Gregory R. Carmichael
June 2022

EDUCATION

Ph. D, 1979 Chemical Engineering, U of Kentucky
M.S., 1975 Chemical Engineering, U of Kentucky
B.S., 1974 Chemical Engineering, Iowa State University

APPOINTMENTS

2014 – 2021, Director, University of Iowa Informatics Initiative
2002-2014, Associate Dean for Graduate Studies and Research, College of Engineering
1991-Present, Co-Director, Center for Global & Regional Environmental Research
1981-1995, and 1998-2000, Chairman, Dept. of Chemical and Biochemical Engineering
1985-Present, Professor of Chemical and Biochemical Engineering, University of Iowa
1981-1985, Associate Professor of Chemical Engineering, University of Iowa
1978-1981, Assistant Professor of Chemical Engineering, University of Iowa

AWARDS

Fellow American Meteorological Society, 2022
Fellow American Geophysical Union, December 2018
University of Iowa Presidential Lecture, Feb 2017
University of Iowa Graduate College, Outstanding Mentor Award, May 2017
Hall of Distinction, University of Kentucky, College of Engineering Alumni Award, April 2016
Fellow, American Institute of Chemical Engineering (AIChE), 2013
AIChE Lawrence K. Cecil Award for outstanding chemical engineering contribution and achievement in the preservation or improvement of the environment (2012)
NASA Group Achievement Awards (INTEX-A Experiment, 2005 & ARCTAS Experiment 2009)
Priestley Lecture, CSIRO, Melbourne, Australia, 2003
Kammermeyer Chair of Chemical & Biochemical Engineering, 2001-Present
Japan Ministry of Education and Culture, Distinguished Visiting Professorship Award, Disaster Prevention Res Inst, Kyoto Univ, May-Aug 2000
College of Engineering Outstanding Research Award, 1999
Iowa Board of Regents Faculty Recognition Award, 1998
Intl Atmospheric Science and Application to Air Quality, Research Recognition Award, 1998
Professional Progress Award, Iowa State Univ, 1989
Outstanding Young Alumni Award, Iowa State Univ, l986
ASEE Dow Young Faculty Award for the North Midwest Section, l986
University of Iowa Faculty Scholar, l982-1985

PROFESSIONAL AND SERVICE ACTIVITIES *(illustrative)*

Department

Chairman, Chemical and Materials Engineering Program, l982-1984
Chairman, Dept. of Chemical & Materials Engineering, l984-1989
Chairman, Dept. of Chemical & Biochemical Engineering, 1989-1995

Interim Chair, Dept. of Chemical & Biochemical Engineering, 1998-2000

College

Associate Dean for Research and Graduate Studies, 2002-2014
Graduate College Self Study, 2002
Core Curriculum Committee, 1999-2001
Ad Hoc Core Curriculum Committee, 1997-1999
Member of Administrative Council, l983-1995, 1998-2000
Mathematics Stem Committee, l979-1980
College Self Study Committee, l984
International Study Committee, l984
Chair, Ad Hoc Committee on Foreign Language, l986
Ad Hoc Committee on Engineering I & II, l987
Engineering College Mathematics Liaison, 1998-2000

University

Chair of the TCoB Review Committee, March 2022
Director Iowa Informatics Initiative, 2014 – 2021
University of Iowa Research Foundation, Board of Directors, 2011 - 2020
Export Controls Advisory Board, 2010-
Ad Hoc Task Force on Research, 2009-2011
Ad Hoc Committee on Postdoctoral fellows, 2007- 2011
Ad Hoc Committee on International Student Recruitment, 2007- 2010
Intercollegiate Task Force on the Organization of Regional Education in the Life Sciences, 2007- 2009
Search Committee for the Vice President for Research, Chair 2004
University Task Force on Energy Conservation, 2004-2010
General Education Fund Task Force, Jan-Aug 2004
Ad-hoc Economic Development Committee for the VP of Research, Nov 2003-2008
Self-Study, Graduate College, 2003
Center for Bioinformatics and Computational Biology, Advisory Board, October 2002-
Advanced Research Computing Advisory Group, 1985-present
UI-Representative to University Consortium for Atmospheric Research (UCAR) 1994-present
MUCIA Executive Committee, 1998-2002
Advisory Committee for International Programmes, 1997-1999
Chair, College of Liberal Arts Review, 1994-1995
UI- Representative on Steering Committee of San Diego Super-computing Center, 1994-1997
Chair, Research Council 1991-1993
Chair, Advanced Computing Advisory Committee, 1992-1993
Chair, Ad Hoc Review Committee of Central Research Facilities, 1991-1992
Board of Directors, Iowa Research Foundation, 1992-1998
Co-Director, Center for Global & Regional Environmental Research, 1995-present
Search Committee for V.P. of Research & Development & Dean of Graduate College, l986-1988
Search Committee for Biocatalysis Chair, l986
University Self Study, Chair of Subcommittee on Service, l986-1987
Treasurer and Secretary of University of Iowa Faculty Club (Triangle Club) l979-1982

High Speed Computer Facility - Advisory Board Member, l987- 1995
Foreign Language Council, l987-1992
Foreign Language Fellowship Committee, l987-1988, Chairman, 1989-1990
Biotechnology Advisory Board, l988-1995
Faculty Scholars Committee, 1988
Co-organizer, University of Iowa Global Group
Research Council, 1990-1993
Chair, Research Council, 1991-1992
Electron microscopy Advisory Board, 1990-2000

National and International

AIChE

- Active member of American Institute of Chemical Engineers **since** 1974
- Leadership roles include**:**
- Member PAIC PUBLIC AFFAIRS AND INFORMATION COMMITTEE, 2020 – chair 2022,2023
- Member Government Relations Committee 2009-2016
- Environmental Division Past chair, Chair, 1st Vice Chair, 2nd Vice Chair, Environmental Division, 2006-2010
- Member, AIChE Acid Rain Task Force, l98l-1990
- President, AIChE, Iowa Chapter, l987-1988

World Meteorological Organization,

- Global Atmospheric Watch, Observations Group, 1998-2000
- Chair Scientific Advisory Group for GURME, 2000 – 2015
- Chair, Scientific Steering Committee GAW, 2016 - present
- Co-chair study team on the development and implementation of the Global Greenhouse Gas Watch (GGGW), 2021 – present
- Member of the WMO Research Board, 2020 - present

Co-Chair Scientific Community Committee, NASA Aerosol and Convective Clouds and Precipitation Decadal Survey Study (A-CCP), 2018 - 2021
Chair of the Science Advisory Board for Environmental Research Programs, World Meteorological Organization, 2014 –
NASA Earth Science Subcommittee, 2014 - 2020
MACC Advisory Board, EU, European Center for Medium Range Weather Forecasting, 2010- 2014
Advisory Board Member, College of Environmental Science, Peking University, 2008-2011
Chair, Scientific Advisory Group, Shanghai Pilot Project, Shanghai Meteorological Bureau, 2007-2015
UCAR, Nominations Committee, 2008-2010
National Research Council, Committee on Mesoscale Observations to meet National Needs, 2007-2009
NOAA, Climate Change Science Research Program, Committee on Direct Radiative Effect of Aerosols, 2004-2005
Texas Environmental Research Council (TERC), Scientific Advisory Board, 2004-2010
NSF, Ad hoc Committee on Cyberinfrastructer in the Atmospheric Sciences (Crydas), June 2003-2004

IGAC (International Global Atmospheric Chemistry), DEBITS (Deposition of Biogeochemically Important Trace Species), coordinating committee, 2004-2007
Anthropogenic Brown Cloud, Scientific Advisory Board, UNEP, 2002-
International Advisory Committee, Urbanization, Emissions and Global Carbon Cycle Institute; Intensive Global Change Institutes, IGPB/START, 2002-
Advisory Board, NASA Langley Research Center, Data Archive and Analysis Center (DAAC), 2001- 2003
Chair, Scientific Advisory Group, Urban Research Program, The World Meteorological Organization, 1999-2014
International Global Atmospheric Chemistry DEBITS, Steering Committee, 1998
Commission on Atmospheric Chemistry and Global Pollution (CACGP) Elected to Steering Committee, 1998-2004
Stanford University, Dept. of Civil & Environ. Engineering, Advisory Board, 1998.
Governors Science Council, 1991-2000
EPA/AMS Advisory Committee, 1991-1994
American Meteorological Society – member
Board on Urban Environment, member, 2007-2010
Chair, Atmospheric Chemistry Committee, American Meteorological Society, 1994-96
2020 – International Volunteer Committee
American Chemical Society - member
Iowa Academy of Science - member
Co-Chairman, Engineering Session Iowa Academy of Science, l980-198l
Chairman, Engineering Session, Iowa Academy of Science, l98l-1982
Sigma Xi – member
American Geophysical Union - member
American Society of Engineering Education - member
Omega Chi Epsilon - Associate Member
American Association for the Advancement of Science - member
Tau Beta Pi - member

Editorial Boards:
Environmental Chemistry, 2004-
Environmental Fluid Dynamics, 2000-
Environmental Software, 1990-
Atmospheric Environment 1995-
Numerical Insight Series, Gordon and Breach Publishing Group, 1997-
Environmental Series, Applied Mechanics Publications, 1997-

PhD Dissertation Supervision

Date	Student	Topic	Permanent Position
1981	Reda, Mohammad	Multicomponent Diffusion Analysis of SO_2 and Sulfate Production in Clouds Using a Detailed Cloud Scavenging Model	Professor, Dept of Chemical Engineering, Kuwait University
1985	Yoshisato, R.A.	Stimulation and Optimization of the Total Continuous Membrane Column by a Two	Dow Chemical, Corporate Research
1985	Adewuyi, Yusuf	Reaction Kinetics of Hydrogen Peroxide with Reduced Sulfur Compounds in Aqueous Medium Investigation of Sulfate	Assoc Professor, Dept of Chemical Engineering, North Carolina A & M
1985	Hong, Min Sun	An Investigation of Sulfate Production in Clouds using a Detailed Transport/ Chemistry Model (STEM-II) Coupled with Detailed Cloud Scavenging Models	Professor, Environmental Engineering, Ajou University, Korea
1986	Cho, Seog-Yeon	Mathematical Modeling and Sensitivity Analysis of Acid Deposition	Professor, Environ. Engineering, Inha University, Korea
1987	Shim, Shang-Gyoo	Application of Detailed Combined Transport/Transformation/Removal Model to Mesoscale Acid Deposition	Senior Researcher, Korean Institute for Science & Technology
1987	Chang, Young Soo	Behaviors of the Polluted Air Mass Under Long Range Transport Mechanism Induced by Local Flows	Research Scientist, Argonne National Lab
1988	Habib, Khaled	Anodic Behavior of Metallic Electrde During Cyclic Deformation in Aqueous Solutions by Holographic Interferometry Holometry	Senior Researcher, Materials Applic. Dept., Kuwait Institute for Scientific Research
1989	Lu, Maiying	The Effects of Pollutants on Atmospheric Corrosion of Stees: A Modeling and Kinetics Study	Post-Doctoral Fellow, Dept of Chemical Engineering, Texas Tech University
1989	Ye, Steve Shao-Jian	Sensitivity Analysis of a Structured Metabolic Model for Glucose-Limited Aerobic Growth of Saccharomyces Cerevisiae in Vegetative Cell Cycle	Searle, NutraSweet Division
1990	Shin-Woo Chul	Comprehensive Air Pollution Modeling on Multiprocessing Environments: Application to Regional Scale Problems	Senior Researcher, Korea Dept of Defense

1991	Kothamarthi, V. Rao	Studies of the Long-Range Transport of Trace Gases and Aerosols in the Western Pacific Rim	Research Scientist, Univ of Illinois & Argonne National Lab
1994	Sunwoo, Young	Ozone in East Asia	Professor, Environmental Engineering, Kyonggyo University
1994	Crist, Kevin	UVB and Tropospheric Trace Gas Interactions	Professor, Environmental Health Sciences, University of Ohio
1994	Zhang, Yang	Dust-Tropospheric Trace Gas Interactions	Assoc Professor, Atmospheric Sciences, North Carolina State
1995	John, Kuruvilla	Sensitivity of Regional Photochemical Oxidant Cycle to Climate Change	Professor, Environmental Engineering, Texas Tech, Kingsville, TX
1997	Beardsley, R.A.	Electrophoresis in Bioseparations	Venture Capital Group
1997	Arndt, Richard	Long Range Transport of Sulfur	Asst Professor, Windsor University, Windsor, Canada
1997	Sandu, Adrian (w/ Prof. Florian Potra)	Implicit Solvers for use in Integrating Stiff ODEs	Assoc Professor, Computer Science Dept, Virginia Tech
1998	Xu, Wie	Acid Deposition in China	Research Scientist, Max Planck Institute for Climatology, Germany
1998	Damian, Valeiru (w/ Prof. Florian Potra)	STEM-III Development, Computer Science	Smiths, Klein, Beacham Research Division, Philadelphia, PA
1999	Song, Chul Han	Aerosol Modeling	Dean & Professor, Gwangju Inst of Science & Tech. (GIST), Dept of Env Sci and Engineering, South Korea
1999	Phadnis, Mahesh	Heterogeneous Reactions in the Troposphere	Research Scientist, Earthtech, Boston, MA
2000	He, Shan	Aerosol Radiative Forcing (CEE)	NESCAUM, Boston, MA
2001	Daescu, Dacian	Adjoint Model for Atmospheric Chemistry	Assoc. Professor, Portland University
2002	Guttikunda, Sarath	Impact of Asian Megacities	Research Scientist, World Band, Washington, D.C.
2005	Thongboonchoo, Narisara	Air Quality in Thailand	Assoc. Prof, Chem Engr, King Mongkut's

			Institute of Technology, Thailand
2006	Pan, Li	Global Mercury	NOAA Air Resources Lab
2007	Mena, Marcelo	Air Quality in Santiago	Undersecretary of the Environment Chile
2008	Adhikary, Bhupesh	Aerosol/Climate Forcing in South Asia	Asst Prof. University of Kathmandu
2009	Kulkarni, Sarika	Aerosol Distributions in East Asia	California Air Resources Board
2010	Wei, Chao	Heterogeneous Chemistry	Max Planck Institute for Atmospheric Chemistry
2012	Marrapu, Pallavi	Aerosol Climate Feedbacks	Post Doc NOAA Boulder
2012	Jamroensan, Aditsuda	Modeling aerosol climate interactions in SE Asia	Thailand Atomic Energy Commission
2012	Huang, Min	Heterogeneous Chemistry	University of Maryland, Research Assist. Prof
2014	Yu, Man	Air Quality and Climate in the Pearl River Delta	Post doc Argonne
2014	Saide, Pablo	Air Quality forecasting and assimilation	Faculty UCLA dept atmos. Sci.
2017	Sabhani, Negin	Long range Transport of Pollutants to the Arctic	NCAR Staff member
2015	Gao, Meng	Reducing uncertainties in climate forcing and health estimates through data assimilation	Professor Hong Kong Baptist Univ.
2017	Abdioskouei Maryam	Novel techniques to estimate emissions	NCAR Staff scientist
2022	Christianson, Megan	LMOS field experiment	NOAA
2022	Ferrada, Gonzalo	Improving plume rise in biomass burning plume	Post-doc Univ. of Tenn.
2023	Tang, Beiming	Improving models through analysis of KORUS AQ	Post doc NOAA ARL/George Mason Univ.
2022	Roozitalab, Behrooz	India air quality analysis	Post-doc, NCAR
2023	Wang, Chen	The possible futures of air quality in Asia	
2024	Kim, Hyerim	Utilization of CMAQ adjoint	

MS Thesis Supervision

Date	Student	Topic
1979	Yang, Dyi-Kang	A Numerical Investigation the Transport and Deposition of Reactive Pollutants

1979	Chang, Shuh-Chih	Mass Transfer Accompanied by Complex Chemical Reaction
1980	Lin, Chiao	Regional Scale Pollutant Modeling
1980	Adewuyi, Yusuf	Gaseous Absorption of Air Pollutants
1981	Mavedatt, Mehrnaz	A Methodology for Liquid Organic Waste Identification and Processing
1982	Hong, Min-Sun	An Investigation of Sulfate Production in Clouds Using a Flow-Through Chemical Reactor Model Approach
1982	Yuk, Kam	An Extrapolation Technique for the Numerical Solution of Atmospheric Transport Problems
1982	Leung, Solomon	Solute Redistribution During Normal Freezing Operations
1983	Kim, W-J	Transport of Reduced Sulfur Compounds in the Troposphere
1983	Tsay, R-P	The Importance of Free Radical Chemistry on the Production of Sulfate in Cloud Droplet
1983	Shieh, D.	Comparison of Solution Techniques for the Integration of Stiff ODE's Arising from Atmospheric Transport Problems
1984	Korndorf, Lisa	Mathematics Analysis of Continuous Rotating Annular Electrophoresis
1984	Shan, T-C	Application of Finite Analytic Method to the Atmospheric Transport Equation
1984	Chang, Y-S	A Numerical Investigation of the Formation of Ambient NH_4NO_3 Aerosol
1985	Zingher, Harry	Numerical Analysis of Buoyancy Effects in the CRAE Column
1986	Gorowitz, J.	Study of Electrokinetic Phenomena
1987	Hash, Linda	The Fate of Toxic Chemistry in the Atmosphere
1987	Bream, Allen	An Immobilized Enzyme Reactor/Separator for the Hydrolysis of Casein by Subtilisin Carlsberg
1989	Ravishanker, B.S.	Important Acid Production Pathways and Effect of Source Emission Reductions on Acid Deposition
1989	John, Kuruvilla	Numerical Evaluation of the Impact of Urban and Industrial Emissions on Mesoscale Acidic Deposition
1995	Chen, Li Ling	Analysis of Aerosol and Non-Methane Hydrocarbon Data from Cheju Island, Korea
1995	Phadnis, Mahesh	Evaluation of Various Modeling Methodologies for Calculation of Acid Deposition

1995	Arndt, Richard	The Distribution and Deposition of Sulfur Oxides in Asia
1996	Hotchkiss, Brian	Sensitivity Analysis of Ozone and UVB Flux via Automatic Differentiation
1996	Durchenwald, James	Visualization of Large Atmospheric Data Sets
1998	Suib, Fachrizal	Acid Deposition in Indonesia
1999	Yienger, James (CEE)	Global Distribution of Tropospheric Ozone
1999	Wang, Jing	Dust Emissions in Asia
1999	Dwivedi, Pramod	Biofuels and Health in Rural India
2001	Dorwart, James	Particulates and Human Health
2004	Kulkarni, Sarika	Aerosol Distributions in East Asia
2007	Adhikary, Bhupesh	Asian Aerosols
2008	Huang, Hao	Secondary Aerosols

SEMINARS AND INVITED LECTURES

Seminars and Invited Lectures

1980 - 1994

Seminar: Radiological and Environmental Research Division of Argonne National Laboratory, Aug., l980.
Seminar: Environmental Engineering Program at the University of Iowa, Spring, l980.
Seminar: Dept. of Chemical Engineering, Seoul National Univ., June, l983.
Seminar: Dept. of Chem. Eng., Korea Adv. Inst. of Science and Technology, June, l983.
Seminar: Kentucky Center for Energy, February, l983.
Seminar: OECD Workshop on Long Range Transport Models, April, l983.
Seminar: Theoretical Research Group on Regional Planning, Toyohashi University of Technology, Japan, July, l983.
Invited lecture 5th Symposium of the Assoc. of Environmental and Sanitary Engineering,
Invited lecture Kyoto University, Japan, July, l983.
Seminar: National Inst. of Environmental Studies, Tsukuba, Japan, October, l983.
Invited lecture l7th Autumn Meeting of Japan Society of Chemical Engineering, Tohoku University, Sendai, Japan, October, l983.
Seminar: Dissolution of Multicomponent Drugs, College of Pharmacy, University of Iowa, l982.
Seminar: Sanitary Eng. Dept., Kyoto University, Kyoto, Japan, November, l983
Seminar: Dept. of Chemical Engineering, Osaka Univ., Osaka, Japan, Nov., l983.
Seminar: Technology Development Center, Toyohashi Univ. of Tech., Nov., l983.

Seminar: Water Research Inst., Nagoya Univ., Japan, November, l983.

Invited lecture: Atmospheric Chemistry, Particulate Matter and air Quality Study Group, Joint Symposium, Air Pollution Study Association, Kanto Branch, Tokyo, Dec., l983

Invited lecture: Acid Deposition Modeling National Institute of Environmental Studies and Meteorology Atmospheric Chemistry and Meteorology, Branches of Japan Society of Air Pollution, Tsukuba, Japan, June l985.

Invited lecture: Study Association, Kanto Branch, Tokyo, Dec., l983.

Seminar: Sensitivity Analysis, National Institute for Environmental Studies, Atmospheric Chemistry, Physics and Aerosol Groups, Tsukuba, Japan, June, l985.

Invited lecture: Reducing Scientific Uncertainty in Atmospheric Processes Influencing Acid Rain, Argonne National Lab Symposium/Workshop, Acid Rain Control: Developing a Consensus for Action, August, l985.

Seminar: Tropospheric Trace Gas Modeling, University of Iowa Academic Seminar for University Administration, November, l985.

Seminar: Toyota Research Center, September, l986.

Seminar: Seoul National University, October, l986.

Seminar: Electric Power Research Institute, Palo Alto, March, l987.

Seminar: Central College, "Biochemical Engineering", January, l987.

Invited Distinguished Lecture: San Jose State University Dept. of Meteorology, March, l987.

Invited Lecture: "Sensitivity Analysis", Task Force on Acid Rain Modeling, Warsaw, Poland, April, l987.

Invited Lecturer: "Air Pollution Modeling", NEA, National Energy Corp., Rome, Italy, June, l987.

University of Munich, Institute of Meteorology, "Tropospheric Trace Gas Modeling", June, l987, Munich, West Germany.

Seminar: Central Electricity Board, "Air Pollution Modeling", Leatherhead, England, July, l987.

Briefing to EPA Air Resources Laboratory, Acid Deposition Modeling, November, l987.

Seminar: "Long Range Transport of Pollutants in Japan", seminar to Environmental Engineering Department, University of Iowa, November, l987.

Invited lecture: "Long Range Transport of O_3 in Japan", International Meeting on Photochemical Oxidants in North America, Quebec, February, l987.

Invited lecture: "Super-computing, How Does One Approach the Change" Engineering Foundation Meeting on Reaction Engineering, February, l987, Santa Barbara.

Invited lecture: series, "Air Pollution Modeling, Chinese Research Academy for Environmental Studies, Beijing, China, April, l988.

Special lecture: "Long Range Transport of Air Pollutants", National Institute for Environmental Studies, Korea, Seoul, April, l988.

Seminar: "Air Pollution Modeling", Korean Institute for Energy Research, Daeduk, April, l988.

Seminar: "Chemical Engineering Aspects of Air Pollution Modeling", Korean Institute for Science and Technology, Department of Chemical Engineering, April, l988.

Seminar: "Modeling Trace Gases in the Lower Troposphere - A Chemical Engineering Analysis", Dept. of Chemical Engineering, University of Nebraska, Dec. 1988.

Seminar: "Modeling Trace Gases in the Lower Troposphere - A Chemical Engineering Analysis", Department of Chemical Engineering, Iowa State Univ., Feb. 1989.

Seminar: "Global Change", Seminar to University of Iowa President and Advisory Council, University of Iowa, Feb. 1989.

Seminar: "Modeling Trace Gases in the Lower Troposphere - A Chemical Engineering Analysis", Institute for Hydraulic Research, U. of Iowa, March 1989.

Seminar: Honors Seminar, "Environmental Quality Concerns", College of Pharmacy, March 1989.

Seminar: "Chemical Integration in the CALGRID Model", California Air Resources Board, Sacramento, CA, April 1989.

Seminar: "Long Range Transport Modeling", Chinese Research Academy for Environmental Studies", May 13, 1989.

Invited Speaker: "Long Range Transport of Pollutants in the Pacific Rim", Hong Kong University, NASA/PEM Planning Meeting, May 10, 1989

Invited Speaker: "Modeling Regional Scale Photochemical Oxidants", Gordon Conference on Air Chemistry, June 1989.

Seminar: "Regional Trace Gas Cycles, Their Importance in Global Change", Kyoto University, Dept. of Chemical Engineering, July 1989

Seminar: "Regional Scale Trace Gas Cycles - A Chemical Engineering Analysis", Kyushu University, Dept. of Chemical Engineering, July 1989.

Seminar: "Regional Scale Trace Gas Cycles, Their Importance in Global Change", National Institute for Environmental Studies, Japan, July 1989.

Seminar: Understanding the Impact of Anthropogenic Emissions on the Atmospheric Environment through the use of Comprehensive Atmospheric Trace Gas Cycles, Department of Chemical Engineering, Louisiana State University, October 1990.

Global Change: - invited lecture - Iowa Association for Energy Efficiency Iowa's Pursuit of Energy Efficiency", Des Moines, October 1990

Seminar: The Long-Range Transport of Pollutants in and around Japan, California Institute of Tech., Environment Engineering, April 1990.

Seminar: Overview of Episodic Tropospheric Trace Gas Models, invited presentation at the Workshop on S and N fluxes to the North Atlantic Ocean, Bermuda, April 1990

*Invited lecturer: IB*M Summer Institute on Environmental Modeling, July 1990 Austria, 2 talks: "Acid Deposition Modeling" and "Photochemical Oxidants in East Asia."

Invited Paper: "Understanding Trace Gas Cycles Through the use of Comprehensive Atmospheric Chemistry Models", 1st PRC-US Workshop on Atmospheric chemistry Modeling, Shanghai, China, August 1-8, 1990.

Invited Critical Review: National Acid Precipitation Assessment Program (NAPAP) State of the Science and Technology Conference, Hilton Head, SC, Feb 1990.

Seminar: "Air Pollution Modeling", Louisiana State University, Dept of Chemical Engineering, October 1990.

Invited lecture: "Acid Deposition Modeling, Workshop on Acid Rain in Asia, Bangkok Thailand, Nov 18-23, 1990.

Invited lecture: "Advances in Air Pollution Modeling", NSF-University of Kentucky, Workshop on Computational Advances in Transport Phenomena, Lexington, KY, Jan 7-9, 1991.

Seminar: "The STEM-II Regional Scale Atmospheric Chemistry Model. Description of the model and current applications." Max Planck Institute for Chemistry, Air Chemistry, Feb. 28, 1991.

Seminar: "Regional Scale Trace Gas Modeling - Current Status and Future Directions," Inst for Geophysics and Meteorology, University of Koln, Germany, March 4, 1991.

Seminar: "Atmospheric Chemistry of Oxidant and Acid Formation: Key Aspects for Long Range Transport Modeling" Invited lecture - EMEP Workshop on Photochemical Modeling for Long Range Transport in Relation to Abatement Strategies." Berlin, Germany, April 16-19, 1991.

Seminar: "Eulerian Modeling of the Long-Range Transport of Photochemical Oxidants." EMEP Workshop, Berlin, Germany, April 16-19, 1991.

Seminar: "Regional Scale Trace Gas Modeling: Current status and future directions." European Geophysics Society, Wiesbaden, April 25, 1991.

Seminar: "Regional distribution of tropospheric ozone in East Asia." European Geophysics Society

Seminar: "Photochemical Oxidant and Acid Formation Key Aspects for Long Range Transport Modeling." Univ Blaise Pascal, CNRS, Lab for Meteorologic Physics, May 1991.

Seminar: "Photochemical Oxidants in East Asia" Fraunhofer-Institute fur Atmospharische Umweltforschung Garmesh, Germany, May 23, 1991.

Seminar: "Long Range Transport of Transport of Trace Gases in East Asia, Stockholm University, Dept of Meteorology, May 30, 1991, Stockholm, Sweden.

Seminar: "Regional Scale Trace Gas Modeling", Norway Meteorological Inst. June 3, 1991, Oslo, Norway.

Seminar: "Modeling Photochemical Oxidants in East Asia", IBM, Bergen Scientific Center, Bergen, Norway, June 6, 1991.

Seminar: "Global Warming", The International Summer Institute, Des Moines, IA, July 1991.

Seminar: "Ozone in Asia", University of Chicago, Dept of Geophysical Sciences, Oct ,1991.

Guest lectures: Acid Deposition Modeling, three lectures as guest of Polish Academy of Sciences at the Institute for Meteorology and Water Resources, Warsaw, Krakow and Katowiec, May 1992.

Seminar: "Tropospheric Air Quality in the Western Pacific Rim Region" Kyushu University Institute for Applied Mechanics, August 1992.

Invited Lecture: "Acid Rain Modeling in Asia" 4th Workshop on Acid Rain in Asia, Bangkok, Thailand, Nov 1992.

Invited lecture: "Modeling Acid Rain in Asia" International Symposium on Sustainable Development, New Delhi, India, Jan. 1993

Invited Lecture: "Long Range Transport in Asia" Air Pollution '93, International Symposium, Monterey, Mexico,

Seminar: "Trace Gases in East Asia", seminar, University of Rhode Island, School of Oceanography, April 16, 1993

Seminar: "Acid Deposition: A Progress Report. Invited presentation in Commission on Atmospheric Chemistry and Global Pollution, International Association of Meteorology and Applied Physics International Meeting, Symposium titled" Major Advances in Atmospheric Chemistry Over the Past Decade and Their Impact on Public Welfare", July 17, 1993, Yokohama, Japan.

Seminar: "Long Range Transport of Pollutants in East Asia" Seminar, Department of Atmospheric Sciences, Seoul National University, July 2, 1993.

Seminar: "Air Pollutants in Asia", invited lecture Argonne National Laboratory, Oct 5, 1993

Seminar: "Analysis of Residual Ozone", TNO Environmental Division, Delft, Netherlands, June 1994.

Seminar: "Aerosol Composition at Cheju Island, Korea", 4th International Conference on Atmospheric Sciences and Air Quality, Invited Lecture, June 1, 1994

Invited Lecture: "Acid Rain in Asia", Workshop on Acid rain Network in South, East, and Southeast Asia, KL, Malaysia, May 1994.

Seminar: "Modeling the Long-Range Transport and Acid Deposition of Sulfur Compounds in Asia", ADB Workshop on Acid Deposition in Asia (RAINS-ASIA), Bangkok, Nov 1994.

Seminar: "Energy and the Environment: Acid Deposition in Asia Today and Tomorrow", Department of Biology, Iowa State University, 1995.

Seminar: "Acid Deposition in Asia", Department of Geography Graduate Seminar, University of Iowa, February 1995.

Seminar: "Recent Advances in Air Quality Modeling", Keynote lecture, Canadian Meteorological and Oceanographic Society, Kalona, British Columbia, May 1995.

Seminar: "Distribution of ozone and aerosols in East Asia", seminar Center of Atmospheric Sciences, Wageningen University, Netherlands, July 1995.

Invited talk: "Present State and Future Directions of Air Quality Modeling", Dag Stuhl Conference on Systems Analysis Modeling and Simulation for Environmental Applications, Dagstuhl Germany, October 1995.

Plenary lecture: "The Impact of Expanding Energy Use on the Asian Environment" 21st International Technical Meeting on Air Pollution Modeling and Its Application, Baltimore, November 1995.

Invited talk: "An Integrated Analysis of the Impact of Expanding Energy use on the Asian Environment", Aspen Global Change Institute, Summer Workshop on the Environmental Future of China, Aug 1995.

Keynote address: "Integrated Analysis of energy growth and acid deposition in Northeast Asia", International Symposium on Acid Deposition and Its Impacts, Tsukuba, Japan, Dec. 1996

Seminar: "Air Quality Issues in Megacities", invited lecture, Coastal '96, Rio di Jinero, Brazil, August 1996.

Invited lecture: "Sensitivity Analysis of Atmospheric Chemistry Models using Automatic Differentiation", Air Pollution '96, Toulouse, France, September 1996

1997

Seminar: "The role of heterogeneous chemistry involving mineral aerosol, Department of Chemistry, ETH, Lousanne, April 1997.

Seminar: "Trace gas and aerosol cycles in Asia", Center for Atmospheric Sciences, Utrecht University, Utrecht, Netherlands, April 1997.

Seminar: "New techniques for solving atmospheric chemistry problems", Computational Science Institute, Amsterdam, April 1997.

Seminar: "Future directions in air quality modeling", CISE, Electricity Board, Milan Italy, July 1997.

Seminar: "Sensitivity analysis using automatic differentiation" GMD-First, Berlin, August 1997.

Invited lecture: "Acid Rain modeling and Monitoring', Workshop on Acid Deposition in Africa, Toulouse France, Oct. 1997.

Invited Lecture: Tropopsheric ozone in east Asia, 3rd International Joint Seminar on Regional Deposition Processes in the Atmosphere, Nara, Japan, Nov 1997.

Special lecture: "Tropospheric Ozone production in East Asia", Toyohashi Institute of technology, Nov. 1997 Acid Deposition in NE Asia,

Special lecture: to the Graduate College, Nîgata University, Oct. 1997

Plenary lecture: "Trace gas and Aerosol Emission in Asia," Synthesis Workshop on Greenhouse Gas Emissions, Aerosols, and Land Use and Cover Change in Southeast Asia, Taiwan, Nov. 1997

Invited paper: Sensitivity Analysis using Automatic Differentiation, AGU Fall Meeting, San Francisco, Dec 1997

1998

Seminar: Asia Energy Growth and the impacts on the atmospheric environment, seminar, IPERTS, Iowa State University, Jan. 9, 1998.

Keynote Lecture: "Atmospheric Chemistry from the Micro Scale, Meso Scale and Global Scale and Back", World Meteorological Organization, Committee of Atmospheric Sciences, Skopje, Macedonia, Feb. 1998

Invited Lecture: "Modeling Aerosol Processes in Asia", Asia Pacific Network, Scoping Meeting on Aerosols, New Delhi, India, April 1998.

Seminar: "Modeling Aerosols at Regional Scales", NASA Workshop on Aerosols, New York, May 1998.

Special Lecture: "The Role of Mega Cities on the Asian Environment", Global Change Program Capitol Hill Seminar, Washington, D.C., June 1998.

Invited Lecture: "Regional Modeling of the Indonesia Fires", WMO Special Meeting on Fires in SE Asia, Singapore, June 1998.

Seminar: "Air Pollution in Shanghai", The World Bank, Washington, D.C., June 1998.

Invited Lecture: "Future Challenges in Air Pollution Modeling", NATO Advance Research Seminar, Bulgaria, July 1998.

Invited Lecture: "Long Range Transport of Pollutants in Asia", Workshop on Modeling Pollutant Transport in Asia, IIASA, Vienna, Austria, July 1998.

Seminar: "The Role of Heterogeneous Processes in the Troposphere", NCAR Seminar Series, Sept. 1998.

Invited Lecture: "Challenges in Modeling Aerosols at Regional Scales", Special workshop on Aerosol State of the Science, Pacific Northwest Lab, Sept. 1998.

Keynote Lecture: "Urban Environments a Re-Emerging Focus", Intl., Air Pollution Modeling Symposium, Paris, Oct. 1998.

Lecture: "Environmental Programs in the UN", Rotary, Iowa City, Oct. 1998.

Seminar: "Aerosol Processes in Asian Environments", Institute of Atmospheric Physics, Beijing, China, Nov. 1998.

Keynote Address: "Long Range Transport of Aerosols", 6th ASAAQ International Conference, Nov. 1998.

Invited Lecture: "The RAINS-ASIA Program", IGAC DEBITS Workshop, Bangkok, Nov. 1998.

Keynote Address: "Asian Development and the Environment", International Conference Mission Earth, San Francisco, Dec. 1998.

1999

Invited Lecture: "Integrated Assessment of the Impacts of Energy Use and the Environment of China", American Association for the Advancement of science, Anaheim, Jan. 1999.

Seminar: "Asian Development and Environmental Consequences", University of California, Irvine, Feb. 1999.

Seminar: "Modeling Air Quality in Chinese Cities", World Resources Institute, Feb. 1999.

Invited Lecture: "Advances in aerosol modeling", Air Pollution 99, Stanford Univ., June 1999

Plenary Lecture: "Tropospheric chemistry impacts of emissions from the transportation sector", International Colloquium and Exhibit on Environmentally Preferred Advanced Energy Generation, Irvine, CA April 1999.

Seminar: "The importance of chemistry on aerosol surfaces", Goddard Institute for Space Science (GISS), New York, NY Dec. 1999

Seminar: "Modeling air pollution in Asian Megacities", The World Bank, Oct. 1999

Invited Talk: "Mineral aerosol as reactive surfaces in the atmosphere", Special Session on heterogeneous chemistry, American Geophysical Union, Dec. 1999

Seminar: "Modeling dust processes in East Asia", Institute for Atmos. Physics, Beijing, Nov. 1999.

Plenary Lecture: "Urban Environments: challenges and future research directions", Workshop on the WMO Program on Urban Environments, Beijing, 1999

Invited Lecture: "Intercomparison of long-range transport models for sulfur deposition in East Asia", Workshop on Long Range Transport Models, International Institute for Applied Systems Analysis, Vienna, Austria, July 1999

Invited Talk: "Modeling aerosol processes in East Asia", NSF-Sponsored, ACE-Asia Planning Meeting, Kunming China, Nov. 1999

Invited Talk: "Modeling dust chemistry interactions on regional scales", Workshop on Mineral Dust, Boulder CO, Oct. 1999.

Invited Talk: "Acid Deposition Modeling in Asia", Asian Development Bank, Workshop on Acid Rain in Asia, Asian Institute of Technology, May 1999.

2000

Seminar: "Long Term Trends in Sulfur Deposition in Asia", The World Bank, Feb. 17,2000.

Plenary Lecture: "Challenges in Atmospheric Chemistry Modeling", Institute for Mathematics and Its Applications, Univ. of Minn., March 23, 2000

Seminar: "The Changing Trend of Sulfur Deposition in East Asia", Woodrow Wilson School, Princeton University, April 15, 2000.

Plenary Lecture: "The Changing Trend of Sulfur Deposition in East Asia", ICEPAC Conference, Irvine, CA, April 2000.

Invited Talk: "Modeling Aerosol Processes", Energy Research Center, Netherlands, April 2000.

Seminar: "The Influence of Aerosol Processes on Atmospheric Chemistry", Kyoto University, Japan, June 2000.

Seminar: "The Influence of Aerosol Processes on Atmospheric Chemistry", Frontier Research Institute, Tokyo, Japan, August 2000.

Seminar: "The Influence of Aerosol Processes on Atmospheric Chemistry", Tohoku University, Sedai, Japan, July 2000.

Plenary Lecture: "Inter-comparison of Long-Range Transport Models", Workshop on Long Range Transport, IIASA, Vienna, Austria, Sept. 2000.

Plenary Lecture: "Inter-comparison of Long-Range Transport Models Applied to Asia, Acid Rain 2000 International Conference, Tsukuba, Japan, Dec. 2000.

Plenary Lecture: "The Influence of Aerosol Processes on Atmospheric Chemistry", International Conference on the Atmospheric Science and Its Application to Air Quality, Taipei, ROC, Nov. 2000.

All College Seminar: Air Quality Engineering, Iowa State University, Nov. 2000.

Invited Talk: The Role of Heterogeneous Reaction in Tropospheric Chemistry,

AICHE Annual Meeting, LA, Nov. 2000

2001

Seminar: The Impact of Asian Emissions on Local/Regional and Global Air Quality, Cal Tech, Environmental Engineering Seminar Series, Jan. 2001

Seminar: The Impact of Asian Emissions on Local/Regional and Global Air Quality, Washington State University, Feb. 2001

Plenary Talk: Changing Trends in Asia Emissions, ICEPAC Conference, Irvine, CA, Feb. 2001

Plenary Talk: Environmental Implications of the Long-Range Transport of Pollutants for Asia, MIT/Endicott Symposium on Exporting and Importing Air Pollution, June 2001

Plenary Talk: Perspectives in Transboundary Pollution Transport in Asia: Lessons and Remaining Challenges, 12th World Air and Environmental Congress, Seoul, Korea, Aug. 26-31, 2001

Seminar: The Impact of Asian Emissions on Local/Regional and Global Air Quality, Environmental Science Seminar Series, UI, Nov. 2001

Seminar: The Impact of Asian Emissions on Local/Regional and Global Air Quality, NASA Langley Research Center, Langley, VA, Nov. 2001

Invited Talk: Intercomparison of Long-Range Transport Models in Asia, Workshop on Transboundary Air Pollution, IIASA, Vienna, Austria, Oct. 2001

Invited Talk: Interactions between Aerosols and Photochemistry in the East Asia Troposphere, Special Session on Heterogeneous Chemistry, AGU Annual Meeting, San Francisco, CA, Dec. 2001

Invited Talk: Climate Effects and Air Quality: Aerosol/Chemistry Interactions and the Role of Megacities, EPA Workshop on Climate Effects and Air Pollution, Research Triangle Park, NC, Dec 2001

Invited Talk: Chemical Weather Forecasting Challenges, Workshop on Air Quality Forecasting for the Weather Research Program, Palm Springs, CA, Nov. 2001

2002

Invited Talk: Measurement Needs for a Modeler's Perspective, Workshop on the Design of a Continental Measurement Network, San Luis Potosi, Mexico, Jan 2002

Invited Talk: Chemical Weather Forecasting, World Meteorological Organization, Experts Meeting on Air Quality Forecasting, Cuernavaca, Mexico, October 2002

Invited Talk: Intercontinental Transport of Pollutants, Lessons Learned from Recent Field Experiments, US/Germany Joint Meeting on International Transport of Pollutants, Baden Baden, Germany, October 2002

Invited Talk: Modeling Analysis in Support of the Ace Asia Field Experiment, Annual AGU Meeting, San Francisco, December 2002

Special Seminar: Recent Advances in Air Quality Modeling, Malaysian Meteorological Agency, Kuala Lampur, Malaysia, November 2002

Invited Talk: Chemical Weather Forecasting in Support of Field Experiments, Telluride Summer Institute on Atmospheric Chemistry, Telluride, CO, August 2002

Public Lecture: The Globalization of Air Pollution, Should We Care? Telluride, CO, August 2002

Invited Talk: Recent Advances in Chemical Weather Forecasting in Support of Atmospheric Chemistry Studies, NCAR Summer School on Aerosols in Climate and Hydrology, Boulder, CO, July 2002

Invited Talk: Impacts of Aerosols on Tropospheric Chemistry, NCAR Summer School on Aerosols in Climate and Hydrology, Boulder, CO, July 2002

Seminar: Recent Advances in Chemical Weather Forecasting, Environmental Engineering Seminar, UI, November 2002

Invited Talk: Recent Advances in Chemical Weather Forecasting in Support of Field Experiments, Symposium on Recent Advances in Atmospheric Chemistry, Boston, August 2002

2003

Invited Talk: Recent Advances in Long Range Transport Modeling, 4th Model Intercomparison Workshop, IIASA, Vienna, Austria, Jan. 2003

Invited Talk: Long Range Transport of Pollutants in Asia, Acid Rain in Thailand, Symposium, JICA, Bangkok, Thailand, February 2003

Seminar: The Impacts of Aerosols on Tropospheric Chemistry, Atmospheric Science Seminar, MIT, February 2003.

Special Seminar: Air Quality and Climate change, Thailand Meteorological Agency, Bangkok, Thailand, February 2003

Invited Talk: Advances in Chemical Weather Forecasting: Results for Recent Field Experiments, International Meeting of Atmospheric Scientists in Support of Air Quality, Tsukuba, Japan, March 2003

2004

Invited Talk: Recent Advances in Long Range Transport Modeling, 5th Model Intercomparison Workshop, IIASA, Vienna, Austria, Jan. 2004

Seminar: Changing Trends of Asian Emissions and the Implications for the Quality of the Air We Breathe, Univ. Wisc., Env. Eng., Oct. 2004

Seminar: Improving Predictability of Air Quality, Tsinghau University, Dept. Env. Eng., Beijing, Sept. 2004

Keynote Address: Regional Emissions and Air Pollutant Transport in China, Beijing International Environment Forum 2004, Sept. 2004

Invited Talk: Chemical Data Assimilation in Support of Chemical Weather Forecasts, Annual meeting of the American Meteorological Society, Seattle, Jan. 2004

Invited Talk: How well can we characterize the sources (regions, sectors, etc.) contributing to an observable? Intercontinental Transport of Pollutants, USEPA Workshop, RTP, Oct. 2004

Special lecture: The Need for Closer Integration of Measurements and Models, Pacific Northwest national Laboratory Workshop on the Frontiers of Atmospheric Chemistry, Oct. 2004

Invited Talk: Improving Emission Estimates Through Regional Studies, Black Carbon and Climate Change Workshop, San Diego, Oct. 2004

Special lecture: Improving Emission Estimates Through Regional Studies, SARCS Regional Training workshop on "Biogenic and Anthropogenic Emissions from Southeast Asia", National Central University, Chung Li, Taiwan, Nov. 2004

Seminar: Recent Advances in Chemical Weather Forecasting, University of Alabama, Huntsville, May 2004

Seminar: The Role of Heterogeneous Reactions in Atmospheric Chemistry, Carnegie Mellon University, Feb. 2004

Invited Talk: The Impact of Megacities on Air Pollution, Dubai Int'l. Conference on Atmospheric Pollution, Dubai, Feb 2004

2005

Invited talk: The WMO GAW GURME program- an overview. GAW Symposium

2005, Geneva, Switzerland.

Invited Talk: Advances in chemical data assimilation in support of air quality forecasting. NOAA Workshop on Chemical Data Assimilation in Support of Chemical Weather Forecasting, Washington DC

Seminar: The Globalization of Air Pollution…Why should we care? Arizona State University, department of mechanical Engineering. Tempe AZ

Invited Talk: How well can we assess source receptor relationships? EU Task Force Meeting on hemispheric Transport of Pollutants, Brussels, Belgium

Invited Talk: Modeling regional scale pollution in East Asia. Workshop on Regional Strategies for Air Quality Management

Invited talk: Regional-Scale Chemical Data Analysis & Assimilation for ICARTT: How does the integration of observations with predictions improve regional air quality models? Symposium on air quality forecasting, Fall AGU meeting, San Francisco.

Invited Talk: Regional-Scale Chemical Data Analysis & Assimilation for ICARTT: How does the integration of observations with predictions improve regional air quality models? ICARTT Science Workshop, Durham New Hampshire

Invited Talk: The Globalization of Air Pollution, University of Iowa President's Club, Iowa City, IA

Seminar: The Globalization of Air Pollution…Why should we care? Center for Atmospheric Sciences, University of New Hampshire.

Invited talk: Linking emissions to air quality, modeling aerosols at regional scales. Joint US/India Workshop on Nanoscale Aerosol Science and Technology, Mumbai India.

Invited talk: How well can we model aerosol distributions in Asia? Annual Meeting of the Asian Aerosols Society, Mumbai

2006

Invite Talk: Recent Advances in Air Quality Forecasting, WMO GURME Workshop on Air Quality Forecasting in Latin America Cities, Sao Paula, Brazil

Invited Talk: Lessons Learned from Model Intercomparison Studies, Workshop on Model Intercomparison Studies in Support of EU Task Force on Hemispheric Transport of Pollutants, Washington, DC

Invited Talk: Chemical Data Assimilation, IGACO Workshop, WMO Geneva, April.

Invited Talk: Recent Advances in Air Quality Forecasting, GURME Air Quality Training Course, Lima Peru, July.

Seminar: Linking aerosols sources to climate change and air pollution impacts -- How good are our global and regional models? Department of Chemical Engineering, University of Kentucky, Sept.

Invited Talk: Passive Samplers and their use in atmospheric chemistry studies, DEBITS Workshop, South Africa, Sept.

Special lecture: Recent advances in air quality forecasting, Shanghai Meteorological Agency, Shanghai, Oct.

Seminar: Recent Advances in Chemical data Assimilation, Institute for Atmospheric Physics, Chinese Academy of Sciences, Beijing, Oct.

Special lecture: VERNON L. SNOEYINK DISTINGUISHED VISITING LECTURE SERIES IN ENVIRONMENTAL ENGINEERING, The Globalization of Air Pollution: Implications for the Quality of the Air We Breathe, University of Illinois, Department of Environmental Engineering, Nov.

2007

Invited Talk: Recent Advances in Air quality Forecasting, Workshop on regional Pollution, Guangzhou, China, Jan.,

Invited Talk: Estimating Source/receptor Relationships, Workshop on Hemispheric Transport of Pollutants, Geneva, Jan.

Special Lecture: Improved Air Quality Forecasts Through Data Assimilation, Shanghai Meteorological Agency, Shanghai, Jan.

Seminar: Improving Air Quality Forecasting through Closer Integration of Measurements and Models, University of Madrid, School of Informatics, Madrid, April

Seminar: Improving Air Quality Forecasting through Closer Integration of Measurements and Models, European Joint Research Center, Ispra, Italy, Feb.

Invited Talk: Dust and its Role in Tropospheric Chemistry, **The International Association of Meteorology and Atmospheric Sciences (**IAMAS) Joint Meeting, Perugia, Italy, July 2007.

Invited Talk: Regional and Global Perspectives of Megacity Air Pollution, Joint Assembly of the American Geophysical Union, Acapulco, Mexico, June 2007.

Plenary Lecture: Predicting Air Quality: Current Status and Future Directions, 29th International Technical meeting an Air Pollution Modeling and Its Applications, Portugal, Sept. 2007.

Plenary Lecture: Improving Regional Predictions of Air Quality Through the Closer Integration of Observations and Models, International Conference on Atmospheric Science and Its Application to Air Quality, Hong Kong, China, May 2007.

Seminar: Improving Regional Predictions of Air Quality Through the Closer Integration of Observations and Models, Gwangju Institute for Science and Technology, Gwangju S. Korea, Aug. 2007.

Special Lecture: Future Directions for Improving Air Quality Predictions, Hankyong National University, Seoul Korea, Aug. 2007.

Invited Talk: Regional Scale Modeling in Support of PACDEX, Fall AGU Meeting, Dec. 2007.

2008

Invited Talk: ABCs of Climate Change: The Effect of Atmospheric Brown Clouds on Health and Climate Policy, Climate Change and Human Justice Symposium, University of Iowa, March 2008

Seminar: Regional and Global Perspectives of Megacity Air Pollution, Department of Atmospheric Sciences, Sun-Yat Sen University, Guangzhou, China, Jan. 2008

Invited Talk: Regional and Global Perspectives of Megacity Air Pollution, Some perspectives from Project Atmospheric Brown Cloud (ABC), 2nd International Workshop on Mega-city and Regional Air Pollution, Guangzhou China, Jan. 2008

UNEP ABC Science team lecture: Use of Models in air quality and climate studies in Asia, Kathmandu, Nepal, December 2008.

WMO-GURME Workshop on Air Quality Modeling and Forecasting: Current Application and Future Challenges to air Quality Forecasting, Pune, India, December 2008.

Invited Talk: Chemical Weather – A New Challenge/Opportunity for Weather and Other Services Evolving Complexity of observing systems, models, and applications, Final Assembly of the U GEMS Project, Julich, Germany, April 2008.

Keynote Lecture: The Growing Reach of Air Pollution – Local, Regional, Global, and Back Again, International Conference on Air Quality 2008, Istanbul, Turkey, March 2008.

Keynote Lecture: The Globalization of Air Pollution, World Meteorological Day, Geneva, Switzerland, March 2008.

Distinguished Lecture: What Goes Around Comes Around, CIRES, University of Colorado, Boulder, February 2008.

Seminar: ABCs (Atmospheric Brown Clouds) and Their Impacts on Air Quality and Climate Change, Department of Energy, Environment and Chemical Engineering, Washington University, St. Louis, February 2008.

Invited Talk: Regional and Global Perspectives of Megacity Air Pollution, AIChE National Meeting, Philadelphia, November 2008.

Seminar: Improving Air Quality Predictions through closer integrations of models and measurements, UCLA Department of Atmospheric Science, May 2008.

Invited Talk: Regional and Global Perspectives of Megacity Air Pollution, IGAC Congress, Annecy, France, 2008.

Invited Talk: Regional and Global Perspectives of Megacity Air Pollution, Beijing Environmental Forum, Beijing, October 2008.

Invited Talk: The ABC Project, UNEP Meeting of Environment Minister, Central Asia, Bishkek, Kyrgyzstan, April 2008.

Public Lecture: ABCs (Atmospheric Brown Clouds) and Their Impacts on Air Quality and Climate Change, Café Scientific, Iowa City, November 2008.

Invited Talk: ABCs (Atmospheric Brown Clouds) and Their Impacts on Air Quality and Climate Change, Conference on Climate Change and Human Justice, College of Law, University of Iowa, February 2008.

2009

Invited Talk: Regional and Global Perspectives of Megacity Air Pollution, Annual Meeting of the America Meteorological Society, Phoenix, January 2009.

Special Seminar: Current State and Future Direction of Air Quality Forecasting, Milan Municipal Environmental Agency, Milan, Italy, June 2009.

Invited Lecture: Asian Aerosols: Current and Future Aerosol Distributions and Their Implications for Human Health and Regional Climate Change, Mountain and Glacier Symposium, Milan, Italy, June 2009.

Keynote Address: Megacities – Where Pollution Problems and Solutions Appear First, 11th International Conference on Atmospheric Science and Air Quality, Jena, China, April 2009.

Seminar: The Growing Reach of Air Pollution – Local, Regional, Global and Back Again! Department of Environmental Engineering, Tsinghua University, Beijing China, 2009

Invited Lecture: Asian Aerosols: Current and Future Aerosol Distributions and Their Implications for Human Health and Regional Climate Change, Goldschmidt Meeting, Switzerland, July 2009.

Seminar: Current State and Future Direction of Air Quality Prediction, Kyushu Univ., Japan, July 2009.

Keynote Address: Regional and Global Perspectives of Megacity Air Pollution, International Meeting of the International Conference on Urban Climate, Yokohama, Japan, July 2009.

Invited Lecture: Current State and Future Direction of Air Quality Prediction, Frontiers Inst., Tokyo, Japan, July 2009.

Seminar: Asian Aerosols: Current and Future Aerosol Distributions and Their Implications for Human Health and Regional Climate Change, College of Environmental Studies, Peking University, Sept. 2009.

Seminar: Asian Aerosols: Current and Future Aerosol Distributions and Their Implications for Human Health and Regional Climate Change, Institute for Atmospheric Physics, Beijing, July 2009.

Seminar: Asian Aerosols: Current and Future Aerosol Distributions and Their Implications for Human Health and Regional Climate Change, Shanghai Environmental Protection Bureau, Sept. 2009.

Invited Talk: Lessons learned from the Beijing Olympics, Gordon research Conference on Atmospheric Chemistry, New Hampshire, Aug. 2009

Invited Talk: *Chemical Weather* – A New Challenge/Opportunity for Weather and Other Services, Technical Conference of the Commission for Atmospheric Sciences, 15th Meeting, Seoul, KR, Nov. 2009.

2010

Invited Talk: Asian Aerosols: Current and Future Distributions and Implications to Air Quality and Regional Climate Change, Annual Meeting of the American Meteorological Society, Atlanta GA, Jan., 2010-04-30.

Invited Talk: Improving air quality analysis through a closer integration of observations and models. Future Research Directions in Megacities in China, Peking University, Feb. 2010

Invited Talk: Current State and Future Direction of Air Quality Prediction, EU Commission on Science and Technology (COST), Geneva, March 2010.

Invited Talk: Aerosol Emissions and Their Implications for Human Health and Climate Change, Special Experts Meeting on BC Called by the Secretary General UNEP, NAS, DC, Oct. 2009.

Invited Talk: Atmospheric Chemistry & Transport: Estimating SLCF Distributions and Contributions, EPA Meeting on Short Lived Climate Forcing, NC, April 2010.

Seminar: Asian Aerosols: Current and Future Distributions and Implications to Air Quality and Regional Climate Change, Iowa Superfund Project, April 2010.

Plenary lecture: Current State and Future Direction of Air Quality Prediction International Conference on Air Quality and Atmospheric Science, Shandong, China June 2010.

Seminar: Asian Aerosols: Current and Future Distributions and Implications to Air Quality and Regional Climate Change, Dept of Environ. Eng., Tsinghua Univ. Beijing, China, June 2010.

Seminar: Asian Aerosols: Current and Future Distributions and Implications to Air Quality and Regional Climate Change, Institute for Atmospheric Physics, Beijing, China June 2010.

Invited talk: *Chemical Weather* – A New Challenge/Opportunity for Weather and Other Services, World Meteorological Day at the Shanghai Expo, May 2010.

Invited talk: Current State and Future Direction of Air Quality Prediction, Special GURME Symposium on air quality forecasting, Santiago, Chile, July 2010.

Seminar: Black carbon as a key climate forcing agent, Univ. Santiago, Chile, July 2010.

Seminar: Current State and Future Direction of Air Quality Prediction, Gwangju Institute for Science and Technology, Korea, Aug. 2010.

Seminar: Globalization of air pollution, Dept. of Chemical Eng., Columbia University, Sept. 2010.

Invited paper: Regional and Global Perspectives of Megacity Air Pollution, Beijing Forum, China, Nov. 2010.

Special lecture: Globalization of air pollution, International Workshop on long Range Transport of Pollution, Kyushu Japan, Nov. 2010.

Invited paper: Constraining aerosol distributions through data assimilation of satellite AOD, American geophysical union annual meeting, San Francisco, Dec. 2010.

2011

Invited lecture: Globalization of air pollution, Air Quality and Climate Conference 2011 Opportunities in Air Quality-Climate Research in Asian-Pacific Region, Hawaii, March 2011.

Invited lecture: Globalization of air pollution, UNEP ABC Training school on atmospheric science, Katmandu Nepal, March 2011.

Keynote Address: The Globalization of Air Pollution, Acid Rain 2011, Beijing, June 2011.

Keynote Address: The Globalization of Air Pollution, US/Korea Conference on Science, Utah, Aug. 2011

Invited Talk: Short Lived Climate Forcing Agents, Policy Opportunities, Technical Workshop on Science and Policy of Short-lived Climate Forcers, September 9-10, 2011, Mexico City.

Invited Talk: Multi-model studies of air quality in Asia, Project ABC Science Team Workshop, Seoul, Sept. 2011.

Invited Talk: Reducing Uncertainties in Aerosol Distributions, Health Effects and Air Pollution Workshop, HEI, Boston, Oct. 2011.

Seminar: Sensitivity analysis of aerosol feedbacks on chemistry and climate at urban and regional scales. UCLA Dept. of Atmos. Science, Oct. 2011

Invited Talk: Pollutant transport in and around China – implications for air quality planning. China-EPA Regional Air Quality Management Workshop, Beijing, Oct. 2011

Plenary Talk: A closer integration of models and observations across air quality/weather/climate applications. 3rd International Air Quality Forecasting Workshop, Washington DC, Dec. 2011

Invited Talk: A closer integration of models and observations across air quality/weather/climate applications. GURME Workshop on the Design of the Shanghai Meso Scale Observing System, Shanghai, Dec. 2011

Seminar: A closer integration of models and observations across air quality/weather/climate applications. Department of Atmos. Science, Nanjing University, Dec. 2011.

2012

Invited Talk: Chemical Weather – A challenge and opportunity for societal service and risk reduction. Workshop on Megacities, Santiago Chile, Jan. 2012

Invited Talk: Applications of air quality models. Workshop on Air Quality Modeling, Asian Center for Air Pollution, Niigata, Japan, Jan. 2012

Seminar: Sensitivity analysis of aerosol feedbacks on chemistry and climate at urban and regional scales. NASA Goddard Space Flight center, Jan. 2012

Invited Talk: What is our understanding of Asian aerosols and their climate and air pollution impacts, AAAS Annual meeting, Vancouver, Feb. 2012.

Invited talk: Sensitivity Analysis of Aerosol Feedbacks on Chemistry and Climate at Urban and Regional Scales, Spring ACS meeting, Denver, April 2012.

Seminar: Sensitivity analysis of aerosol feedbacks on chemistry and climate at urban and regional scales, Dept. of Atmos. Science, Wisconsin, Madison, June 2012.

Cecil Award Lecture: What Goes Around Comes Around - *The globalization of air pollution and the implications for the quality of the air we breathe, the water we drink, and the food we eat,* Annual AIChE Meeting, Pittsburg, Oct. 2012

Invited Talk: Modeling the Transport and Fate of Black Carbon, US-Russia Bilateral Meeting on BC, Moscow, Oct. 2012.

Invited Talk: Sectoral Contributions to Black Carbon Concentrations and Radiative Forcing in Delhi, Fall AGU meeting, San Francisco, Dec. 2012.

Invited talk: Recent advances in chemical data assimilation, International Workshop on Air Quality Forecasting, Geneva, Switzerland, Dec. 2012.

2013

*Stoute Lecture***:** What Goes Around Comes Around - The globalization of air pollution and the implications for the quality of the air we breathe, the water we drink, and the food we eat, Department of Earth and Atmospheric Sciences, University of Nebraska, Lincoln, April 2013

Invited Lecture: Short-lived pollutants –opportunities to address air quality and climate together, University of Bogota, Columbia Jan2013

Seminar: Sensitivity analysis of aerosol feedbacks on chemistry and climate, Applied math Department, UIowa, Feb 2013

Invited Talk: Improving megacity air quality services through advancing research, India Institute for Tropical meteorology, Pune, India Apr 2013

Invited Talk: Improving aerosol distributions by assimilating cloud droplet number, Workshop on Monsoon Asia, Pune India, Apr 2013

Invited Talk: Regional and local interactions between air quality and climate in monsoon Asia, Workshop on Atmospheric Chemistry and Climate in Asia Monsoon, Kathmandu, Nepal, Jun 2013

Invited talk: MICS Asia III and other model intercomparison studies, Workshop on Asia Emissions, Beijing, China, Jun 2013.

Invited Talk: Emissions and modeling in support of air quality and climate impacts – a regional perspective, Workshop on Air Quality and Health, NCAR Boulder, Jul 2013

Invited Talk: Modeling aerosol feedbacks at local/regional scales, Geophysical Fluid-dynamics Research lab, Chip Levy retirement symposium, Aug 2013

Special Lecture: Future directions of air quality forecasts, Chilean Met. Agency, Santiago, Chile Oct 2013

Invited Talk: SLCP – A near term opportunity to deal with health and climate change BUT what are the knowledge gaps holding back action? Workshop on SLCP in the Andes, Santiago, Chile, Oct 2013

Invited Talk: SLCP – A near term opportunity to deal with health and climate change, High Summit, Lecco, Italy Oct 2013

Invited Talk: Emissions and impacts of short-lived climate forcers, AGU, San Francisco, Dec 2013

2014

Seminar: Sensitivity analysis of aerosol feedbacks on chemistry and climate, Dept. Chem Eng, CMU, Jan 2014

Invited Talk: Advances in aerosol data assimilation, Workshop on AQ Forecasting in Support of the Youth Olympic Games, Nanjing, China, Feb 2014

Invited Talk: Globalization of air pollution: implications for the air we breathe, the water we drink and the food we eat, Foreign Relation Council, Iowa City, Apr 2014

Plenary Lecture: Global Atmospheric Watch the first 25 years and what's next, international meeting of the International Global Atmospheric Chemistry Project, Brazil, Sept. 2014

Invited Talk: Improving Air Quality *(and Weather)* Predictions using Advanced Data Assimilation Techniques Applied to Coupled Models, International Open Science Conference on Atmospheric Science, Montreal, Aug. 2014

Invited Talk: Improving Air Quality *(and Weather)* Predictions in Asia using Advanced Data Assimilation Techniques Applied to Coupled Models, AGU Fall Meeting, Dec. 2014

2015

Keynote Address - Modeling Atmospheric Composition Matters: To Air Quality, Weather, Climate and More, International Meeting on Air Quality and Atmospheric Sciences, Kobe, Japan, Nov 2015

Invited Talk - Improving Air Quality *(and Weather)* Predictions using Advanced Data Assimilation Techniques Applied to Coupled Models, AGU, Dec 2015

Invited Talk - Modeling Atmospheric Composition Matters: To Air Quality, Weather, Climate and More, Seminar on Improving Air Quality in Chile, Santiago, Oct 2015

Invited Talk - Modeling Atmospheric Composition Matters: To Air Quality, Weather, Climate and More, International Acid Rain Conference, Rochester NY, Nov 2015

Invited Talk - Improving Air Quality *(and Weather)* Predictions using Advanced Data Assimilation Techniques Applied to Coupled Models, Korea Academy of Sciences Symposium on PM in Asia, Seoul, Korea, Sept 2015

Invited Talk - Improving Air Quality *(and Weather)* Predictions using Advanced Data Assimilation Techniques Applied to Coupled Models, International Workshop on Air Quality Forecasting Research, College Park, Sept 2015

Invited Talk - Emissions and Impacts of Short-Lived Climate Forcers, Asia Pacific Air Quality Consultation, Tokyo, March 2015

2016

Plenary Talk - Atmospheric Composition Matters: To Air Quality, Weather, Climate and More, Science team meeting of the EU MARCO POLO Project, Guangjou China, Feb 2016

Invited Talk - Improving Air Quality *(and Weather)* Predictions Through Close Integration of Observations and Models, Center for Aerosol Research, University of British Columbia, Feb 2016.

Invited Talk - Improving Air Quality *(and Weather)* Predictions Through Close Integration of Observations and Models, Blueprint Workshop on the Future of Data Assimilation, NCAR, Boulder, March 2016.

Invited Talk - Improving Air Quality *(and Weather)* Predictions Through Close Integration of Observations and Models, TEMPO Workshop on Applications, Univ. Of Alabama, Huntsville, June 2016.

Invited Talk – Recent advances in data assimilation, NCAR Summer School on data Assimilation, NCAR, Boulder, Aug. 2016.

Plenary Lecture – Recent Advances in Air Quality Modeling, IAUPA & BAQ Asia International Conference, Busan Korea, Aug. 2016.

Invited Talk - Advancing Environmental Predictions by Closer Integration of Air Pollution and Meteorology Services, International Brainstorming Meeting on "Air Quality and Climate Impacts", New Delhi, India, 5-7 October 2016.

Invited Talk - Air Pollution and Climate Change Connections and Opportunities for Sustainable Development, Sustainable Infrastructure 2016, Shenzhen, China, Oct. 2016.

Invited Talk – Urban cross-cutting focus and elaboration of WMO guidelines for integrated urban services, UN Habitat III, Quito, Equator, Oct. 2016.

2017

Invited Talk - Improving Air Quality *(and Weather)* Predictions Through Close Integration of Observations and Models, International Workshop on Air Quality Forecasting, Toronto, Jan. 2017.

Invited Talk - Expanding the Role of Atmospheric Composition in Environmental Prediction and Services, American Meteorological Society, Seattle, Jan. 2017.

Presidential Lecture Univ. of Iowa, what goes around comes around, Feb. 2017

Invited Talk – Multihazard early warning systems, UN Workshop on Early Warning Systems, Cancun, Feb. 2017

Invited Talk - Improving Air Quality *(and Weather)* Predictions through Closer Integration of Observations and Models, NASA TEMPO Science team meeting, Huntsville, Al., and May 2017

Keynote Lecture - Improving Air Quality *(and Weather)* Predictions through Closer Integration of Observations and Models, CMOS meeting, Chengdu, China, July 2017

Invited Talk - Improving Air Quality Predictions through Closer Integration of Observations and Models, Experiences from Recent Field Experiments, GEMS Science team meeting, Seoul Korea, October 2017

Invited Talk – Recent Advances in Improving Air Quality Predictions, Regional Air Quality Management, Guangzhou, China, November 2017

Invited Talk – Overview of the Global Atmospheric Watch program, African Workshop on Air Pollution Forecasting, Pretoria, Africa, December 2017

2018

UI Alumni Educational Events - Big Data – Its Human Face and Impact on Scholarship, Teaching and More, Naples FL and Phoenix AZ, February 2018

Invited Talk – The Growing Importance of Atmospheric Composition Predictions in Air Quality Management and Sustainable Development, CMOS, Air Quality, Beijing May 2018

Invited Talk – The Growing Importance of Atmospheric Composition Predictions in Air Quality Management and Sustainable Development, Regional Air Quality Management, Chengdu June 2018

Seminar- The Growing Importance of Atmospheric Composition Predictions in Air Quality Management and Sustainable Development, Jinan Univ. China, July 2018

Seminar - The Growing Importance of Atmospheric Composition Predictions in Air Quality Management and Sustainable Development, Hong Kong University of Technology, July 2018

Invited Talk – Improving Air Quality (and weather) Predictions via Closer Integration of Observations and Models, AMS-CAS Meeting on PM2.5, Xian, China, Oct. 2018.

Invited Talk – What goes around, comes around, AGU Honors session, Dec. 2018

Invited Talk – The Growing Importance of Atmospheric Composition Predictions in Air Quality Management and Sustainable Development, India Institute for Tropical Meteorology, Pune, March 2019

Invited Talk – The Importance of Atmospheric Chemistry Research in Advancing Weather, Climate and Air Quality and Enhancing Associated Societal Services, Union Session, EGU, April 2019.

NOT up to date

PRINCIPAL INVESTIGATOR ON CONTRACTS AND/OR GRANTS

Contract or Grant Title	Annual Funding Rate	Starting & Expiration Date
University Research Council, NIH Support for Junior Faculty Research	$5,000	1979-80
NASA	$60,000	2/1/80-2/1/83
Battelle Northwest Labs	$17,000	10/1/80-10/1/85
EPA Acid Rain Program	$35,000	10/1/82-10/1/85
EPA Mesoscale Program	$50,000	1984-
DOE PRECIP Program	$70,000	1985-
EPRI – Source Evaluation	$60,000	1985-1988
Iowa High Technology Council (Continuous Electrophoresis Column)	$60,000	1985-1987
NSF Sensitivity Analysis (Supercomputer Initiation Grant)	$20,000	1984-85
NASA/Goddard, Application of Chemistry Calculations, Calculations on the Massively Parallel Processor Computer (unlimited time on this unique computer)	$40,000	1985-
Sigma Research (updating a photochemistry model for the California Air Resources Board)	$28,000	1987-88
IBM Computing Grant (200 hrs. supercomputing time)	~$100,000	1987-88
NESCAUM, Photochemical modeling in the Northwest US	$25,000	1988
NSF Japan/US Project for Cooperative Research	$5,000	1988-91
Research & Development Program in Biochemical Engineering, Iowa Dept. of Economic Development	$320,000	1989-91
Processing Fermentation Waste	$120,000	1990
IBM Supercomputer Grant	$5,000/400 hours	1989-91
NASA Grant	$80,000	1990-93
NSF/Korea Grant	$10,000	1991-93
Center for Global & Regional Environmental Research	$120,000	1991-2001
National Academy of Sciences, Polish Academy of Sciences	$6,000	1992
World Bank, Acid Rain in Asia	$70,000	1992-94
NOAA Global Change Program	$60,000	1994-96
NASA, Long Range Transport of Dust	$100,000	1994-97
Central Research Institute for Electric Power Generation Industry, Japan	$30,000	1994-96
DOE, Evaluation of UVB, Ozone and Aerosol	$125,000	1994-97
Air Quality in Mega-Cities, DOE	$20,000	1997

Urban Air Quality Issues in Asia, DOE, World Bank	$50,000	1997
NASA Mineral Aerosol in East Asia	$120,000	1997-2000
NASA China Map	$75,000	1997-2000
LIVE – Laboratory for Immersive Visualization of the Environment, co-investigator w/M. Armstrong, J. Brown, and G. Malanson, NASA	$140,000	1998-99
Integrated Framework for Analysis of Climate Change and Air Quality, DOE, co-PI w/Argonne National Laboratory, DOE	$45,000	1998-99
Rains-Asia Phase II, World Bank, UI contract	$60,000	1997-1998
Heterogeneous Chemistry, DOE	$150,000	1998-2000
Taiwan Acid Deposition	$10,000	1999
Argonne National Lab	$30,000	1999-2000
IIASA/CRIEPI	$10,000	1999
WMO, Passive Samplers	$45,000	1999
Dreyfus Foundation Post-Doctoral Programme		
In Environmental Science (with Vicki Grassian)	$45,000	1998-2000
WMO/GURME	$35,000	2000
NSF REU Program focused on Env. (with Vicki Grassian)	$60,000	2000-2002
Aerosol Chemistry Interactions, NASA	$100,000	2000-2003
Modeling Activities for Ace Asia Experiment, NSF	$90,000	2000-2003
Modeling Activities for TRACE-P Experiment, NASA	$90,000	2000-2003
Heterogeneous Chemistry/A Laboratory & Modeling Study, DOE	$140,000	2001-2005
NOAA Intercontinental Transport of Pollutants	$100,000	2002-2005
NSF ITR	$500,000	2002-2007
MSF MRI (Co-I, Mark Young PI)	$65,000	2001-2004
NOAA Atmospheric Brown Cloud	$75,000	2004-2007
NASA Effect of Aerosols on Radiative Forcing	$75,000	2004-2007
NASA Improving CO and BC Emissions though Inversion	$75,000	2004-2007
NASA INTEX A	$100,000	2004-2005
NOAA test bed for data assimilation	$150,000	2005-2006
NASA INTEX-B	$250,000	2006-2008
NOAA Data Assimilation Test Bed	$150,000	2005-2006
NSF Collaborative Research: Field, Laboratory & Modeling Invest	$50,713	2006-2009
Transcontinental Transport of Air Pollution from central Asia to the US, E.H. Pechan & Associates, EPA	$100,000	2007-2008
International Science and Technology Center, US State Department	$20,000	2007-2008
Regional scale modeling in support of ARCTAS Experiment, NASA	$160K	2008-2011
Dynamic Updating of Emissions by Systematic Integration of Bottom-Up Activities and Satellite-Based Top-Down Constraints to Support Air Quality Forecasting and Analysis, NASA	$200K	2008-2011
VOCALS Experiment, NSF	$75K	2008-2010
Applying Data Assimilation and Adjoint Sensitivity to Epidemiological and Policy Studies of Airborne Particulate Matter, co-PI, EPA	$50K	2008-2011
NAST, Center for Nano Aerosol Science and Technology, US India Partnership	$20K	2008-2010
Ladco, Data Analysis and Modeling of the LADCO Winter Nitrate Study	$10k	2010-2011
Nsf, Iowa EPSCoR: Harnessing Energy Flows in the Biosphere	$35k	2009/2010
NIEHS, Superfund Center, Modeling PCBs in the environment	$100K	2010-2014
NASA Air Quality Applications Science Team	$110K	2011-2015
NSF Aerosol climate Interactions in Asia	$75K	2011-2014
EPA Star Grant Black carbon	$300K	2011-2013

NASA SEAC4RS Field Experiment	$200K	2012-2014
NASA ORACLES Field Experiment	$80K	2015-2020
NASA KORUS-AQ Field Experiment	$120K	2016-2018
NASA Health Applied Science Team	$25K	2016-2019
NOAA FIREX	$40K	2017-2020
NASA A-CCP Study	$70k	2019-2022
NASA ACMAP	$100K	2019-2022
NASA SERVIR	$200K	2023-2025
NASA Asia-AQ	$200K	2023-2025

PUBLICATIONS.
Books and monographs

1. Carmichael, G.R., Yoon, S-C., Jones, C., Hochfeld, C., and Oben, T., *Independent Environmental Assessment: Beijing 2008 Olympic Games,* United Nations Environment Programme, 2009.

2. Carmichael, G, and F. Dentener, co-lead authors chapter 5, *HEMISPHERIC TRANSPORT OF AIR POLLUTION 2007 AIR POLLUTION STUDIES No. 16,* Interim report prepared by the Task Force on Hemispheric Transport of Air Pollution acting within the framework of the Convention on Long-range Transboundary Air Pollution, ECONOMIC COMMISSION FOR EUROPE, Geneva, UNITED NATIONS PUBLICATION, *Sales No. E.08.II.E.5 ISSN 1014-4625, ISBN 978-92-1-116984-3, 2007*

3. *Preparing for Global Change: A Midwest Perspective*, Folk, E., J. Schnoor, and G. Carmichael, editors, SPB Academic Publishers, in Biometeorology Series, The Netherlands (1995).

4. Large Scale Computations in Air Pollution Modeling, NATO Science Series, Edited by Z. Zlatev, J. Brandt, P. Buitjes, and G. Carmichael, Kluwer Academic Publishers, 392 pages, 1998.

5. WMO Workshop on Regional Transboundary Smoke and Haze in Southeast Asia, Proceeding and Report, G. Carmichael, editor, 2 volumes, GAW Report, 131, 400 pages, World Meteorological Organization, Geneva, 1999

6. IMA Volumes in Mathematics and Its Applications, Vol 130: Atmospheric Modeling, Chock, D. and G. Carmichael, editors, Springer-Verlag, 2002.

Articles in technical journals with rigorous review procedures *(Web of Science H-index factor 51)*

1979-1996

1. Carmichael, G.R., and L. K. Peters, "Some Aspects of SO_2 Absorption by Water - Generalized Treatment", *Atmospheric Environment,* l3, l979, l505-l5l3.
2. Carmichael, G. R., and S-C Chang, "Mass Transfer Accompanied by Equilibrium and Second-Order Irreversible Reactions", *Chemical Engineering Science,* 35, l980, 2459-246l
3. Carmichael, G.R., D-K Yang, and C. Lin, "A Numerical Technique for the Investigation of the Transport and Dry Deposition of Chemically Reactive Pollutants", *Atmospheric Environment,* l4, l980, l433-l438.
4. Carmichael, G.R., T. Kitada, and L.K. Peters, "Application of a Galerkin Finite Element Method to Atmospheric Transport Problems", *Computers and Fluids,* 8, l980, l455-l76.
5. Carmichael, G.R., and L.K. Peters, Application of Mixing-Reaction in Series Model for Simultaneous Mixing and Chemical Reaction - NO_X-O_3 Plume

Chemistry", *Atmospheric Environment,* l5, l98l, l069-l074.

6. Carmichael, G. R., and S-C Chang, "A Three-Zone Model for Mass Transfer Accompanied by Equilibrium and Very Fast Second-Order Irreversible Reactions", *Chemical Engineering Science*, 35, l98l, 2463-2465.
7. Carmichael, G. R., S.A. Shah, and E.L. Parrott, "A General Model for Dissolution Rates of n-Component, Nondisintegrating Spheres", J. *of Pharmaceutical Sciences,* l2, l98l, 133l-l338.
8. Adewuyi, Y., and G. R. Carmichael, "A Theoretical Investigation of Gaseous Absorption by Water Droplets from SO_2 - HNO_3 - NH_3 - CO_2- HCl Mixtures", *Atmospheric Environment,* l6, l982, 7l9-729.
9. Reda, M., and G. R. Carmichael, "Non-Isothermal Effects on SO_2 Absorption by Water Droplets—Model Development", *Atmospheric Environment,* l6, l982, l45-l50.
10. Reda, M., and G. R. Carmichael, "Non-Isothermal Effects on SO_2 Adsorption by Water Droplets—Results and Discussion*", Atmospheric Environment,* l6, l982, l5l-l59.
11. Reda, M., Y. Adewuyi, and G. R. Carmichael, "On the Influence of Gas Scavenging of Trace Gases on Precipitation Acidity", *Energy and Environmental Chemistry: Acid Rain,* Ann Arbor Science, Pub., Vol. 2, l982, 263-285
12. Schnoor, J. L, G. R. Carmichael, and F. A. van Schepen, "An Integrated Approach to Acid Rainfall Assessments", *Energy and Environmental Chemistry: Acid Rain,* Ann Arbor Science, publ., Vol. 2, l982.
13. Carmichael, G.R., "Estimation of the Drag Coefficient of Regularly Shaped Particles in Slow Flows from Morphological Descriptors*", I & EC Process Design and Development,* 2l, l982, 40l-403.
14. Reda, M., and G. R. Carmichael, Non-Isothermal Effects on SO_2 Absorption by Water Droplets—The effects of Precipitation Intensity, Sulfate Aerosol Scavenging, and Aqueous S(IV) Oxidation", *Atmos. Environment*, l6, l982, 2905-29l5.
15. Carmichael, G.R., T. Kitada, and L.K. Peters, ": The Effect of In-cloud Scavenging on the Transport of Gas Phase Reactions of SO_x, NO_x, HC_x, H_xO_y, and O_3 Compounds," *Precipitation Scavenging, Dry Deposition, and Resuspension,* Elsevier Science Publishing Co., l983, 675-686.
16. Hong, M-S., and G. R. Carmichael, "An Investigation of Sulfate Production in Clouds using a Flow-Through Chemical Reactor Model Approach," *J. Geophysical Research,* 88, l983, l0733-l0744.
17. Leung, W-K, and G. R. Carmichael, "Solute Redistribution During Normal Freezing", *Water, Air and Soil Pollution,* 2l, l984, l4l-l50.
18. Carmichael, G.R. and L. K. Peters, "Eulerian Modeling of the Transport and Chemical Processes Affecting the Long-Range Transport of SO_2 and Sulfate," *Symposium on Acid Precipitation: Modeling of Total Acid Precipitation Impacts,* Butterworth Publisher, Boston, l984, p. 25-5l.
19. Carmichael, G.R. and L. K. Peters, "Sulfur Dioxide and Sulfates in the Atmosphere - Chemical and Physical Processes", accepted for publication in

Advances in Environmental Science and Engineering, Gordon and Breach, Science Publishers.

20. Carmichael, G.R. and L. K. Peters, "An Eulerian Transport/Transformation/Removal Model for SO_2 and Sulfate: part I - Model Development, *Atmospheric Environment,* l8, l984, 937-95l.
21. Carmichael, G. R., and L. K. Peters, "Model Calculation of the SO_X Transport in the Eastern United States", *Atm. Environ.,* l8, l984, 953-967.
22. Adewuyi, Y.G., S-Y Cho, R-P Tsay and G. R. Carmichael, "Importance of Formaldehyde in Cloud Chemistry," *Atmos. Environ.,* l8, l984, 24l3-2420.
23. Kitada, T., G. R. Carmichael, and L. K. Peters, "Numerical Simulation of the Transport of Chemically Reactive Species under Land and Sea Breeze Circulation", *J. Appl. Meteor.,* 23, l984, ll53-ll72.
24. Carmichael, G.R., "The Effect of Shape on Particle Solids Flow", *Modern Methods in Fine Particle Characterization,* J. K. Beddow, Editor, CRC Press, l984, pp. 205-223.
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28. Cho, Y-S and Carmichael, G.R., "Evaluation of Liquid Phase Chemical Production of Sulfate using Sensitivity Analysis", *Atmos. Environ.,* 20, l986, pp. l959-l988.
29. Hong, M-S and Carmichael, G.R., "Examination of a Subgrid-Scale Parameterization for the Transport of Pollutants in a Nonprecipitating Cumulus Cloud Ensemble", *Atmos. Environ.,* 20, l986, pp. 2205-2217.
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31. Hong, M-S and Carmichael, G.R., "An Investigation of Sulfate Production in Clouds using a Detailed Transport/Chemistry Model Coupled with a Detailed Cloud Scavenging Model", *Atmos. Environ.,* 20, l986, pp. l989-l997.
32. Chang, Y-S., Carmichael, G.R., Ueda, H., and Kurita, H., "An Investigation of the Formation of Ambient NH_4NO_3 Aerosol", *Atmos. Environ.,* 20, l986, pp. l969-l977.
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34. Carmichael, G.R., Peters, L.K., and T. Kitada, "Transport of Reaction Pollutants within Local Circulations", *Air Pollution Modeling and its Applications,* pp. 3l5-326 l986.

35. Carmichael, G.R., Response to comments on "Estimation of the Dry Coefficient of Regularly Shaped Particles in Slow Flows from Morphological Descriptors", *Ind. Eng. Chem. Process Des. Dev.,* Vol 20, pp. l979-87, l987.

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