^-$) over the subarctic western North Pacific Ocean were estimated to be 4.9 ± 2.6 μmol m^{-2} d^{-1}, 33 ± 47 μmol m^{-2} d^{-1}, and 7.8 ± 8.7 μmol m^{-2} d^{-1}, respectively. While NO_3^- was the dominant inorganic N species in dry and sea fog deposition, inorganic N supplied to surface waters by wet deposition was predominantly by NH_4^+. The contribution of dry, wet, and sea fog deposition to total deposition flux for TIN (46 ± 48 μmol m^{-2} d^{-1}) were 11%, 72%, and 17%, respectively, suggesting that ignoring sea fog deposition would lead to underestimate of the total influx of atmospheric inorganic N into the subarctic western North Pacific Ocean, especially in summer periods.

TJ6.3

The Mixing of Asian Dust with Pollution Aerosol and the Transformation of Aerosol Components during the Dust Storm over China

Guoshun Zhuang, Fudan University, Shanghai, China; S. Rao

Abstract Extensive and continuing sampling, monitoring and analyzing aerosols for the last ten years were performed at 10 representative sites (desert, rural, urban, and island) in China to investigate the characteristics, composition, source, and long-range transport of aerosols over East Asia. In particular, fine and coarse particulate samples collected under normal conditions, as well as samples taken during specific events like haze-fog, rain, and dust storm were characterized for their elemental and ionic compositions and for the organic markers to study the variation of characteristics and the different formation mechanisms of aerosols in dust, haze, and clear days. Several techniques have been developed for the differentiation of local and remote PM. The ratios of Ca/Al and Mg/Al can be used to distinguish and estimate the contributions of mineral particles from different dust sources and from local or remote sources. The spatial variation of the visual range over entire China is achieved, which demonstrated that almost all areas of the central and eastern China, especially all of those urban clusters were covered by heavy haze with very poor visibility. The results demonstrated that there has been tremendous heavy air pollution over entire China and a new weather pattern of haze is shown over many China cities. The high concentration of the soluble salts with high hygroscopicity, especially, ammonium salt, sulfate salt was the formation mechanism of the new weather pattern in China. Sulfate emitted from Taklimakan Desert was found most from the primary dust aerosol, which is due to the paleo-ocean source of this largest desert in Asia. Sulfate transported to Eastern China and Pacific would be much more than previous estimation. The mixing and interaction of Asian dust with the heavy anthropogenic aerosol during the long range transport of China aerosol would have an significant impact on the environment of downstream local cities as well as the global climate change. Asian dust not only delivered large amounts of mineral elements but also carried several times high concentration of pollution elements to the open ocean. Dust not only serves as surface carrier for the formation of sulfate and nitrate, but also can provide the limiting nutrients, Fe(II) to the oceans, which would has far-reaching impact on the global biogeochemical cycle.

TJ6.4

Investigation of the impacts of Asian pollution on Pacific storm track using multi-scale modeling results

Yuan Wang, Texas A&M University, College Station, TX; M. Wang, S. J. Ghan and R. Zhang

Long-term satellite data and numerical simulations with the cloud-resolving model (CRM) suggest that increasing pollution levels in Asia and associated outflows may impact the Pacific storm track by altering cloud development, lifetime, albedo, and precipitation. In this study, results from a pair of 6-year global atmosphere simulations were analyzed, using the multi-scale aerosol-climate model PNNL-MMF where a CRM is embedded within each grid column of the Community Atmosphere Model (CAM). Two different aerosol conditions are considered in the simulations, representing Present Day (PD) and Pre-Industrial (PI) emissions, respectively. A comparison of those two scenarios shows that over the Northwest Pacific region aerosol optical depth is increased by 50% and cloud droplet number concentration is doubled under the influence of Asian pollution outflow. Meanwhile, cloud liquid water path and ice water path are enhanced by 9% and 8% due to the elevated aerosol loading in the PD case. The larger percentage of convective cloud coverage and the higher cloud top height in the PD case demonstrate that the convection strength of mid-latitude cyclones is invigorated. A 3% increase of precipitation induced by the larger PD aerosol concentration is found over the Northwest Pacific area. Smaller cloud droplets and the larger liquid and ice water path lead to the increase of cloud optical thickness by 10% in the PD case. Cloud shortwave and longwave forcing at the top of atmosphere (TOA) are enlarged by 7% and 6%, respectively. The poleward eddy heat transport along the storm track at 850 hPa is enhanced by 5% in the PD case. In addition, the results from the standard CAM model (no embedded CRM), simulates a similar increase in the aerosol concentration in the PD case but predicts significant suppression of the convection strength and heavy precipitation associated with the cyclones. This indicates that the multi-scale framework approach is critical for reproducing the aerosol invigoration effect on the deep convective cloud systems in the PNNL-MMF.

(1979) SEAREX Enewetak experiment - This is a picture of people at the first NSF SEAREX experiment on Enewetak Atoll in the Marshall Islands, where extensive studies on the atmospheric transport of chemicals from the continents to the central North Pacific took place. Bob is third from the left.

TJ12.1

Delivery of anthropogenically-sourced trace metals to the surface ocean in the eastern North Atlantic: A16N

Pamela M. Barrett, University of Washington, Seattle, WA; J. A. Resing, N. J. Buck, C. S. Buck, W. M. Landing and C. I. Measures

Trace metals in the surface ocean can function as essential micronutrients that regulate the productivity of phytoplankton, and hence the uptake of carbon dioxide by the oceans (e.g. Fe, Zn), or as potential toxins to marine organisms (e.g. Pb, Cu). Many biologically important trace metals are abundant in emissions from coal and oil combustion. To assess the impact of trace metals from atmospheric pollution on the open ocean, particulate samples from the upper 1000m of the Atlantic Ocean were collected between 62°N and 5°S during the CLIVAR/CO2 Repeat Hydrography section A16N from June to August 2003. Samples were analyzed by energy-dispersive X-ray fluorescence for Al, Si, P, Ca, Ti, V, Cr, Fe, Ni, Cu, Zn, Sr, As, and Pb. Surface-ocean particles were enriched in Cr, Ni, Cu, Zn and Pb compared to average crustal composition. Trace metals enrichment displayed similar latitudinal trends as atmospheric aerosol V:Ti ratios, suggesting deposition of atmospheric pollution products was the primary source of excess trace metals in the surface ocean. Robust anthropogenic sources for Cr, Ni, Cu, Zn and Pb were apparent at most locations between 62°N and 5°S. Lithogenic sources dominated only within a region between 10 and 20°N where surface waters were heavily impacted by the delivery of desert dust from the African continent. Enrichment in anthropogenically-sourced trace metals was correlated with increased aerosol-Fe solubility. Surface-ocean distributions of particulate Cu indicate that aerosol-Cu delivery to the North Atlantic and the spatial extent of Cu toxicity on phytoplankton may be underestimated by current models.

TJ12.2

Atmospheric Deposition of Pesticides, PCB, PAH, Nutrients and Metals to Texas Coastal Estuaries

Terry L. Wade, Texas A&M University, College Station, TX; S. T. Sweet

Long term atmospheric deposition monitoring was established by Coastal Bend Bays and Estuaries Program (CBBEP) from April 22, 1997 to August 31, 1999 at Texas A&M University Corpus Christi (TAMUCC) and from June 3, 1997 to August 31, 1999 at Whites Point (Phase I). Wet only rain samples were collected every week on Tuesday from January 2, 2002 until December 26, 2006 at TAMUCC as part of the National Atmospheric Deposition Program (NADP). Samples were collected once a week and represented an integration of all the individual rain events that occurred during the sampling period. The results indicate that atmospheric deposition is an important source of nutrient nitrogen, trace element and organic contaminants to the Coastal Bend Bays. The yearly average pH of the rain from 2002 through 2006 ranged from 5.09 to 5.21 (average of 5.14) which is slightly acidic but comparable to pre-industrial revolution natural pH (5.0). Some of the major ions detected in the wet and dry deposition (Cl, Na, Mg) are derived from sea salts as anticipated for a site located on the coast. The majority of sulfate in rain and dry deposition is of anthropogenic origin. Potassium and calcium can have marine and anthropogenic sources. Forty-six percent (46%) of the nutrient nitrogen entering the Bays is from atmospheric deposition to the Bay and watershed. While contaminant inputs have significant seasonal variability, the long term inputs are consistent when integrated over longer temporal intervals (e.g., years). Trace elements Zn, Pb, As, Cu and Cd have anthropogenic sources. Organic contaminants including polycyclic aromatic hydrocarbons (PAH), pesticides, and PCB are deposited and removed from the Coastal Bend Bays by atmospheric deposition and gas exchange. These data provide a robust estimate of atmospheric deposition that can be applied to the Coastal Bend Bays ecosystem. Further research is required to determine how the timing of nutrient inputs to the Coastal Bend Bays system from atmospheric deposition affects phytoplankton species and abundance and their role in harmful alga blooms, hypoxia and sea grass abundance.

TJ12.3

Atmospheric Deposition Controls On The East Mediterranean Marine Ecosystem

S. Christodoulaki, University of Crete, Heraklion, Greece; G. Petihakis, N. Mihalopoulos and M. Kanakidou

Atmospheric deposition is known to be a significant source of nutrients for the marine environment. Increased knowledge of the interactions between atmospheric deposition of nutrients and ocean productivity is of great importance for both carbon dioxide (CO2) storage in the ocean and marine ecosystems life. These interactions can vary spatially and temporally, changing the role of the ocean from a sink to a source of CO2 and vice versa. Mediterranean Sea is one of the world's most oligotrophic ecosystems and presents an unusually high Nitrogen-to-Phosphorus ratio (N:P) in the eastern (28:1) basin. In this basin, where riverine nutrient inputs are negligible, N and P atmospheric deposition is believed to be the main source of nutrients in the euphotic zone of the open sea. In the present study, the impact of the inorganic N and P atmospheric deposition on the marine ecosystem in the East Mediterranean Sea is investigated by using a 1-D coupled physical/biogeochemical model (Christodoulaki et al., 2012, Journal of Marine Systems, doi: 10.1016/j.jmarsys.2012.07.007). The model is set-up for the Cretan Sea as a representative area of the Eastern Mediterranean Basin and is forced by observations of atmospheric deposition over Crete Island. The results show that atmospheric deposition can be the responsible mechanism for the unusually high N/P analogy. The impact of the atmospheric deposition on the primary production and population distribution is also calculated. The contribution of human activities in these impacts is estimated. The robustness of these findings is evaluated based on additional sensitivity simulations.

TJ12.4

Aerosol Indirect Effect on Tropospheric Ozone via Lightning

Tianle Yuan, NASA, Greenbelt, MD; L. Remer, H. Bian, R. Albrecht, J. Ziemke, K. Pickering, L. Oreopoulos, S. Goodman, H. Yu and D. Allen

Tropospheric ozone (O3) is a pollutant and major greenhouse gas and its radiative forcing is still uncertain. Inadequate understanding of processes related to O3 production, in particular those natural ones such as lightning, contributes to this uncertainty. Here we demonstrate a new effect of aerosol particles on O3 production by affecting lightning activity and lightning-generated NOx. We find that lightning flash rate increases at a remarkable rate of 30 times or more per unit of aerosol optical depth. We provide observational evidence that indicates the observed increase in lightning activity is caused by the influx of aerosols from a volcano. Satellite data analyses show O3 is increased as a result of aerosol-induced increase in lightning and lightning produced NOx. Model simulations with prescribed lightning change support the satellite data analysis. O3 production increase from this aerosol-lightning-ozone link is concentrated in the upper troposphere, where O3 is most efficient as a greenhouse gas. Our findings thus suggest a stronger O3 historical radiative forcing because this link implies lower lightning-generated NOx and lower O3, especially in the upper troposphere, in preindustrial time. Aerosol forcing therefore has a warming component via its effect on O3 production and this component has mostly been ignored in previous studies of climate forcing related to O3 and aerosols. Sensitivity simulations suggest

that 4-8% increase of column tropospheric ozone, mainly in the tropics, is expected if aerosol-lighting-ozone link is parameterized, depending on the background emission scenario. We note, however, substantial uncertainties remain on the exact magnitude of aerosol effect on tropospheric O3 via lightning. The challenges for obtaining a quantitative global estimate of this effect are also discussed. Our results have significant implications for understanding past and projecting future tropospheric O3 forcing as well as wildfire changes and call for integrated investigations of the coupled aerosol-cloud-chemistry system.

TJ12.5

Aerosol Impacts on Cloud Properties—A Global Statistical Study

Jan Cermak, Ruhr-Universität Bochum, Bochum, Germany

This contribution presents a statistical analysis of the relationship of cloud properties with corresponding aerosol and meteorological conditions, using satellite-based observations.

Aerosol-cloud interactions are believed to contribute significantly to the optical and microphysical properties of clouds. In recent years, various studies of this relationship have been performed based on numerical models and observations, mostly from the satellite perspective. While the former frequently suffer from an inadequate observational basis, the latter often rely on small data sets and very basic statistical methods. In this study, machine learning techniques are employed to relate aerosol and meteorological conditions to patterns of cloud properties, focusing on selected cloud regimes and regions. MODIS products and ECMWF re-analysis data are used. In this extensive data set, the sensitivities of cloud optical depth and droplet effective radius to variations in each of the meteorological and aerosol parameters are investigated numerically. The relative contribution of the aerosol indirect effect is quantified on a regional basis.

TJ12.6

New Particle Formation in Marine, Urban, and Terrestrial Environments—A Tribute to Robert A. Duce

Renyi Zhang, Texas A&M University, College Station, TX

Fine particulate matter (PM) or aerosols represent a major environmental problem, causing degradation in visibility, directly and indirectly impacting climate, and posing negative human health effects. A majority of atmospheric fine PM is produced through new particle formation in various environments. Aerosol nucleation events have been frequently observed in urban, forested, and marine areas, where extremely high concentrations (>104 particle cm-3) of nucleation mode nanoparticles are generated. New particle formation occurs in two distinct stages (Figure 1), i.e., nucleation of a critical cluster (or nucleus) and subsequent growth of the critical nucleus to a detectable size of 1.5 to 3 nm. This presentation will discuss our results on experimental and field studies of formation of atmospheric nanoparticles in diverse environments and contributions of Robert A. Duce to the development of the Atmospheric Chemistry Program at Texas A&M University.

J2.1

(Keynote Presentation) 'Only Connect.....'—Inspirations from the work of Robert Duce

Peter S. Liss, Univ. of East Anglia, Norwich, United Kingdom

The research of Robert (Bob) Duce is notable for several important reasons. The one I will concentrate on here is his ability to bring together work from several (traditionally separate) fields, hence the 'Only connect ....' of the title. This approach has been applied over a distinguished career to many different problems in the environmental sciences.

Although much of his work has dealt with marine particulates and rain and their role in exchanges between atmosphere and ocean, he has also had significant influence on the field of air-sea gas transfer.

I will expand on this through several examples including the transfer of selenium and iodine across the sea surface and its role in the global biogeochemical cycles of these two elements. Another example is the impact of iron additions on ocean productivity and resulting changes in the exchange of trace gases, including carbon dioxide and halogens, between ocean and atmosphere. In addition, new laboratory results on the deposition of ozone to seawater, its reactivity with surface components and gaseous feedbacks to the atmosphere will be presented.

Finally, Bob Duce's role in several major international projects will be illustrated via the SOLAS (Surface Ocean - Lower Atmosphere Study) project.

J2.2

(Invited Presentation) Recent Advances in Air-Sea Gas Flux Measurements

Barry J. Huebert, Univ. of Hawaii, Honolulu, HI; B. Blomquist and C. W. Fairall

Recent developments in analytical instrumentation and data analysis have made possible open-ocean direct measurements of carbon monoxide evasion and improved the sensitivity of carbon dioxide air-sea exchange measurements.

We conducted a field trial in December, 2011 of ship-based air-sea flux measurements of carbon monoxide (CO) by direct eddy correlation using an infrared-laser trace gas analyzer. The analyzer utilizes Off-Axis Integrated-Cavity-Output Spectroscopy (OAICOS) to achieve high selectivity for CO, rapid response (10Hz) and low noise. Over a two-day sea trial, peak daytime seawater CO concentrations were 1.5nM and wind speeds were consistently 10–12ms-1. A clear diel cycle in CO flux with an early afternoon maximum was observed. An analysis of flux error sources suggests air-sea CO flux measurements are best performed in regions remote from continental pollution sources. Horizontal fluxes add variance that can obscure the vertical flux signal for long-lived gases.

The recent availability of fast, high precision cavity-ringdown (CRDS) analyzers offered a prospect of significant improvements in both precision and detection limit for eddy correlation CO2 flux measurements. A CRDS flux system was deployed on the R/V Ka'imimoana during TORERO in January and February of 2012. As a test of flux precision, estimated air/sea pCO2 differences were derived from the observed flux and modeled gas transfer coefficients (COAREG ver. 3.1). The estimated delta pCO2 compares favorably with February mean pCO2 climatology for the 95W - 110W region of the eastern Central Pacific.

Initial results indicate the CRDS analyzer delivers significantly improved sensitivity for flux measurement. Delta pCO2 for a detection criterion of dF/F = 1 (100% relative error) appears to be 4-8 times lower than the best performance of LICOR open-path non-dispersive IR analyzers. The use of a decorrelation technique substantially reduces residual ship-motion artifacts in winds and fluxes.

This work is a part of the HiWinGS program (High Wind Gas Exchange Study). These methods will be deployed during a high-wind cruise in the Fall of 2013 alongside DMS flux measurements and detailed physical characterizations of bubbles, waves, turbulence, and other potential flux-controlling factors.

(2010) Zhisheng An, Bob Duce, and Peter Liss at the Symposium on Asian Dust/Aerosols and its Impact on Global Climate Change, Shanghai, China.

J2.3

(Invited Presentation) Short-lived organic trace gases in the remote atmosphere: Results from recent field campaigns

Elliot Atlas, University of Miami, Miami, FL; K. Smith, F. Moore, S. Montzka, B. Miller, J. Elkins, L. Pan, D. Blake, S. Meinardi, B. Quack, K. Krueger and S. Tegtmeier

The trace gas composition of the upper troposphere/lower stratosphere (UT/LS) region depends on emission sources, transport pathways, mixing rates and photochemical processing time. Because surface emissions include gases with a range of chemical lifetimes, and because different source emissions (e.g. marine boundary layer, anthropogenic emissions, biomass burning) can have different chemical signatures, the composition of the organic trace gases that are found in the UT/LS and throughout the remote atmosphere have the potential to provide diagnostic information on air mass sources and transport time scales. For most reactive organic halogen compounds, such as bromoform, air-sea exchange is a major source to the atmosphere. Measurements of this flux provide the boundary conditions to evaluate the potential impact of reactive halogen on the chemistry of the UT/LS region. In fact, measurement of short-lived organic halogen gases in the UT/LS provides data to define the reactive halogen budget and the

chemical boundary conditions for the stratospheric chemistry that affects ozone depletion rates. Recent airborne and ship-based research campaigns in the tropics, the extra-tropics, and in mid-ocean transects, from near surface to the lower stratosphere have included the measurement of a wide range of trace gases including halocarbons, hydrocarbons, and related species. This presentation will emphasize short-lived trace gases and will highlight different aspects of these measurements that deal with distributions, seasonality, transport pathways, transport rates, and halogen budgets.

J2.4

Uncertainties in future marine N2O emissions in the eastern tropical Pacific

L.M. Zamora, Helmholz Center for Ocean Research, Kiel, Germany; A. Oschlies

Marine emissions of nitrous oxide (N_2O) supply ~10-30% of the annual N2O flux to the atmosphere, affecting both climate and stratospheric ozone. Low oxygen regions of the eastern tropical Pacific (ETP) supply much of open ocean N_2O. However, due to this region's sensitivity to future climate change, future N_2O emissions from the ETP are highly uncertain, although previous short-term responses to ENSO events indicate that N_2O is sensitive to changes in oxygen. Here, we use global biogeochemistry-circulation models to assess uncertainties in projected current and future N_2O emissions from the ETP to the atmosphere. Our work includes a comparison between previous model descriptions of marine N_2O and a newly developed data based parameterization of N_2O production and consumption.

J2.5

Tropospheric trace gases measured from space

John P. Burrows, Institute of Environmental Physics and Remote Sensing IUP/IFE, Bremen, Germany; H. Bovensmann, A. Richter, M. Buchwitz, A. Schönhardt and O. Schneising

GOME, Global Ozone Monitoring Experiment, on ESA ERS-2, SCIAMACHY on Envisat and GOME-2 have provided since 1995 measurements the up welling solar electromagnetic radiation at the top of the atmosphere from an early morning sun synchronous orbit. Mathematical Inversion of these measurements yields the tropospheric columns of the trace gases NO2, HCHO, CHO.CHO, BrO, IO , O3, H2O and in the case of SCIAMACHY the dry CO2 and CH4. This talk will provide an overview of the measurements made and highlights of the past decade.

TJ22.1

(Keynote Presentation) Spatial-Temporal Aerosol Composition Trends Over the North Atlantic and the Relationship to African Dust Transport

Joseph M. Prospero, Univ. of Miami/RSMAS, Miami, FL; R. Arimoto

The Atmosphere/Ocean Chemistry Experiment (AEROCE) was a comprehensive multi-disciplinary and multi-institutional research program that focused on the atmospheric chemistry over the North Atlantic Ocean (NAO). Of particular interest was the impact of aerosols transported from the continents to the oceans. To this end, sampling stations were established on Barbados, Miami, Bermuda, Tenerife, and Mace Head (Ireland), and daily samples were collected from 1987 to 1996. This data set is unique in its temporal and spatial coverage. Various aspects of these data have been presented in past publications. Here we bring these data together to provide a broad overview of dust over the Atlantic. Our main focus is on the elemental composition of dust at Barbados where we have the most complete sample coverage: over the 2327 days of the program, we acquired 2163 samples. The completeness of this record enables us to look for changes in concentration and composition that might be linked to sources in Africa; it also enables us to identify impacts that might be linked to other sources including pollution. Previous studies carried out in proximity to African sources (e.g., in the Mediterranean or along the coast of Africa) have shown changes in composition that were attributed to specific sources. Also it is known that on larger scales, the locus of dust activity changes with season. In late winter and spring, dust sources in the Sahel are most active while in summer and fall, the Saharan sources become more persistently active; thus we might expect the dusts' composition to change seasonally to reflect changes in large-scale source terrains. However even if the emitted dust did change for these reasons, it is not clear that the signatures would be sufficiently unique that they would be retained after the dust had been transported over larger distances because of the mixing that might occur during transit or because of the settling-out of larger particles that might carry the source signature. In our study, samples were collected using high-volume, bulk, filter samplers and analyzed by instrumental neutron activation for a suite of 28 elements: Al, Br, Ca, Cl, Cu, I, Mg, Mn, Na, V, Ba, Co, Cr, Cs, Eu, Fe, Hf, Nd, Ni, Rb, Sb, Sc, Se, Ta, Tb, Th, Yb, Zn. For the most part, the elemental concentrations were highly correlated with total dust concentration. Most elements were present in concentrations that were close to average crustal abundances. A number of elements were distinctly different in that their concentrations were much higher than crustal and the scatter poorly correlated with dust concentration (or with dust proxy elements, e.g., Al, Fe, Sc). These were the usual pollution-linked elements: e.g., Sb, Se, V, and Zn. Furthermore when we stratified the data by season, we saw no substantial change in these relationships. These findings suggest dust-aerosol composition over the Atlantic is, in general, relatively invariant, as will be the dust that is deposited to the ocean. Thus we might expect that it will be difficult to extract source-related information on long-term changes in African dust emissions based on elemental composition of sediments from the remote Atlantic. These statements do not necessarily apply to sediments closer to the coast of West Africa where specific source signatures have indeed been observed.

TJ22.2

(Invited Presentation) Air-sea fluxes of individual and collections of elements: impacts on the evolution of trace species and climate

David J. Erickson III, ORNL, Oak Ridge, TN

Global numerical simulations of climate have evolved to include the radiative impacts of sea-salt and various ocean derived gases and particles. Sea-salt has long been known to change the composition of the atmosphere as well as altering the radiation distribution, hence heating rates, of the marine boundary layer. In addition to the physical impacts on tropospheric radiation directly, chemical species derived from sea-salt aerosols have proven to be important. Halogen chemistry is critical to the production and destruction of a variety of radiatively important trace species and the details of how halogens, associated with sea-salt, interact with multi-phase chemistry to influence tropospheric chemistry has long been an active area of research. Here I will expound on recent modeling activities that include multi-phase atmospheric chemistry in global climate models with attendant impacts on atmospheric composition, radiation and climate statistics.

TJ22.3

Using Integrated Approaches of In-situ Observations, Laboratory Experiments and Modeling to Study Atmospheric Iron and Its Input to the Ocean: A New Lesson Learned from the Southern Ocean and Coastal Antarctica

Yuan Gao, Rutgers University, Newark, NJ; G. Xu, D. Roberts-Semple, J. Zhan and R. Jusino-Atresino

Atmospheric input of dust is an important source of iron (Fe) to phytoplankton growth in the surface waters of several large oceanic regions. However, the efficiency of Fe uptake by phytoplankton may depend on Fe properties in dust, such as Fe solubility and speciation. Many processes occurring in the atmosphere may alter dust properties and then its bioavailability in the ocean. During long range transport, dust particles may undergo heterogeneous reactions at gas-solid-liquid interfaces. Photochemical reduction in more acidic cloud waters and precipitation may promote dissolution of Fe in dust, leading to the production of soluble Fe (II) which is believed to be more readily used by phytoplankton. Relative contributions of atmospheric Fe input to the ocean by wet and dry deposition vary between coastal and remote oceans, and currently the estimates of the air-to-sea deposition of soluble Fe involves substantial uncertainties, in particular in the large high-nutrient-low-chlorophyll (HNLC) oceanic regions.

The Southern Ocean, surrounding Antarctica, plays an important role in regulating the global nitrogen and carbon cycles. The vast Southern Ocean is a HNLC region where phytoplankton growth is partially limited by micronutrient Fe. This region is extremely under-sampled due to its vast area and rough atmospheric and oceanic conditions for in situ observations, hindering the accurate estimate of the atmospheric dissolved Fe input. In this presentation, we will discuss our results of atmospheric Fe from recent shipboard aerosol measurements in the Southern Ocean and coastal East Antarctica. We will explore the interactions of different aerosol components and possible processes affecting atmospheric Fe solubility, and our thoughts on existing questions and future studies in the regions will also be shared.

TJ22.4

(Invited Presentation) Oxidization of SO2 to sulfate by O3, NO2 and nitrate on the surface of mineral dust particles

Tong Zhu, Peking University, Beijing, China; M. Wang, T. Yu, D. Zhao, X. Song and N. Zheng

CaCO3 is one of the most important components of the atmospheric mineral aerosol. CaCO3 particles can undergo heterogeneous reactions with nitrogen-containing gases (e.g., NO2, gaseous HNO3 and N2O5) in the atmosphere during long-range transport, producing Ca(NO3)2. Ca(NO3)2 is much more hygroscopic than CaCO3, and may have a reactive activity different from CaCO3 in the atmosphere.

Heterogeneous reactions between SO2(50PPM)/O3(50PPM) mixing gas and individual CaCO3, Ca(NO3)2 particles (with the geometric diameter of about 6 to 7 micrometers) under various RH conditions were investigated using Micro-Raman Spectrometry and flow reaction system. Chemical composition and microscopic morphology of the individual particles were determined in situ with Micro-Raman spectrometer during the reactions. Individual CaCO3 particles started reaction with SO2/O3 mixing gas at RH values of 55% and 80%, producing CaSO4. The reactive uptake coefficient (¦ÃSO2) was in the order of 10-7 to 10-8 using the geometric surface area of the individual particles. Individual Ca(NO3)2 particles could react completely with SO2/O3 mixing gas at RH values of ≥ 15%. The product was CaSO4. The reactive uptake coefficient (¦ÃSO2) was in the order of 10-6 to 10-7 using the geometric surface area of the individual particles. The reaction rate increased with the RH. At RH=80%, individual Ca(NO3)2 particles with the geometric diameter of 6 micrometers could react completely with SO2/O3 mixing gas in 480 minutes to produce CaSO4.

Under the same RH and concentration of SO2 and O3, the reaction rate of individual Ca(NO3)2 particles with SO2/O3 mixing gas was much higher than that of individual CaCO3 particles with SO2/O3 mixing gas. Thus the formation of Ca(NO3)2 from CaCO3 particles could accelerate the transform of S(IV) to S(VI) in the atmosphere. The possible gaseous product of the reaction between SO2/O3 mixing gas and Ca(NO3)2 particles was HNO3, indicating the heterogeneous reactions between SO2/O3 mixing gas and Ca(NO3)2 particles were sinks of SO2 and O3 and are a potential source of gaseous HNO3, and might have important impacts on the formation of acid rain and atmospheric oxidizability.

J3.1

(Invited Presentation) Fifty years at the skin of the ocean; Understanding the air-sea exchange of trace elements on Bermuda under the Duce legacy

Thomas M. Church, University of Delaware, Newark, DE

The legacy of Bob Duce has contributed largely to understanding the exchange of elements and materials at the air-sea interface, covering the globe by his leadership of pioneering programs. One legacy was to launch an atmospheric program on Bermuda during the seventies that continues to this day.

Our Bermuda studies were initiated in the eighties under the auspices of the WATOX, AEROCE and FeAST projects in order to understand the atmospheric source, deposition and fate of trace elements at the surface ocean. These elements span those dominated by the seasonal invasion of lithogenic dust, to those that have both natural and anthropogenic emissions from sources surrounding the North Atlantic. A prime example is the abundant evidence of Pb from gasoline additives during the earlier records. Using stable isotopes it is possible to identify the continental source of Pb and associated trace elements, and upon deposition to the sea surface to trace its oceanic circulation. Similarly Bi data, including that from the early Duce records, suggests a primary source from coal combustion and a potential tracer. Somewhat surprising is the soluble nature of non-lithogenic Fe, a required micro-nutrient for important biological processes such as nitrogen fixation in the Sargasso Sea. Here a marked signature associated with Ni and V indicates residual oil combustion and implicates background emissions from the transit of ocean vessels. Similar emission sources of micro-nutrients may contribute to either nutrition or toxicity in the case of Cu, or a limiting growth vitamin in the in the case of Co. The surface micro-layer was early identified by Duce as an important phase for enrichment and recycling by sea salt aerosol as confirmed at Bermuda. Lastly, there is the unequivocal role of methylation processes at the sea surface for elements such as Se, Te and Po that through vapor phase transfer contribute to their enrichment in the marine atmosphere. Without the Bob Duce legacy, many of these studies on Bermuda and elsewhere would have not come to fruition.

J3.2

(Invited Presentation) Atmospheric Nutrient Inputs to the Atlantic Ocean

Tim Jickells, University of East Anglia, Norwich, United Kingdom; A. Baker

The SEAREX programme led by Bob Duce established that atmospheric transport from land to sea is a quantitatively important component of the Earth System for many elements. In this presentation we will describe our recent studies that have attempted to better quantify the atmospheric input of the key nutrients nitrogen, phosphorus and iron to the Atlantic Ocean. We will summarise results of our field measurements of aerosol and rainwater composition from ships, and use these to estimate fluxes. We will consider the chemical speciation and bioavailability of the different nutrients and emphasise both what we know, and what we do not know about the controls on this bioavailability. We will then consider the impacts of this atmospheric deposition on the ocean biogeochemistry of different regions of the Atlantic Ocean and how this might change in the future.

J3.3

Following Duce: The Decadal Evolution of Pb and Pb Isotope Delivery to the Ocean by Atmospheric Aerosols

Edward A. Boyle, MIT, Cambridge, MA; A. Noble, Y. Echegoyen-Sanz and J. M. Lee

One of Bob Duce's important contributions to our science was enabling Turekian and Patterson's studies of Pb-210 and Pb in atmospheric aerosols in AEROCE and other sampling programs. This work was important for several reasons. One reason common to all aerosol work was of course in using Pb-210 in order to get an estimate for aerosol deposition into the ocean: because studies of Pb-210 fallout and ocean mixed layer chemistry allows for an estimate of Pb-210 fluxes into the ocean, measurements of the ratio any other aerosol property to Pb-210 in the aerosols allows for an estimate of the deposition rate for that property. But the measurement of combined Pb-210 and Pb concentrations also enabled Patterson to obtain the first global view of anthropogenic Pb dispersal, confounding the deniers who claimed that anthropogenic Pb must be small potatoes compared to natural sources such as volcanoes. As someone following in Patterson's footsteps, my research group has been able to document the decadal consequences of leaded gasoline phaseout from the mid-1970's to the present. In the North Atlantic ocean, Pb has been decreasing consistently in the upper km because of US and European leaded gasoline phaseout. The difference in the US-European phaseout rapidity is reflected in the increasing Europeanization of Pb isotope ratios in the Atlantic Ocean during the 1990's and early 2000's. We can see North American and European Pb in the deep water carried into the South Atlantic by NADW. In the North Pacific, US, Japanese, and Canadian gasoline Pb is being replaced by coal Pb from south Asia. The later-industrializing and later-Pb-gas-phaseout countries of the Indian Ocean have now made it the ocean with the highest surface Pb concentrations. The evolution from dominant Pb-gas to dominant coal-combustion sources in the southern Indian ocean is documented in the vertical distribution of Pb isotopes.

J3.4

(Invited Presentation) Atmospheric fluxes of organic N and P to the global ocean

M. Kanakidou, University of Crete, Heraklion, Crete, Greece; R. A. Duce, J. M. Prospero, A. R. Baker, C. Benitez-Nelson, F. J. Dentener, K. A. Hunter, P. S. Liss, N. Mahowald, G. S. Okin, M. Sarin, K. Tsigaridis, M. Uematsu, L. M. Zamora and T. Zhu

The global tropospheric budget of gaseous and particulate non-methane organic matter (OM) is re-examined to provide a holistic view of the role that OM plays in transporting the essential nutrients nitrogen and phosphorus to the ocean. A global 3-dimensional chemistry-transport model was used to construct the first global picture of atmospheric transport and deposition of the organic nitrogen (ON) and organic phosphorus (OP) that are associated with OM, focusing on the soluble fractions of these nutrients. Model simulations agree with observations within an order of magnitude. Depending on location, the observed water soluble ON fraction ranges from ~3% to 90% of total soluble N in rainwater; soluble OP ranges from about 20-83% of total soluble phosphorus. The simulations suggest that the global ON cycle has a strong anthropogenic component with about 45% of the overall atmospheric source (primary and secondary) associated with anthropogenic activities. In contrast, only 10% of atmospheric OP is emitted from human activities. The model-derived present-day soluble ON and OP deposition to the global ocean is estimated to be about 16 Tg-N/yr and 0.35 Tg-P/yr respectively with an order of magnitude uncertainty. Of these amounts about 40% and 6%, respectively, are associated with anthropogenic activities, and 33% and 90% are recycled oceanic materials. Therefore, anthropogenic emissions are having a greater impact on the ON cycle than the OP cycle; consequently increasing emissions may increase P-limitation in the oligotrophic regions of the world's ocean that rely on atmospheric deposition as an important nutrient source.

J3.5

Using Be-7 to quantify the flux of trace elements from the atmosphere to the oceans

William M. Landing, Florida State University, Tallahassee, FL; D. Kadko, B. Galfond, N. Krishnamurthy and B. Kilgore

Following production by cosmic-ray spallation, tropospheric Be-7 (half-life 53.3d) quickly attaches to aerosols and is deposited to the oceans by wet and dry deposition. Due to its radioactive decay, the inventory of Be-7 in the upper ocean is balanced by its flux from the atmosphere. The ability to derive the atmospheric flux of Be-7 from its ocean inventory provides a key linkage between the atmospheric concentrations of chemical species and their deposition to the ocean. This includes many trace elements and isotopes of interest to the GEOTRACES program such as Al, Mn, Fe, Co, Ni, Cu, Zn, Cd, Pb, and others.

The atmospheric flux of trace elements and isotopes (TEIs) to the oceans can be extremely important in marine biogeochemical cycles, especially for bioactive trace elements including V, Mn, Fe, Co, Ni, Cu, and Zn. However, there are large uncertainties associated with converting rainfall and aerosol TEI concentrations into estimates of atmospheric deposition. By measuring ratios of TEIs to Be-7 in rainfall and aerosol samples, the atmospheric flux of TEIs can be calculated: Flux(TEI) = Flux(Be-7) * (TEI/Be-7), where the Flux(Be-7) is calculated from the uper ocean inventory of Be-7. Where the fractional solubility of aerosol TEIs in rainwater or surface seawater has been measured, the same ratio approach can be used to calculate the atmospheric flux of soluble TEIs. Soluble TEIs are expected to be intrinsically bioavailable to phytoplankton, and therefore can play an important role in biogeochemical cycling in the upper ocean.

We will present results from field campaigns in the Sargasso Sea (Bermuda) and the Arctic Ocean to test this approach.

J3.6

Iron, Biological Productivity, Carbon Drawdown, and Climate: Have we demonstrated the glacial/interglacial implications of the Martin Hypothesis?

Margaret S. Leinen, Florida Atlantic University, Fort Pierce, FL; R. W. Murray

Twenty-five years ago John Martin hypothesized that terrigenous iron transported to the oceans in aerosols could fertilize biological productivity in open ocean regions far from shore. During the 1980s Bob Duce's group did much to demonstrate how much iron was transported to remote regions, in what form, and how its soluble fraction was made available to phytoplankton. Since that time each decade has completed projects that have added to the evidence supporting key aspects of Martin's paradigm-shifting hypothesis. For example, early open ocean fertilization experiments in the 1990s showed that phytoplankton productivity was stimulated by the addition of soluble Fe to surface ocean waters. Most recently, results from EIFEX fertilization in the southern ocean conclusively demonstrated the transfer of organic matter from the surface to deep waters. Our recent studies of Quaternary sedimentation in the equatorial Pacific -- one of the critical areas highlighted by Martin in his earliest formulations of The Iron Hypothesis -- indicate that Fe in the sediment is dominantly from terrigenous non-volcanic sources and that terrigenous Fe in the sediments is closely correlated with the biogenic silica (diatom) in the sediments. Variations in Fe flux, paired with diatom response, are not related to glacial/interglacial periods in a simple fashion. Overall, nearly 30 years of work on the Iron Hypothesis appears to be converging toward an answer that at once demonstrates the complexity of the coupled Fe-biological system, yet also speaks to the overall accuracy of Martin's prediction.

1.1

Aerosol-Derived Fluxes of Dissolved Trace Metals Evaluated Using Paired Thorium Isotopes

Robert F. Anderson, Lamont-Doherty Earth Observatory of Columbia University, Palisades, NY; C. T. Hayes, M. Q. Fleisher, L. F. Robinson, K. F. Huang, R. L. Edwards, H. Cheng and S. B. Moran

Aerosols (dust) supply dissolved ^{232}Th to the ocean just as they serve as a source of micronutrients and other trace elements. Surface waters in regions downwind from major dust sources are enriched in dissolved ^{232}Th, reflecting this source. The residence time of dissolved Th is evaluated by measuring the radioactive disequilibrium between dissolved ^{230}Th and its parent, ^{234}U. Assuming steady state, which is reasonable when dissolved ^{232}Th inventories are integrated through the thermocline, the quotient of the dissolved ^{232}Th inventory divided by the residence time of dissolved Th provides the mean annual flux of dissolved Th from aerosols. The supply of other dissolved trace elements (M), such as iron, can then be evaluated by multiplying experimentally-derived ratios for M/^{232}Th solubility by the measured ^{232}Th flux.

Fluxes of dissolved ^{232}Th were measured in the subtropical North Atlantic, in a region of high Saharan aerosol flux, along the U.S. GEOTRACES section occupied in 2010 and 2011. The section ran from Portugal to Mauritania, under the plume of Saharan dust, and from there via Bermuda to Woods Hole. Fluxes of dissolved ^{232}Th were evaluated by integrating inventories to a depth of 500 m, which gives a mean residence time of about three years. Integrating to this depth will average out seasonal variability of dust supply. Results will be compared to mean annual dust flux estimated using the model of Mahowald et al., 2005. Assumptions and prospects for future development will be discussed.

1.2

(Invited Presentation) Monomethyl and Dimethyl Mercury Cycling on The Continental Margin of The Northwest Atlantic Ocean

William F. Fitzgerald, University of Connecticut, Groton, CT; C. R. Hammerschmidt, K. L. Bowman, P. H. Balcom and J. O'Donnell

Principal and unifying findings from three comprehensive oceanographic cruises (2008-10) relating to the biogeochemical cycling of Hg and methylated Hg species on the continental margin (NW Atlantic) are presented. Vertical gradients are evident for mono and dimethylmercury (i.e., MMHg and DMHg, respectively) in waters on the shelf and upper slope (< 1000m) with substantial enhancements near the sediments. These regions are affected by pollution-borne mercury, principally from atmospheric sources. Diffusional estimates (pore water gradients) range from 0.1 to 45 pmol m^{-2} d^{-1} for MMHg (average of 10 pmol m^{-2} d^{-1}), while measurements with benthic chambers are typically 3-5x greater. Estimated vertical fluxes of DMHg based on water column distributions range from DL to ca. 40 pmol m^{-2} d^{-1}. These inputs are quite significant, likely present in other comparable oceanic settings, and represent a potentially large sedimentary source of methylated Hg to the marine environment including the open ocean. Further, upper ocean maxima in MMHg, DMHg, and filtered total Hg, which correlate with the oxygen distributions (e.g., minimum zone) and isopycnal surfaces, are found at the more remote and deeper stations on the slope. This studies are showing quantitatively that MMHg and DMHg are formed on the continental margin and in ocean waters (<1000m), which are affected by atmospheric Hg deposition from natural and anthropogenic sources.

1.3

Photosensitized reactions at the Air-Sea interface

Christian George, CNRS-IRCELYON, Villeurbanne, France; B. D'Anna, A. Jammoul, J. Donaldson and D. Reeser

The significant presence of organic compounds at the surface of the ocean form the link between ocean biogeochemistry through the physico-chemical processes near the water-air interface with primary and secondary aerosol formation and evolution in the air aloft and finally to the climate impact of marine boundary layer aerosols. However, their photochemistry and photosensitizer properties have only been suggested and discussed but never fully addressed. Chemical analysis of the organics at the sea surface has shown that amphiphiles derived from oceanic biota (fatty acids, fatty alcohols, sterols, amines, and more complex colloids and aggregates exuded by phytoplankton mainly constituted by lipopolysaccharides), can be highly enriched in this microlayer. Taking chlorophyll as an accessible proxy for the organic fraction of this surface layer, we will demonstrate that photochemical process may be central to the deposition and chemistry of the sea surface. Especially, we will address the kinetics of the heterogeneous reaction between gas-phase ozone and chlorophyll present at the air-salt water interface. We will demonstrate that these kinetics are altered in the presence of actinic radiation. In salt solutions a transient absorption feature assignable to Cl2– is observed following laser excitation of chlorophyll. As well, absorptions due to the chlorophyll cation and / or triplet state and also solvated electrons are seen in illuminated salt- and fresh-water chlorophyll solutions. These results together suggest that Cl atoms are formed in this system, via the reduction of the photo-formed chlorophyll cation by chloride anions. The yield of Cl is enhanced in the presence of ozone, through the oxidation of Cl2–. The chlorine atoms thus formed are responsible for the enhanced chlorophyll loss at the surface of illuminated salt-water substrates. The formation of Cl atoms also has implications for gas phase oxidative chemistry in the marine boundary layer.

1.4

Spatial and Temporal Distributions of Polybrominated Very Short Live Substances in the Atlantic Ocean, and Their Linkages with Ocean Primary Production

Yina Liu, Texas A&M Univeristy, College Station, TX; S. A. Yvon-Lewis, L. Hu, D. C. O. Thornton, T. S. Bianchi, L. Campbell and R. W. Smith

Bromoform ($CHBr_3$), dibromomethane (CH_2Br_2) and other very short-lived substances (VSLS) were measured during 5 cruises in the Atlantic Ocean from 1998 to 2010. These cruises were conducted over large meridional (62° N - 60° S) and zonal (11° W – 86° W) ranges in the Atlantic Ocean. Elevated atmospheric mixing ratios and seawater concentrations of $CHBr_3$ were observed coincident with regions of elevated chlorophyll *a*, such as the equatorial region, upwelling zones and coastally influenced shelf waters, suggesting that processes related to ocean primary production may have contributed to $CHBr_3$ production. While CH_2Br_2 seawater concentrations exhibit similar trends with $CHBr_3$, it is more well-mixed in the atmosphere, due to its longer atmospheric lifetime. The sea-to-air flux maxima for $CHBr_3$ and CH_2Br_2 were observed in coastally influenced shelf waters. Assuming the fluxes measured in the Atlantic open ocean are globally representative, the extrapolated $CHBr_3$ global open ocean annual net sea-to air flux is 0.13 - 3.6 Gmol Br yr^{-1}. Biological parameters including pigment biomarkers and flow cytometeric picoplankton counts were measured during one of the cruises conducted in 2010 (HalocAST – A). None of the pigment biomarkers yield significant correlations with

$CHBr_3$ and CH_2Br_2. While zeaxanthin does not distinguish between *Synechococcus* and *Prochlorococcus*, flow cytometeric cell counts do allow for their separation and determination of their individual abundances, as well as providing cell abundance information for other picoeukaryotes and heterotrophic bacteria. Seawater concentrations of $CHBr_3$ were significantly correlated with *Synechococcus* near the Northwestern African upwelling zone but not anywhere else during the HalocAST – A cruise. These findings suggest that more specific parameters are needed for assessing biogenic sources of the VSLS during large oceanographic transects due to changing biomes during the course of the cruise. A new solubility relationship to temperature and salinity determined from recent laboratory studies will be presented along with an updated VSLS net sea-to-air net flux.

1.5

Fertilisation Potential of Volcanic Dust in Carbon Fixation and Climate Feedback in the Western North Pacific Subtropical Ocean

I.-I. Lin, Department of Atmospheric Sciences, National Taiwan University, Taipei, Taiwan; C. Hu, Y. H. Li, T. Y. Ho, T. Fischer, C. W. Huang, J. Wu, A. Chu, G. T. F. Wong, D. S. Ko and J. P. Chen

The fertilisation of atmospheric aerosols, which promotes ocean biogeochemical activities in the low productivity waters of the earth, plays an important role in global iron, nitrogen, and carbon-biogeochemical cycling, thus is a critical component of the earth's climate system. Through the aerosol deposition process, macro and micro nutrients, such as N, P, and Fe, become available and stimulate ocean productivity responses and carbon fixation for climate feedback. For several decades, research on the aerosol nutrient supply has focused on desert dust. Meanwhile, it has been suggested that volcanic dust is a much-neglected aerosol source which may also provide nutrients to stimulate ocean biogeochemical responses. Research on volcanic fertilisation is still in its infancy, and very little real world evidence has been obtained. This is especially true for the Low Nutrient Low Chlorophyll (LNLC) waters, since most current results report on findings over the High Nutrient Low Chlorophyll (HNLC) waters. In May 2003, the Anatahan volcano in the Northern Mariana Islands erupted for the first time in recorded history. As it strategically locates in one of the most oligotrophic LNLC ocean deserts on Earth, i.e., the western North Pacific subtropical gyre, this motivated us to use satellite remote sensing and laboratory experiment to search for evidence of volcanic fertilisation over the LNLC waters. Our results based on the 2003 Anatahan event suggest that through provision of Fe and P, volcanic aerosols could indeed make significant contribution to stimulate biogeochemical activity and carbon fixation in the LNLC water.

Reference: I-I Lin, Chuanmin Hu, Yuan-Hui Li, Tung-Yuan Ho, Tobias Fischer, George T. F. Wong, Jingfeng Wu, Chih-Wei Huang, D. Allen Chu, Dong-San Ko, and Jen-Ping Chen, Fertilisation Potential of Volcanic Dust in the Low Nutrient Low Chlorophyll Western North Pacific Subtropical Gyre - Satellite Evidence and Laboratory Study, Global Biogeochemical Cycles, Vol. 25, doi:10.1029/2009GB003758, Feb. 26, 2011. I-I Lin, Chuanmin Hu, Yuan-Hui Li, Tung-Yuan Ho, Tobias Fischer, George T. F. Wong, Jingfeng Wu, Chih-Wei Huang, D. Allen Chu, Dong-San Ko, and Jen-Ping Chen, Volcanic-Induced Large Scale Carbon Drawdown in an Low Nutrient Low Production Ocean Desert, in submission, 2012.

1.6

(Invited Presentation) Biogeochemical Linkage Between Atmosphere and Ocean in the Eastern Equatorial Pacific Ocean: Results From the EqPOS Research Cruise

Mitsuo Uematsu, The University of Tokyo, Chiba, Japan

Eastern equatorial Pacific Ocean is a remote open ocean with relatively high marine biological activity. Enhanced effect of marine natural processes may reflect to atmospheric composition above the surface ocean. This region is also characterized as a high nutrient low chlorophyll (HNLC) ocean, in which availability of trace metals such as iron may limit marine primary production. Atmospheric deposition of these trace elements to the ocean surface may play an important role in regulating marine primary productivity and defining unique microbial community. Tropical deep convection over this region is expected to bring marine biogenic substances emitted from the surface ocean into stratosphere, efficiently.

In this unique eastern equatorial Pacific Ocean, the EqPOS (Equatorial Pacific Ocean and Stratospheric/Tropospheric Atmospheric Study) research cruise was organized as a part of SOLAS Japan activity to understand biogeochemical ocean-atmosphere interaction and exchange processes between stratosphere and troposphere. Coordinated atmospheric, oceanic, and marine biological observations including sampling/characterization of thin air-sea interfacial layer (sea surface microlayer: SML) and stratospheric air sampling using balloon-borne cryogenic air samplers were carried out on-board R/V Hakuho Maru starting from 29 January for 39 days.

Biogeochemically important trace/long-lived gases such as CO_2, dimethyl sulfide (DMS), and some volatile organic carbons (VOCs) both in the atmosphere and seawater were continuously monitored and their air-sea fluxes were observed using gradient and eddy-covariance techniques. Atmospheric gas measurement of CO_2, CH_4, N_2O, SF_6, CO, H_2, Ar and isotopic composition of the selected gases were further extended to stratospheric air with balloon-born sampling in addition to a vertical profiling of O_3, CO_2, and H_2O with sounding sondes. Physical and chemical properties of marine atmospheric aerosols such as size distribution, total and cloud

condensation nuclei concentrations, microscopic morphological observation, bulk and single particle chemical composition were also continuously determined to find out potential link between biogenic VOCs emitted from the ocean and aerosol composition. Biological and biogeochemical characterizations of marine microorganisms, suspended particulate matter, dissolved nutrients in seawater and SML were also conducted.

In the presentation, brief overview of the research activities during the EqPOS cruise and preliminary findings on biogeochemical linkage atmosphere and ocean via atmospheric and oceanic gaseous and particulate matter from ocean surface to stratosphere observed during the cruise would be presented.

1.7

GESAMP Study on the Atmospheric Input of Chemicals to the Ocean: Iron Atmospheric Processing

Slobodan Nickovic, WMO, Geneva, Switzerland

This presentation summarizes conclusions of a study on atmospheric deposition of chemicals to the ocean, evaluated by the UN Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) in collaboration with the World Meteorological Organization. We focus on the importance of deposition of the iron-carried dust aerosol responsible for marine production. The GESAMP study recommends more effort to understand major components of the Fe atmospheric cycle, including physical aerosol size sorting, mineral composition at emission and Fe processing during the atmospheric transport.

In this presentation, we will also show results produced by a regional dust-iron model developed to simulate the Fe atmospheric solubilization. The iron solubility, a necessary form for marine production, is low at soil dust sources, but during the atmospheric transport the solubility increases due to Fe atmospheric exposition. The chemical decay rate for transforming iron to soluble form is parameterized in the model to depend on the iron mineralogy at soil sources. It is also a function of cloud processing and solar radiation (Fe photo-reduction). We compare the model results with the Fe solubility observations collected during several Central Atlantic research cruises. on 7-19-2012-->

1.8

Does sea salt influence air chemistry in the central U.S.?

Alex Pszenny, University of New Hampshire, Durham, NH; R. Chang, O. R. Cooper, W. Keene, M. S. Long and R. Sander

Bulk and size-segregated aerosols were sampled 22 m AGL at the Boulder Atmospheric Observatory (40°N, 105°W, 1563 m ASL) from 18 February to 13 March 2011 during the Nitrogen, Aerosol Composition, and Halogens on a Tall Tower (NACHTT) Campaign. Concentrations of total Na, Mg, Al, Cl, V, Mn, Br and I in bulk aerosol were determined by neutron activation analysis. Ionic compositions of all size-segregated and a subset of bulk samples were determined by ion chromatography of aqueous extracts. Mg, Al, V and Mn concentrations were highly correlated and present in ratios similar to those in surface soils. Total Na and Cl were less well correlated with these soil elements but, after correction for soil contributions, were highly correlated with each other, suggesting the presence of a soluble NaCl "salt" component. Br and I were somewhat correlated and appeared to represent a third aerosol component. The average bulk Cl^-:total Cl ratio was 0.99 ± 0.03 (n = 44) indicating that essentially all aerosol chlorine was water-soluble. Na^+ and Cl^- mass distributions were bimodal with most of the masses (medians 75% and 78%, respectively, n = 45) associated with supermicrometer diameter particles. Possible oceanic origin of the "salt" component will be evaluated based on consideration of forward FLEXPART model runs with explicit wind speed-dependent sea salt emissions along with other information on characteristics of sampled air masses. Implications of "salt" aerosols at this mid-continent site will be discussed.

484

Carbon Monoxide Emissions from the Southern Ocean Estimated by Underway Measurements

Keyhong Park, Korea Polar Research Institute, Yeonsu-gu, Incheon, South Korea; T. S. Rhee, D. Hahm, H. C. Shin and S. Lee

Atmospheric carbon monoxide (CO) plays an important role in ozone-related chemistry in the troposphere, especially under low-NOx conditions like the open ocean. While the ocean has been known as a source of atmospheric CO, previous studies reveal large discrepancies among their source strength estimates. Thus, clarifying the contribution of the ocean to atmospheric CO budget is essential to understand atmospheric chemistry. During austral seasons of 2009 through 2012, we performed continuous shipboard measurement of atmospheric and dissolved CO in the Southern Ocean and along the trans-pacific passage from Incheon, Korea to Christchurch, New Zealand. Based on our observation, we will present source strength estimate of CO in the Southern Ocean. Furthermore, global ocean emission of CO will be optimized using inversion analysis of our measurements and the result of 3-D global chemical transport model.

485

Characterization of PM2.5 Aerosol Particles over Puerto Rico in the Tropical Atlantic

Rafael Jusino-Atresino, Rutgers University, Newark, NJ; J. Anderson and Y. Gao

To characterize atmospheric particulate matter equal or less than 2.5 μm in diameter ($PM_{2.5}$) over the Tropical Atlantic Ocean, aerosol sampling was carried out at Cape San Juan, Puerto Rico during August and September, 2006. Aerosol particles were analyzed by ion chromatography for water soluble inorganic and organic ions (Na^+, NH_4^+, Mg^{2+}, Ca^{2+}, K^+, Cl^-, SO_4^{2-}, NH_4^+, F^-, methanesulfonate (MSA), and oxalate), by induced coupled plasma mass spectrometry (ICPMS) for trace elements (Al, Cr, Cd, Co, Cu, Fe, Mn, Ni, Pb, Sb, Sc, V, and Zn), and by scanning electron microscopy for individual particle composition and morphology. The results show that dominant cations were: sodium (631 ng m^{-3}) and ammonium (164 ng m^{-3}), accounting for 64% and 14% of the total cation concentration, respectively. Main inorganic anions were: chloride (576 ng m^{-3}, 54%) and sulfate (596 ng m^{-3}, 38%), and the key organic anion was oxalate (18 ng m^{-3}, 0.1%). Non-sea salt sulfate (316 ng m^{-3}) dominated in days with volcanic influences, accounting for 68% - 91% of the total sulfate; these fine sulfate particles may serve as cloud condensation nuclei (CCN) and influence the radiation balance. The crustal enrichment factor calculations identified 62% of the selected trace elements (Al, Cr, Co, Cu, Fe, Mn, Ni, Sc, and V) with crustal origin. Al (144 ng m^{-3}) and Fe (76 ng m^{-3}) were the major elements, accounting for 63% and 34% of the total trace elements concentrations, respectively. Single particle analysis demonstrated that 40% of the total aerosol particles examined was Cl^- rich particles in the form of sodium chloride from seawaters and 34% of the total particles were Si- rich particles, mainly in the form of aluminosilicates from soil dust. About 42% of the total aerosol particles examined by SEM were under 0.8 μm in diameter in size, suggesting their potential roles in serving as CNN and light scatters. Based on the combination of air-mass back trajectories, cluster analysis and principal component analysis, the major sources of these $PM_{2.5}$ particles include marine, volcanic emissions from the Soufriere Hills in Montserrat, Saharan dust and biomass burning from West Africa, in addition to possible anthropogenic influences from northern continental sources.

486

Characterization of Aerosol in the North Pacific Marine Boundary Layer using a High Resolution Time of Flight Aerosol Mass Spectrometer

Taehyoung Lee, Colorado State University, Fort Collins, CO; T. S. Rhee, D. Hahm, K. Park, S. J. Park, B. Seok and J. L. Collett Jr.

The magnitude of particle formation from the oxidation of gaseous precursors (e.g. VOCs) in the marine atmosphere is still uncertain. As aerosols play important roles in influencing global climate and the chemistry of the remote atmosphere, it is important to study the composition of aerosols in oceanic regions. In order to increase understanding of the formation of particulate matter and the characteristics of aerosol over the ocean, field measurements were conducted from July 14th – 30th, 2012 from Incheon, Korea to Nome, Alaska, using a High Resolution Time of Flight Aerosol Mass Spectrometer (HR-ToF-AMS) on-board the Korean icebreaker R/V ARAON, as a part of the SHIPPO (Ship-borne Pole-to-Pole Observations) project. The cruise sailed from the Yellow Sea to the western portions of the North Pacific and Bering Sea through the East Sea (Sea of Japan). The HR-ToF-AMS deployed on the ship provided insight into particle size distributions and non-refractory fine particle composition, including concentrations of nitrate, sulfate, ammonium, chloride, and organic carbon, with a 5-minute time resolution. To screen out periods of contamination from the ship's exhaust, a variety of filtering criteria based on the AMS and other additional datasets (e.g. wind direction and gaseous CO concentrations) were applied. Many periods during the study were dominated by sulfate aerosol. The highest concentrations of sulfate and organic compounds were observed along the ship tracks in the Yellow Sea and in the vicinity of the Tsugaru Strait, Japan, being associated with continental outflow of anthropogenic sources from China, Korea, and Japan. The presentation will provide an overview of the composition of particulate matter measured in the remote and mostly pristine marine boundary layer and examine secondary aerosol formation over the ocean and the marine boundary layer with a focus on gaseous precursors and their influence on particle formation.

487

Modeling the Direct and Indirect Effects of Atmospheric Aerosols on Tropical Cyclones

Yuan Wang, Texas A&M University, College Station, TX; K. H. Lee and R. Zhang

The hurricane system is a large and complex convective system with enormous heating energy and moistures from the tropical ocean. The direct and indirect effects of aerosols on the hurricane 'Katrina' have been investigated using the WRF model with a two-moment bulk microphysical scheme and modified Goddard shortwave radiation scheme. Simulations of the hurricane 'Katrina' were conducted under the three aerosol scenarios: the clean case, the polluted case and the aerosol radiative effects (AR) case with same aerosol concentration as polluted case but with a modified shortwave radiation scheme. The polluted and AR cases have much larger amounts of cloud water and water vapor in troposphere, and the increased cloud water can freeze to produce ice water paths. A tropical cyclone in dirty and dusty air has active rainbands outside the eyewall due to aerosol indirect effects. The aerosol direct effect can lead to the suppressing of convection and weakening of updraft intensity by warming the troposphere and cooling the surface temperature. However, these thermal changes in atmosphere are concerned with the enhanced amounts of cloud hydrometeors and modification of downdraft and corresponding the low level winds in rainband regions. Thus, the AR case can produce the enhanced precipitation even in the weakest hurricane. From this study, we suggest that aerosols can influence the cloudiness, precipitation, and intensity of hurricanes significantly, and there may be different results in the mesoscale convective clouds cases. Moreover, relationships between various hydrometeors in hurricane systems are difficult to isolate and thus, it needs further study with more realistic cloud microphysical processes, aerosol distributions, and parameterizations.

488

A database of Marine Aerosol, Nitrous Oxide and Methane from the global oceans

Shital Shirsat Rohekar, University of East Anglia, Norwich, Norfolk, UK; P. S. Liss, A. Baker and H. W. Bange

Pollution of the marine atmosphere has received considerable attention in past years, and atmospheric and marine measurements of pollutants have been carried out at various ocean sites. However, in many instances the data remains solely with the individual scientist or research group(s), thereby limiting public access to these valuable data sets.

To address this issue, we have developed an online data repository of atmospheric aerosol and rain (http://www.bodc.ac.uk/solas_integration/implementation_products/group1/aerosol_rain/) chemical data measured exclusively from ship platforms and remote island sites. Here, we primarily focus on collating trace-metals, nutrients and organics data, but other data is also equally welcome. Currently, the database holds about 1,341 aerosol and 115 rain data points measured over the global oceans and remote island sites. In future, we aim to look at the temporal and spatial variation of various trace metals/nutrients and their deposition to the ocean surface.

To improve our understanding of the oceanic distribution of methane (CH_4) and nitrous oxide (N_2O) and to accurately estimate their flux to the atmosphere, a MarinE MethanE and NiTrous Oxide database ('MEMENTO') has been developed (https://memento.geomar.de/). This database aims at collating all the marine surface and/or depth profiles of CH_4 and N_2O on a single server with open access to the scientific community. To date there are about 21,432 CH_4 and 99,084 N_2O oceanic measurements dating back to 1975 and 1976, respectively. The N_2O/CH_4 data will be used to compute global fields of dissolved N_2O/CH_4 concentrations as well as their air-sea fluxes in both the open and coastal ocean.

489

Interaction between anthropogenic aerosols and sea breeze front in Houston area

Yuan Wang, Texas A&M University, College Station, TX; Y. Lin, G. Li and R. Zhang

Sea breeze is a prevailing wind near the coastal areas induced by the increasing temperature differences between the land and the sea. When the cold moist air from the sea meets the warmer air from the land, a shallow cold front boundary is created and cumulonimbus clouds are triggered. A two-moment bulk microphysical scheme has been implemented into the Weather Research and Forecasting (WRF) model to investigate the effects of aerosols on cloud and precipitation processes associated with the sea breeze frontal event occurring on 24 August 2000 in Houston, Texas. The anthropogenic sulfate aerosols from the Houston urban area are simulated using a constant local emission source, and the production of sea salt particles is simulated using an empirical parameterized scheme over the ocean surface in the model. In comparison of the National Mosaic Reflectivity Images, the modeled evolutions of column-maximal radar reflectivity exhibit a qualitatively good agreement with the measurements. Sensitivity simulations are initialized using a set of aerosol profiles. The results show that aerosols, serving as cloud condensation nuclei, can significantly alter the cloud number concentration, liquid and ice water content, cloud optical thickness and cloud coverage associated with the sea breeze front. In the downwind of the urban area, the precipitation has been redistributed due to the modified convection core affected by the aerosols. The response of precipitation amount to the elevation of aerosol concentrations is non-monotonic because of the complicated interaction between cloud microphysics and dynamics. The aerosol radiative effects on the atmospheric stability and the sea breeze formation will be examined in the next step through incorporating the aerosol optical properties in the radiative scheme of the model.

490

Characterization of atmospheric aerosols over the Southern Ocean and coastal East Antarctica during Austral Summer

Guojie Xu, Rutgers University, Newark, NJ; Y. Gao

To characterize the concentrations and size distributions of water-soluble species (including Na^+, NO_3^-, NH_4^+, nss-SO42-, methane sulfonate (MSA), oxalate and succinate) and nutrient trace elements (Cu, Fe, Mn, Ni and Zn) in aerosols over the Southern Ocean and coastal East Antarctica, bulk and size-segregated aerosols were collected from 40°S, 100°E to 69°S, 76°E and between 69°S, 76°E and 66°S, 110°E during a cruise from November 2010 to March 2011. Results indicated that sea salt was the major aerosol component, accounting for 72% of the total mass over the Southern Ocean and 56% over coastal East Antarctica. The concentrations of non-sea-salt sulfate varied from 50 to 1160 ng m^{-3}. The concentrations of MSA ranged from 62.5 to 108 ng m^{-3} over the Southern Ocean and from 45.9 to 172 ng m^{-3} over coastal Antarctica. High MSA/nss-SO_4^{2-} ratios appeared over coastal Antarctica, affected by high MSA concentrations. The average concentrations of oxalate ranged from 3.6 ng m^{-3} to 6.6 ng m^{-3}. The concentrations of all other organic acids measured were low. A bimodal mass-size distribution existed over coastal Antarctica, with peaks in the 0.32-0.56 μm and 3.2-5.6 μm ranges. Nss-SO_4^{2-} was dominated in the fine mode, and NO_3^- had a bimodal size distribution. MSA showed a bimodal distribution over the Southern Ocean and was enriched in fine particles over coastal Antarctica. Oxalate and formate existed in the fine mode, while succinate showed a bimodal distribution. High chloride depletion was associated with particles <1.0 μm over coastal Antarctica. These fine-mode particles may act as cloud condensation nuclei (CCN), contributing to the clouds-marine ecosystem interactions. The concentrations of atmospheric nutrient elements over the Southern Ocean were low in the ranges of smaller than 1 ng m^{-3} for Cu, Mn and Ni, although the average concentration of Fe was slightly higher over the coastal Antarctica than over the Southern Ocean. Input of these trace elements from the atmosphere to the Southern Ocean and coastal Antarctica may contribute to the nutrient and biogeochemical cycles in the regions.

491

The Role of Isoprene in Aging of Atmospheric Soot Aerosols

Alexei Khalizov, Texas A&M University, College Station, TX; Y. Lin, C. Qiu, S. Guo and R. Zhang

The emissions of isoprene from terrestrial and marine biogenic sources can impact the composition and properties of atmospheric aerosols. We have investigated the contribution of isoprene to atmospheric aging of combustion soot. Atmospheric soot is often found to be internally mixed with other aerosol constituents, yet the processes and chemical species responsible for the soot aging are not well understood. Aging experiments were conducted in a fluoropolymer chamber on size-classified soot aerosol in the presence of isoprene and photolytically generated hydroxyl radical (OH). The evolution in the aging state of soot was monitored from measurements of the particle size, mass, hygroscopicity, cloud condensation nuclei (CCN) activity, and optical properties. Upon photooxidation of isoprene in the chamber the soot particle mass was found to increase promptly due to condensation of semi-volatile and low-volatility reaction products on the particle surface. The increase in the particle mass was accompanied by a decrease in the particle mobility diameter and an increase in the effective density, indicating that the condensed material partially restructured the fractal soot aggregates, making them more compact. Upon humidification, the coating material absorbed water, increasing in volume and causing an additional restructuring of the soot aggregates. Furthermore, the presence of a water-soluble coating has transformed initially hydrophobic soot into efficient CCN at atmospherically relevant water supersaturations. However, the absorption and scattering of light by the aged soot remained practically unchanged because of the relatively low coating mass. The rate of aging and corresponding changes in the properties of soot were significantly enhanced in the presence of nitrogen oxides (NOx = NO + NO2), a common combustion co-pollutant of soot. On the basis of our experimental results we conclude that isoprene may play a significant role in the atmospheric aging of combustion soot aerosols, altering their atmospheric lifetime and impacts on air quality and cloud formation.

492

Laboratory measurement on dicarboxylic acid assisted nucleation by sulfuric acid/water system

Wen Xu, Texas A&M University, College Station, College Station, TX; A. Khalizov and R. Zhang

Binary nucleation system consisted of sulfuric acid and water was shown to fail in explaining the field observed nucleation rate long time ago. Many improved nucleation mechanisms, such as ternary nucleation by sulfuric acid/water/amines, ion-induced nucleation, and organic acid assisted nucleation, have been proposed to reconcile the controversy. In this study, the effect of succinic acid (an example of dicarboxylic acid) on sulfuric/water nucleation rate was determined in the laboratory by flow tube technique. The gaseous concentrations of sulfuric acid and succinic acid were measured simultaneously by the ion drift-chemical ionization mass spectrometry (ID-CIMS) in the negative ion proton transfer (NI-PT) mode. Meanwhile, the particle concentration was measured using the particle size magnifier (PSM, home-build) and ultra fine condensation particle counter (UCPC, commercially available) coupled system. PSM was introduced to lower the size detection limit of UCPC from about 3 nm down to about 1.5 nm, which is usually considered to be the size of critical nuclei. The results show that 5 ppb of succinic acid can enhance the sulfuric acid/water nucleation rate by 102 orders of magnitude. The slope of lnJ versus the ln[SA] and ln[SUA] are around 4 and 2, respectively, indicating that the critical nuclei contains 4 molecules of sulfuric acids and 2 molecules of succinic acids. In addition, theoretical calculations also show that succinic acid can have strong hydrogen bonding with sulfuric acid, which is consistent with the laboratory obtained results.

493

Impact Of Biological Feedback On Heat Fluxes And Sea Surface Temperature In Global And Regional Ocean Models

Charlie N. Barron, NRL, Stennis Space Center, MS; J. Jolliff, T. A. Smith, J. Wesson and S. Anderson

Ocean models require parameterization of the penetrative length scales of shortwave irradiance into the surface ocean. Surface ocean biology may modulate this length scale on a variety of space-time scales and this variability may, in turn, impact numerical model forecasts of surface ocean temperatures and ocean-atmosphere heat exchange. We present results from both global and regional ocean forecasting systems evaluating the sensitivity of the systems to various representations of surface ocean bio-optical variability. Global numerical experiments with the Hybrid Coordinate Ocean Model (HYCOM) demonstrate secondary circulation effects due to bio-optical variability in surface waters. Regional-scale two-way coupled ocean atmosphere systems further indicate a significant impact on turbulent thermal energy exchanges when coastal phytoplankton blooms are represented in the modeling system.

494

Contribution and Formation of Biogenic and Anthropogenic Secondary Organic Aerosols in Beijing

Song Guo, Texas A&M University, College Station, TX; M. Hu, R. Zhang, Q. Guo, X. Zhang, M. Zheng, J. Zheng and J. J. Schauer

Ambient aerosol samples were collected at an urban site and an upwind rural site of Beijing during the CAREBEIJING-2008 (Campaigns of Air Quality REsearch in BEIJING and surrounding region) summer field campaign. Contributions of primary particles and secondary organic aerosols (SOA) were estimated by chemical mass balance (CMB) modeling and tracer-yield method. The apportioned primary and secondary sources explain 73.8%±9.7% and 79.6%±10.1% of the measured OC at the urban and rural sites, respectively. Secondary organic carbon (SOC) contributes to 32.5±15.9% of the organic carbon (OC) at the urban site, with 17.4±7.6% from toluene, 9.7±5.4% from isoprene, 5.1±2.0% from α-pinene, and 2.3±1.7% from β-caryophyllene. At the rural site, the secondary sources are responsible for 38.4±14.4% of the OC, with the contributions of 17.3±6.9%, 13.9±9.1%, 5.6±1.9%, and 1.7±1.0% from toluene, isoprene, α-pinene, and β-caryophyllene, respectively. The aerosol gaseous precursor concentrations and temperature correlate well with SOA, both affecting SOA formation. The significant SOA enhancement with increasing water uptake and acidification indicates that the aqueous-phase reactions are largely responsible for SOA formation in Beijing. Source control policy during Olympic Games remarkably reduced the contributions of coal burning, gasoline cars and diesel cars by 60%, 38.5% and 12.5%. However, these strategies seemed have no significant effect on SOA contributions. A variety of other source apportionment techniques were also used to estimate secondary organic aerosols, including EC tracer method, water soluble organic carbon content, chemical mass balance model, and AMS-PMF method. Possible reasons for the differences between these methods were discussed.

495

Bimolecular Reaction of SO2 with Thermalized Syn Carbonyl Oxide from Isoprene Ozonolysis

Fei Xu, Texas A&M University, College Station, TX; D. Zhang and R. Zhang

Carbonyl oxides (Criegee intermediates or CIs) are produced in the process of olefins ozonolysis and can decompose to form OH or engage in bimolecular reactions with SO2, H2O, CO2, aldehydes, etc. In particular, the reaction of carbonyl oxides with SO2 can contribute to conversion of SO2 to H2SO4, a crucial step in the formation of sulfate aerosols and represents. Since isoprene is one of the most abundant hydrocarbons naturally emitted by the terrestrial biosphere and ozonolysis of isoprene provides an important source of nighttime OH radicals on the regional scale. In this study, the potential enery surface (PES) and mechanism of the reaction between the stabilized syn carbonyl oxide arising from isoprene ozonolysis and SO2 are investigated by using density functional theory (DFT) and ab initio (MP2 and CCSD(T)) methods. The mechanism involving the formation of a preactivation complex and an adduct, followed by two decomposition pathways leading to methyl vinyl ketone (MVK) + SO3 and an ester + SO2 is described. The results reveal a profound impact of the title reaction on SO2 oxidation and OH formation yield from isoprene ozonolysis under atmospheric conditions.

496

Heterogeneous Reactions of Epoxides in Acidic Media

Yun Lin, Texas A&M University, College Station, TX; V. Lal, A. F. Khalizov and R. Zhang

Epoxides have recently been identified as important intermediates in the gas-phase oxidation of hydrocarbons, and their hydrolysis products have been observed in ambient aerosols. We investigate the kinetics and mechanism of heterogeneous reactions for isoprene oxide and α-pinene oxide with sulfuric acid, ammonium bisulfate, and ammonium sulfate, using two complementary experimental techniques. Kinetic experiments in a fast flow reactor coupled to an ion drift-chemical ionization mass spectrometer (ID-CIMS) reveal a fast irreversible uptake of both epoxides on sulfuric acid, with a temperature-dependent reaction mechanism. For 90 wt % H2SO4, the uptake coefficients (γ) of isoprene oxide and α-pinene oxide at room temperature are (1.7 ± 0.1) × 10-2 and (4.6 ± 0.3) × 10-2, respectively. Measurements with attenuated total reflection-Fourier transform infrared spectroscopy (ATR-FTIR) show that acetals are formed from isoprene oxide, whereas organosulfates are generated from α-pinene oxide when reactions occurred in concentrated H2SO4(>65 wt %). For ammonium bisulfate and dilute H2SO4 (<25 wt %) solutions, diols are mainly formed from both epoxides. The reaction of epoxides with ammonium sulfate is slow and no products are observed. This study suggests that acid-catalyzed hydrolysis of epoxides results in the formation of a wide range of products, some of which have low volatility and can contribute to SOA growth under ambient conditions prevailing in the urban atmosphere.

497

Inter-hemispheric Tropospheric Vertical Distribution of Ozone Over the Atlantic Ocean: Multi-year assessment from shipboard observations during the NOAA AEROSE II –AEROSE VII Campaigns

Mayra I. Oyola, Howard Univ., Washington, DC; E. Joseph, F. Adames, N. R. Nalli, V. Morris, C. D. Barnet and D. Wolfe

The role of ozone in the troposphere is of utmost importance as it can affect atmospheric composition and radiative properties. Ozone (O3) is the primary source of hydroxyl radicals, which in turn are responsible to initiate most of the oxidation processes in the atmosphere. In the upper troposphere, ozone is a greenhouse gas that plays a key role in radiative forcing and potential climate change [Wang et al., 1980, 1993; Hansen et al., 2002, Thompson et al., 2002]. Previous studies have shown the significance of gravity and Rossby wave activity in the formation and transport of ozone and other constituents, due to vertical displacement and quasi-horizontal transport of material surfaces, respectively [Danielsen et al., 1991; Reid and Vaughan, 1991; Tsuda et al., 1994; Teitelbaum et al., 1996; Pierce and Grant, 1998; Grant et al., 1998; Fujiwara et al., 1998, Stone, 2006 and Thompson et al., 2007, 2011]. Based on this approach, Thompson et al. (2007, 2011) proposes 4 major dynamical ozone formation mechanisms responsible for the total tropospheric budget: stratospheric-tropospheric interactions, boundary layer processes, advection of pollutants and regional convection and lightning. Obtaining quantitative approximations of the contribution of each process towards the total tropospheric ozone budget is not known accurately and it is still an area of ongoing research, due to the extreme limitations in satellite retrievals and frequency of balloon-borne ozone measurements, especially over remote areas like the ocean.

Despite the logistical and opportunistic limitations in obtaining ozonesonde records, we describe an unprecedented data set acquired from oceanographic intensive observation periods (IOP) conducted onboard the NOAA Ship Ronald H. Brown, during seven years (2006-2011) of the NOAA Aerosols and Ocean Science Expeditions (AEROSE). A composite of well-resolved and accurate tropospheric profiles retrieved from daily ozonesondes, launched along latitudes between 33N to 34 S; aim to describe the Atlantic Ocean ozone geographical and vertical distribution during boreal Spring and Summer months. Laminae obtained applying the Pierce-Teitelbaum (PT) method are coupled to gravity waves (GW) and Rossby waves (RW). The ozone records are complemented with other RAOB parameters, ECMWF and NOAA NCEP meteorological and backtrajectory re/analysis and a myriad of in-situ and remote-sensing measurements collected daily during every cruise. Furthermore, we highlight ozone distribution patterns as a result of stratospheric folding events from storms and cut-off lows systems, effect of precursors from biomass burning regions and transport from continental airmasses and polluted areas, interactions with regions of deep convection (e.g. ITZC), boundary layer dynamics, possible enhancement by mineral aerosols and others. Finally we strive to address the contribution from each of the aforementioned mechanisms to the total tropospheric ozone budget over the tropical Atlantic.

498

The Relationship between Dimethyl Sulfide and Marine Cloud Condensation Nuclei in the Northern Atlantic Ocean

Chunhua Deng, Texas A&M Univ., College Station, TX; S. D. Brooks, D. C. O. Thornton, T. G. Bell, E. S. Saltzman and W. DeBruyn

Despite numerous studies since the CLAW hypothesis was first suggested in 1987, the extent to which marine dimethyl sulfide (DMS) contributes to marine atmospheric aerosol populations and the ability of those aerosol to act as cloud condensation nuclei (CCN) remains unclear. Here, we present data from a cruise aboard the R/V Knorr in the Northern Atlantic during June-July 2011which passed through areas of relatively high and low phytoplankton biomass. Continuous ambient measurements of aerosol concentration, cloud condensation nuclei (CCN) concentration, aerosol particle size distributions, and seawater and atmospheric dimethyl sulfide (DMS) concentrations were performed simultaneously during the three-week-cruise. Throughout the cruise, CCN concentration was measured at a series of five supersaturation levels and used to derive the critical superstation required for aerosols to activate as CCN. Our preliminary data analysis shows that the maximum atmospheric DMS concentration and the lowest critical supersaturation were both observed on July 6th – 7th (UTC). However, while our data suggests that phytoplankton blooms result in increases in aerosol available to act as CCN, other factors, including meteorological conditions and non-marine contributions to the aerosol populations, influence the properties of aerosols and formation of marine clouds. Factors contributing to the cloud-nucleating ability of aerosol particles will be presented and the atmospheric implications discussed.

499

A Three-Dimensional Model of the Sea Surface Consistent with Anomalously Low Gas Transfer Coefficients for Non-Ideal Gases at High Wind Speeds

Edward C. Monahan, University of Connecticut, Groton, CT; P. Vlahos

A three-dimensional model of the ocean surface, where, due to the stirring effect of rising big bubbles, the gas transfer coefficient, k, assigned to the interior of the ephemeral, active, whitecaps is some three orders of magnitude greater that than the k attributed the whitecap-free majority of the sea surface, gave rise to an area-averaged k that varies as the cube of the wind speed. Now, an addition to this model which explicitly takes account of the role of the momentarily large aggregate surface area associated with the great number of smaller bubbles submerged within the dense, transient, bubble plume beneath each active whitecap in temporarily sequestering surface active gases "when and where it counts" provides an explanation for the anomalously low k that a number of laboratory and recent open ocean experiments have suggested for aqueous-side-controlled, non-ideal or surface active gases. Horizontal averaging can convert this 3-D model into a one-dimensional (z) model for direct comparison with other 1-D models, but at the cost of obscuring the governing physics.

500

Field Observations of Submicron Particles at the California-Mexico Border

Misti Levy, Texas A&M University, College Station, TX; A. Khalizov, J. Zheng and R. Zhang

US Border Crossing regions frequently suffer from reduced air quality due to the increased transportation between the United States and Mexico. Gasoline and diesel vehicles produce a significant amount of submicron particles, which not only impact the local environment and climate, but also pose serious health risks to the residential population. In this demonstration, we will present a detailed description of the submicron aerosols in the region observed during the Cal-Mex 2010 field campaign. The Texas A&M team deployed several instruments to observe an extensive analysis of the ambient aerosols including a Hygroscopic-Volatility Tandem Differential Mobility Analyzer (HV-TDMA), Aerosol Particle Mass analyzer (APM), Condensation Particle Counter (CPC), Cavity Ring-Down Spectrometer (CRDS), and nephelometer to determine the hygroscopicity, volatility, particle mass, size, surface area, and volume, effective density, and the light extinction, scattering, and absorption coefficients. Emphasis will be placed on the characteristics of black carbon containing particles, which are produced from incomplete combustion of fossil fuels, with the expectation of obtaining a greater understanding of their composition and concentration.

501

Vertical Fluxes and Atmospheric Cycling of Methanol, Acetaldehyde, and Acetone In a Coastal Environment

Mingxi Yang, Plymouth Marine Laboratory, Plymouth, United Kingdom; R. Beale, T. Smyth and B. Blomquist

Oxygenated Volatile Organic Compounds (OVOCs) exist ubiquitously in the troposphere and are important for atmospheric chemistry and climate. They can be emitted from natural or anthropogenic sources, photochemically produced or destroyed in air, and deposited to the surface. We present here eddy covariance fluxes of methanol, acetaldehyde, and acetone measured during March to July 2012 near the southwest coast of the United Kingdom. OVOC concentrations and fluxes vary significantly with the time of day and wind direction. Higher concentrations and fluxes of acetaldehyde and acetone are usually observed in the daytime and from the direction of a forested park, most likely due to elevated emissions from terrestrial plants. Methanol concentration and flux do not demonstrate clear diel variability, suggesting sources in addition to plant emissions. The mean (1 sigma) acetaldehyde concentration of 0.13 (0.02) ppb at night is partly maintained by sea-to-air transfer, while photochemical destruction likely outpaces production during the day. Air-sea exchange and photochemistry are probably net sinks of methanol and acetone in this region. Their nighttime concentrations of 0.46 (0.20) and 0.39 (0.08) ppb are affected more by terrestrial emissions and long distance transport, respectively. To more accurately constrain the air-sea exchange of OVOCs, measurements at sea, rather than at a spatial inhomogeneous coastal site, are necessary.

(1988) Global Atmospheric Chemistry program (IGAC) Steering Committee, Dookie, Australia. Dan Albritton second from left; Bob third from left; Paul Crutzen sitting on the table next to Bob; Henning Rodhe far right; Dieter Ehhalt third from right; Patrick Buat-Menard second from right; Ian galbally sitting under Paul Crutzen; Eugenio Sanhueza far left.