ANNA M. MICHALAK

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RESEARCH INTERESTS

Dr. Michalak's research interests focus on characterizing complexity and quantifying uncertainty in environmental systems with the goal of improving our understanding of these systems and our ability to forecast their variability. Her current research interests focus on atmospheric greenhouse gas emission and sequestration estimation, water quality monitoring and contaminant source identification, and use of remote sensing data for earth system characterization. The common theme of her research is the development and application of statistical and geostatistical data fusion methods for optimizing the use of limited in situ and remote sensing environmental data. Dr. Michalak is also interested in the environmental policy, economic and legal impact and applicability of environmental research.

EDUCATION

Stanford University, Stanford, California	Civil & Environmental Engineering	Ph.D. 2003
Stanford University, Stanford, California	Civil & Environmental Engineering	M.S. 1998
University of Guelph, Ontario, Canada	Environmental Engineering	B.Sc.(Eng.) 1997

POSITIONS HELD

Faculty Member 06/2011 – present
Department of Global Ecology,
Carnegie Institution for Science, Stanford, California

Associate Professor, by courtesy 06/2011 – present
Department of Environmental Earth System Science,
Stanford University, Stanford, California

ASP Faculty Fellow 2010 – 2011
Institute for Mathematics Applied to Geosciences (IMAGe),
Computational and Information Systems Laboratory,
National Center for Atmospheric Research (NCAR), Boulder, Colorado

Adjunct Associate Professor 06/2011 – present
Frank and Brooke Transue Faculty Scholar 2010 – 2011
Associate Professor 2009 – 2011
Assistant Professor 2004 – 2009
Environmental and Water Resources Engineering,
Department of Civil and Environmental Engineering,
University of Michigan, Ann Arbor, Michigan

Associate Professor 2009 – 2011
Assistant Professor 2005 – 2009
Atmospheric Sciences,
Department of Atmospheric, Oceanic and Space Sciences,
University of Michigan, Ann Arbor, Michigan

NOAA Climate and Global Change Postdoctoral Fellow 2003 – 2004
Climate Monitoring and Diagnostics Laboratory (CMDL)
National Oceanic and Atmospheric Administration, Boulder, Colorado

Research Assistant, Environmental Fluid Mechanics and Hydrology 1998 – 2003
Department of Civil and Environmental Engineering
Stanford University, Stanford, California

Summer Fellow, Property and Environment Research Center (PERC), Bozeman, Montana 2001

PROFESSIONAL MEMBERSHIP AND SERVICE

National and International Service:

- *Member,* Orbiting Carbon Observatory 2 (OCO-2) satellite science team, 2011 – present
  The Orbiting Carbon Observatory 2 (OCO-2) is an Earth orbiting mission sponsored by NASA and designed to collect precise global measurements of carbon dioxide (CO_2) in the Earth's atmosphere.
- *Member,* NASA Carbon Monitoring System Science Definition Team, 2011 – present
  The Carbon Monitoring System (CMS) is a forward-looking initiative designed to make significant contributions in characterizing, quantifying, understanding, and predicting the evolution of global carbon sources and sinks. CMS is funded and directed by a 2010 Congressional Appropriation.
- *Member,* External Advisory Committee, Vermont (Experimental Program to Stimulate Competitive Research (EPSCoR), 2011 – present
  EPSCoR is a program designed to fulfill the NSF's mandate to promote scientific progress nationwide. The EPSCoR program is directed at those jurisdictions that have historically received lesser amounts of NSF Research and Development funding. Twenty-seven states, the Commonwealth of Puerto Rico and the U. S. Virgin Islands are currently eligible to participate.
- *Member,* NASA Advisory Council, Earth Science Subcommittee, 2009 – present
  The NASA Advisory Council provides the NASA Administrator with counsel and advice on programs and issues of importance to the Agency. The committees conduct fact-finding sessions throughout the year in an effort to gain a broad understanding of current NASA issues and future mission implementation plans.
- *Editorial board member*, Advances in Water Resources, Elsevier, 2009 – present
  Advances in Water Resources provides a forum for the presentation of fundamental scientific advances in the understanding of water resources systems. The scope of Advances in Water Resources includes theoretical, computational, or experimental approaches used to advance fundamental understanding of surface or subsurface water resources systems or the interaction between these systems.

- *University of Michigan Representative,* University Corporation for Atmospheric Research (UCAR), 2009 – 2011
  UCAR serves as a hub for research, education, and public outreach for the atmospheric and Earth system science community. UCAR manages the National Center for Atmospheric Research and UCAR Community Programs on behalf of the National Science Foundation and the university community. Each university member has two representatives who serve as links between the research and teaching communities and UCAR and its programs.
- *Co-lead*, Carbon Cycle Science Working Group (CCS WG), 2008 – 2011
  The CCS WG is responsible for developing a new science plan for U.S. carbon cycle science, identifying challenges and priorities for the next decade (2010-2020). Ten federal agencies coordinate and support the program activities of the U.S. Carbon Cycle Science Program.
- *Co-chair,* Steering Committee, ASCENDS (Active Sensing of CO_2 Emissions over Nights, Days, and Seasons) Satellite Mission, 2008 – 2011, *Member,* 2011 – present
  In its Decadal Survey "*Earth Science and Applications from Space: National Imperatives for the Next Decade and Beyond*," the National Research Council of the U.S. National Academies recommended a mission to produce global atmospheric column CO_2 measurements without seasonal, latitudinal, or diurnal bias, using laser remote sensing of CO_2 and O_2. The goal of the ASCENDS mission is to enhance understanding of the role of CO_2 in the global carbon cycle.
- *Associate editor*, Water Resources Research, American Geophysical Union, 2008 – present
  Water Resources Research is an interdisciplinary journal integrating research in the social and natural sciences of water. It contains original contributions in hydrology; in the physical, chemical, and biological sciences; and in the social and policy sciences, including economics, systems analysis, sociology, and law.
- *Associate,* Orbiting Carbon Observatory (OCO) satellite science team, 2005 – 2009
  The Orbiting Carbon Observatory (OCO) is an Earth orbiting mission sponsored by NASA's Earth System Science Pathfinder (ESSP) Program designed to collect precise global measurements of carbon dioxide (CO_2) in the Earth's atmosphere. OCO failed at launch in 2009.
- *Corresponding member,* Body of Knowledge Second Edition (BOK2) task committee, Committee on academic prerequisites for professional practice, American Society of Civil Engineers (ASCE), 2006 – 2008
  The BOK2 committee was charged with the development of the "*Civil Engineering Body of Knowledge for the 21st Century*" report, which outlines the recommendations of ASCE regarding the knowledge, skills, and attitudes required to enter into professional civil engineering practice, and how these goals can be achieved.
- Selected scientific conference planning and organization:
  - *Co-organizer*, Program on "Simulating our complex world: Modeling, Computation and Analysis," Institute for Mathematics and Its Applications (IMA), Minneapolis, Minnesota, 2010-2011.
  - *Co-chair and local host,* ASCENDS Satellite Mission instrument and modeling workshop, University of Michigan, Ann Arbor, Michigan, April 2009. The goal of the workshop was to promote synergistic development between the instrument team and the modeling team involved in the ASCENDS mission. The workshop was attended by 20 invited participants.

- *Invited member,* Planning Committee, 2nd North American Carbon Program (NACP) Investigators' Meeting, February 2009. The central objective of the U.S. North American Carbon Program is to measure and understand the sources and sinks of carbon dioxide, methane, and carbon monoxide in North America and in adjacent ocean regions. The conference brought together over 250 participants.
- *Co-organizer*, Symposium entitled "The Carbon Budget: Can We Reconcile Flux Estimates with Those Reported to the UNFCCC?" American Association for the Advancement of Science (AAAS) Annual Meeting, Chicago, Illinois, February 2009
- *Co-chair and local host*, ASCENDS Satellite Mission community workshop, University of Michigan, Ann Arbor, Michigan, July 2008. The goal of the workshop was to refine the ASCENDS mission, particularly in terms of its scientific goals, objectives, and requirements. The workshop brought together 100 participants from six countries.
- *Invited member*, International Scientific Committee, *6th International Conference on Inverse Problems in Engineering: Theory and Practice* (ICIPE), Paris, France, June 2008
- *Invited co-chair,* Session organized as part of symposium on "*Carbon science and landscape ecology: estimation of ecosystem carbon dynamics across multiple spatial and temporal scales,"* International Union of Forest Research Organizations (IUFRO) Landscape Ecology International Conference, Chengdu, PR China, September 2008
- *Invited moderator,* NOAA Office of Global Programs, Climate and Global Change Postdoctoral Program, Celebration of the Postdoctoral Fellowship 100th Appointment Conference, Washington, D.C., April 2005

- American Geophysical Union Fall Meetings, San Francisco, California, special session planning and organization:
  - *Co-organizer and convener,* with C. Miller (JPL), Special session entitled "*Remote sensing of CO_2: Observations, modeling, and synthesis*," December 2011
  - *Co-organizer and convener,* with M. Chahine (JPL) and C. Miller (JPL), Special session entitled "*Remote sensing of CO_2 emissions and atmospheric transport*," December 2010
  - *Co-organizer and convener,* with M. Chahine (JPL) and C. Miller (JPL), Special session entitled "*Atmospheric carbon dioxide: Observation, validation, modeling, and assimilation*," December 2009
  - *Co-organizer and convener*, with J. Butler (NOAA-ESRL) and R. Duren (JPL), Special session entitled "*Towards a policy-relevant, open and transparent global greenhouse gas monitoring and information system (GHGIS),*" December 2009
  - *Co-organizer and convener,* with M. Chahine (JPL) and C. Miller (JPL), Special session entitled "*Space Observations of Atmospheric Carbon Dioxide: Retrieval, Validation, Modeling, and Assimilation,"* December 2008
  - *Co-organizer and convener*, with M. Chahine (JPL) and S.R. Kawa (NASA GSFC), Special session entitled "*Space Observations of Atmospheric Carbon Dioxide: Retrieval, Validation, Modeling and Assimilation*," December 2007
  - *Invited convener,* Special session entitled "*Observing, Modeling, and Predicting Regional-Scale Carbon Exchange,*" December 2007
  - *Invited convener,* Special session entitled "*Data Assimilation*," December 2006
  - *Co-organizer and convener*, with Y. Yung (Caltech) and B. Connor (NIWA, New Zealand), Special session entitled "*Remote Sensing and Modeling of Greenhouse and Related Gases and Implications for Understanding Their Sources and Sinks*," December 2005

- *Co-organizer and convener*, with O. Cirpka (EAWAG, Switzerland) and P. Kitanidis (Stanford U.), Special session entitled "*Inverse Modeling and Conditional Uncertainty Propagation in Heterogeneous Aquifers*," December 2005
- *Co-organizer and convener*, with P.P. Tans (NOAA ESRL) and W. Peters (NOAA ESRL), Special session entitled "*Use of Inverse Modeling for Constraining Global and Regional Budgets of Atmospheric Trace Gases*," December 2004
- *Co-organizer and convener*, with P.P. Tans (NOAA ESRL) and W. Peters (NOAA ESRL), Special session entitled "*Use of Inverse Modeling for Constraining Global Budgets of Atmospheric Trace Gases*," December 2003

- *Scientific research proposal review panel member:*
  - NASA Research Opportunities in Space and Earth Sciences (ROSES) Terrestrial Ecology program
  - NSF Environmental Sustainability, Division of Chemical, Bioengineering, Environmental, and Transport Systems (CBET), Directorate for Engineering (ENG)
  - NOAA Global Carbon Cycle Program, Climate Program Office
- *Scientific research proposal reviewer:*
  - NSF Atmospheric Chemistry Program, Division of Atmospheric Sciences (ATM), Directorate for Geosciences (GEO)
  - NSF Collaborations in Mathematical Geosciences, Directorate for Geosciences (GEO) and Directorate for Mathematical and Physical Sciences (MPS)
  - NSF Hydrologic Sciences Program, Division of Earth Sciences (EAR), Directorate for Geosciences (GEO)
  - NSF Early Career Development (CAREER) Program
  - NASA Research Opportunities in Space and Earth Sciences (ROSES) Terrestrial Ecology program
  - NASA Research Opportunities in Space and Earth Sciences (ROSES) Earth Science U.S. Participating Investigation
  - DOE internal proposals
- *Journal reviewer,* Advances in Water Resources (AWR), American Geophysical Union Geophysical Monograph Series, Chemical Engineering Science (ChES), Earth System Science Data (ESSD), Ecological Modeling (ECOMOD), Geophysical Research Letters (GRL), Global Biogeochemical Cycles (GBC), Ground Water (GW), Hydrology and Earth System Sciences (HESS), Journal of Applied Remote Sensing (JARS), Journal of Climate (JClim), Journal of Contaminant Hydrology (JCH), Journal of Environmental Engineering (JEE), Journal of Fluid Mechanics (JFM), Journal of Geophysical Research (JGR), Journal of Hydraulic Research (JHR), Stochastic Environmental Research and Risk Assessment (SERRA), Transactions in Mobile Computing (TMC), Water Resources Research (WRR)
- *Reviewer*, National Research Council (NRC) "*Uncertainty Management in Remote Sensing of Climate Data"* report.

University of Michigan Service

- ***University and College of Engineering:***
  - *Member,* Executive Steering Committee, Institute for Computational Science and Engineering, 2010 – 2011
  - *Member,* College of Engineering Research Computing Executive Committee, 2007 – 2011
  - *Member,* advisory group for the Junior Women Faculty Network (JWFN), 2005 – 2011
  - *Member,* Spatial Certificate Committee, Interdisciplinary Certificate Program in Spatial Analysis, 2004 – 2011
- ***Department of Civil and Environmental Engineering:***
  - *Member*, Strategic Planning Committee, 2009 – 2011
  - *Member,* Research Strategic Directions Committee, 2009
  - *Chair,* Information Technology Committee, 2008 – 2010; *Member,* 2005 - 2010
  - *Member*, Robust and resilient infrastructure systems faculty search committee, 2007 – 2008
  - *Member*, Graduate Committee, 2005 – 2008
  - *Member*, Hydrology faculty position search committee, 2004 – 2006
  - *Member*, Curriculum Committee, 2004 – 2005

Member:

- American Geophysical Union (AGU)
- American Statistical Association (ASA)
- Association of Environmental Engineering and Science Professors (AEESP)
- International Association of Hydrological Sciences (IAHS)
- American Society for Engineering Education (ASEE)

TEACHING EXPERIENCE

Courses Taught and New Courses Introduced at Stanford University

EESS 214 Introduction to Geostatistics and Modeling of Spatial Uncertainty

Department: Environmental Earth System Science
Introduced: Spring 2012
Taught: Spring 2012 (14 students and 10 auditors)

In its first offering, this 3- to 4-credit graduate level course attracted students and postdoctoral researchers from six departments. The course represents an evolution of the CEE 570 / NRE 569 course taught at the University of Michigan.

Description from course outline: Introduction of fundamental geostatistical tools for modeling spatial variability and uncertainty, and mapping of environmental attributes. Additional topics include sampling design and incorporation of different types of information (continuous, categorical) in prediction. Assignments consist of small problems to familiarize students with theoretical concepts, and applications dealing with the analysis and interpretation of various data sets (soil, water pollution, atmospheric constituents, remote sensing) primarily using Matlab. No prior programming experience is required. Open to graduates. Open to undergraduates with consent from the instructor. 3-credit option includes midterm/final or student-developed project. 4-credit option requires both.

CEE 333 / GES 333, Water Policy Colloquium

Department: Geological and Environmental Sciences
Introduced: Spring 2002
Directed: Spring 2002

Co-developed and directed new inter-disciplinary and inter-departmental graduate course on California water policy and allocation issues. The course continued as a student-directed course for many years after Michalak's graduation.

CEE 109 Seminar on Mathematical Laboratory Applications in Civil and Environmental Engineering

Department: Civil and Environmental Engineering
Teaching Assistant: Spring 2001

CEE 268 Groundwater Flow

Department: Civil and Environmental Engineering
Teaching Assistant: Winter 1999

New Courses Introduced at the University of Michigan

CEE 682 Section 039: Inverse Problems in Environmental Science and Engineering

Department: Civil and Environmental Engineering
Introduced: Winter 2008
Taught: Winter 2008 (10 students)

In its first offering, this 3-credit Ph.D. level course attracted students from three schools across the University of Michigan (College of Engineering, School of Natural Resource and the Environment, College of Literature, Science and the Arts) and guest speakers from seven departments within these schools. Students in the class participate in lectures, create weekly reports describing opportunities in environmental and earth sciences for the application of the tools described by guest speakers, and complete projects where they develop inverse modeling solutions to their ongoing doctoral research. The seminar component in the course drew an audience of faculty, graduate students, and researchers from the University of Michigan and other local institutions.

Description from course outline: Inverse problems abound in scientific disciplines interested in furthering understanding of the natural environment and the Earth system. Inverse modeling approaches are used for parameter estimation in models ranging from groundwater hydrology to modeling of atmospheric constituents. Similar approaches are also used in data integration for merging information from multiple data streams and models. One common feature of inverse problems in environmental applications, when compared to other fields, is the relative scarcity of the available data. Despite the broad range of applications of inverse problems in environmental science and engineering, the implemented tools rely on a common mathematical and statistical foundation. This course uses a combination of lectures and guest presentations to introduce inverse modeling approaches and applications for environmental systems.

CEE 570 / NRE 569: Introduction to Geostatistics

Department: Civil and Environmental Engineering, and
School of Natural Resources and the Environment
Introduced: Winter 2005
Taught: Winter 2005 (17 students), 2006 (17 students), 2007 (17 students);
Fall 2009 (26 students)

Masters and Ph.D. students from 18 different departments have participated in the first four offerings of this 3-credit course. Various innovative learning and teaching approaches have been integrated into the course, including an ArcGIS "Geostatistical Analyst" tutorial by staff from the Center for Statistical Consulting and Research, guest lectures by scientists using geostatistics in non-academic settings, and a term project developed by each student to focus on their research interests.

Description from course outline: Geostatistics provides a set of statistical tools for data analysis when the parameter of interest exhibits spatial and/or temporal autocorrelation. This course introduces the main geostatistical tools for describing and modeling spatial variability, and for interpolating environmental attributes (e.g., pollutant concentrations) at unsampled locations. Sampling design and the incorporation of different types of information (continuous, categorical) in prediction are also addressed.

CEE 270: Statistical Methods for Data Analysis and Uncertainty Modeling

Department: Civil and Environmental Engineering
Introduced: Fall 2005 (initially as CEE 490 Section 039)
Taught: Fall 2005 (14 students), 2006 (39 students), 2007 (61 students), 2008 (54 students), 2009 (88 students)

This 4-credit course provides an introduction to the study of probability and statistics with applications that are relevant to civil and environmental engineering. After its initial offering in Fall 2005, this course was recommended by the University of Michigan College of Engineering to become part of the core Civil and Environmental Engineering undergraduate curriculum. The course has now also been recommended for students in chemical engineering.

Description from course outline: This course provides an introduction to probability and statistical inference with an emphasis on data analysis and modeling the uncertainty inherent in engineering and natural systems. Topics include methods for summarizing and analyzing data, drawing conclusions from available measurements, and presenting probabilistic information. Examples from environmental and engineering systems are used to motivate and illustrate the modeling techniques. Applications of the examined statistical principles to (experimental) design as well as risk and reliability analysis are also presented. A weekly lab section introduces students to statistical software and provides hands-on practice in applying the topics covered in the lectures.

Short Courses Taught

Workshop on Geostatistical Inverse Modeling

Location: University of Michigan, Ann Arbor, Michigan
Dates: August 3 – 6 , 2009
Role: Organizer and lead lecturer
Enrollment: 12 researchers, postdoctoral fellows, and graduate students
Description: This workshop included lectures, presentations, and computational exercises aimed at introducing key concepts of geostatistical approaches to the solution of inverse problems, within the context of other deterministic and stochastic approaches to inverse problems.

Summer Colloquium on Regional Biogeochemistry, Needs and Methodologies

Location: National Center for Atmospheric Research, Boulder, Colorado
Dates: June 4-15, 2007
Role: Invited lecturer and day lead
Enrollment: 50 graduate students from throughout the United States
Description: "The colloquium will provide unique hands-on learning components and significant opportunities to discuss the state of the science and future directions of the field with colleagues and a select group of keynote speakers. Morning lectures will be followed by either afternoon tutorials or evening poster sessions. The tutorials will focus on state of the art methods for studying regional-scale biogeochemical budgets and the mechanisms governing them. Ample time will be provided for group interaction, including professional development seminars and social activities."
http://www.asp.ucar.edu/colloquium/2007/index.php

Summer Graduate Workshop on Data Assimilation for the Carbon Cycle

Location: Mathematical Sciences Research Institute, University of California at Berkeley, Berkeley, California
Dates: July 16-29, 2006
Role: Course instructor (with eight others)
Enrollment: 28 graduate students from throughout the United States
Description: "A diverse set of meteorological observations (from e.g. satellites, balloons, ground stations) has been assimilated into numerical weather prediction models to improve weather forecasts. Observations of atmospheric CO_2 abundances from orbiting satellites present a new challenge to data assimilation, as atmospheric CO_2 varies not only with the atmospheric circulation, but also with the changing CO_2 fluxes at the surface. Indeed the goal of the upcoming Orbiting Carbon Observatory is to use satellite CO_2 observations to deduce the surface sources and sinks. This 2-week workshop is designed for graduate students in mathematics and the atmospheric sciences. The program includes lectures by experts in data assimilation, the global carbon cycle, as well as inverse problems. Also student teams are expected to work on a carbon data assimilation project, using computing resources at MSRI and NERSC."
http://www.msri.org/calendar/sgw/WorkshopInfo/374/show_sgw

Ecosystem Modeling Workshop

Location: University of Michigan Biological Station (UMBS), Pellston, Michigan
Dates: July 31, 2006
Role: Organizer and instructor
Enrollment: 6 graduate student fellows from the NSF IGERT Biosphere Atmosphere Research and Training (BART) program

Description: This technical workshop introduced basic concepts of inverse modeling as applied to estimating sources and sinks of atmospheric trace gases at global and regional scales.

Mathematical Geophysics Summer School

Location: Stanford University, Stanford, California
Dates: One week course, July 2001
Role: Course instructor (with several others)
Enrollment: 20 postdoctoral researchers and junior faculty in applied mathematics interested in geophysical applications

Description: The Mathematical Geophysics Summer School was an NSF-funded program held at Stanford University during the month of August from 1998 to 2002. Its overall purpose was to attract the attention and interest of theoreticians (applied mathematicians in particular) to the many interesting and important problems in geophysics, as well as to define mathematically, address and solve some of these problems. The topic for the 2001 summer school was "Multiscale Theory and Computation with Geophysical Applications."

High School Teaching Experience

Second Language Monitor, French as a Second Language, Grades 9 through 13 1996 – 1997
Centennial High School, Guelph, Ontario, Canada

Second Language Monitor, French as a Second Language, Grades 9 through 13 1994 – 1996
St. James High School, Guelph, Ontario, Canada

HONORS AND AWARDS

Frank and Brooke Transue Faculty Scholar, 2010 - 2011
The Frank and Brooke Transue Faculty Scholar is a named professorship that is awarded to a mid-career faculty member at the University of Michigan, and includes an annual research stipend.

2011 University of Michigan Henry Russel Award, awarded in 2010
"This award is conferred annually to recognize mid-career faculty who have demonstrated an impressive record of accomplishment in research, scholarship and/or creativity, as well as their conspicuous ability as a teacher. The Henry Russel Award is meant to acknowledge their accomplishments and encourage their potential for even more notable achievements in the future that benefit the University community." The award is typically presented to two faculty at the University of Michigan each year.
http://rackham.helpserve.com/index.php?_m=knowledgebase&_a=viewarticle&kbarticleid=12&nav=0,2

National Center for Atmospheric Research (NCAR) ASP Faculty Fellowship, 2010 – 2011
The goals of the NCAR Advanced Study Program Faculty Fellowship program is to "provide opportunities and resources for faculty employed at universities, with an emphasis on UCAR member universities and academic affiliates and early career faculty, to work in residence at NCAR." "Evaluation criteria include the scientific merit of the proposal, the potential for applicant career development, the promise of fruitful and lasting interactions between NCAR and a University faculty member, the potential for increasing diversity in the atmospheric and related sciences, and the involvement of a UCAR member university or academic affiliate."
http://www.asp.ucar.edu/ffp/faculty_fellowship.php

Department of Civil and Environmental Engineering Merit Award, 2010
The department of Civil and Environmental Engineering at the University of Michigan presents the Merit Award to one faculty member each year, in recognition of outstanding accomplishments in research, teaching, and service.

University of Michigan College of Engineering 1938E Award, 2009
This is the highest award presented by the College of Engineering, awarded to one Assistant Professor each year. The award is presented in recognition of contributions to research, education, and service.
http://www.engin.umich.edu/admin/adaa/faculty/docs/award/Awardguidelines0809.pdf

2007 Presidential Early Career Award for Scientists and Engineers (PECASE), awarded in 2008
The Presidential Award is the highest honor bestowed by the U.S. government on outstanding scientists and engineers beginning their independent careers. The Presidential Awards are intended to recognize and nurture some of the finest scientists and engineers who, while early in their research careers, show exceptional potential for leadership at the frontiers of scientific knowledge during the twenty-first century. Dr. Michalak was nominated by NASA "for the development of innovative geostatistical approaches to the study of carbon cycling and global distributions of carbon dioxide; and outstanding contributions to science education."
http://en.wikipedia.org/wiki/PECASE

AEESP Outstanding Educator Award for " Outstanding Teaching in Environmental Engineering and Science,"2008
This award is given annually by the Association of Environmental Engineering and Science Professors (AEESP) to recognize AEESP members who are making outstanding contributions to the teaching of environmental engineering, both at the individual's home institution and beyond. The award for "Outstanding Teaching in Environmental Engineering and Science" is given annually to "honor a faculty member who has made substantive contributions directly through class-oriented teaching, as enhanced through the development of new pedagogic techniques."
http://www.aeespfoundation.org/awards.html

Michigan Memorial Phoenix Energy Institute (MMPEI) Faculty Fellow, 2007 - present
The MMPEI Faculty Fellows program represents the most active faculty in energy research and education at the University of Michigan. Faculty Fellows shape the energy initiative at U-M and play an active role in MMPEI's mission in charting the path to a secure, affordable and sustainable energy future by combining science and engineering with public policy, business, and social science.
http://www.mmpei.umich.edu/outreach/fellows.html

NSF CAREER Award, National Science Foundation, 2007
The Faculty Early Career Development (CAREER) Program is a Foundation-wide activity that offers the National Science Foundation's most prestigious awards in support of the early career-development activities of those teacher-scholars who most effectively integrate research and education within the context of the mission of their organization.
http://www.nsf.gov/pubs/2005/nsf05579/nsf05579.htm

Elizabeth Crosby Research Award, University of Michigan, 2005
The Elizabeth C. Crosby Research Fund aims to help meet career-relevant needs of individual instructional track faculty in science and engineering if meeting those needs will help increase the retention or promotion of women scientists and engineers.
http://sitemaker.umich.edu/advance/crosby_recipients

NOAA Postdoctoral Program in Climate and Global Change Fellowship, University Corporation for Atmospheric Research, 2003 - 2005
The objective of this program is to "help create the next generation of researchers needed for climate studies." The program focuses on observing, understanding, modeling, and predicting the climate system on seasonal-to-centennial time scales and assessing the regionally specific socioeconomic consequences of climate variability. The Climate and Global Change fellowships program, an initiative of NOAA's Office of Global Programs, is designed to produce the next generation of researchers who have both the intellectual ability and the scientific imagination to address global climate issues. This highly competitive program has a less than 10% acceptance rate.
http://www.vsp.ucar.edu/cgc/index.html

Roe Legal Fellowship, Property and Environmental Research Center 2002
The Roe Legal Fellowship is offered to support research that brings market principles to resolving environmental problems. It is administered by the Property and Environmental Research Center (PERC) in Bozeman, Montana.

PERC Summer Fellowship, Property and Environmental Research Center, 2001
Graduate fellows spend three months at PERC in Bozeman, Montana, researching and writing a paper under the supervision of a PERC senior fellow. While there, fellows are required to present two to three seminars to outline, report on, and summarize their research findings. A paper of publishable quality is the expected result.
http://www.perc.org/enviroprog/students/grad/basics.php

Hydrology Section Outstanding Student Paper Award, American Geophysical Union, 1999
The purpose of this award is to recognize student excellence in geoscience research and presentation at the AGU National meetings. Evaluations are based on timing, clarity of expression, effective use of illustrations, organization, and logic.
http://www.agu.org/meetings/stpapguide.html

Gabilan Fellowship, Stanford University, 1999
This named fellowship is offered to specially selected students as a supplement to the Stanford Graduate Fellowship, described below.

Stanford Graduate Fellowship, Stanford University, 1997 – 2000
Member of the first incoming class of the Stanford Graduate Fellowship Program in Science and Engineering. The program was initiated by Stanford University to recruit the very best graduate students to the university's science and engineering Ph.D. programs. Typically, one fellowship is offered per graduate program per year.
http://www.stanford.edu/dept/DoR/Fellows/about/index.html

Department of Civil & Environmental Engineering Fellowship, Stanford University, 1997 – 2000
Supplemental fellowship offered by the department to cover additional stipend and tuition costs.

School of Engineering Scholarship, University of Guelph, 1997

Second place in Student Poster Competition, Air and Waste Management Association Annual Conference and Exhibition, 1997

Helen Grace Tucker Design Award, School of Engineering, University of Guelph, 1997

College of Physical & Engineering Science Alumni Association Scholarship, University of Guelph, 1996

A&WMA Scholarship for Post-Secondary Studies in Air and Waste Management, Air and Waste Management Association, 1995 and 1996

STUDENTS AND RESEARCHERS SUPERVISED

Completed committee service as principal Ph.D. advisor or co-advisor:

- *Kimberly Mueller*, Ph.D. Candidate, "A data-driven multi-scale statistical investigation of regional sources and sinks to improve knowledge of terrestrial carbon cycling," Department of Civil and Environmental Engineering, University of Michigan, *Principal advisor,* Ph.D. completed 02/2011.
- *Sharon Gourdji*, Ph.D. Candidate, "Improved estimates of regional-scale land-atmosphere CO_2 exchange using geostatistical atmospheric inverse models," Department of Civil and Environmental Engineering, University of Michigan, *Principal advisor,* Ph.D. completed 02/2011.
- *Alanood Alkhaled, "*Remote sensing of CO_2: Geostatistical tools for assessing spatial variability, quantifying representation errors, and gap-filling," Department of Civil and Environmental Engineering, University of Michigan, *Principal advisor,* Ph.D. completed 03/2009.
- *Shahar Shlomi,* "Combining geostatistical analysis and flow-and-transport models to improve groundwater contaminant plume estimation," Department of Civil and Environmental Engineering, University of Michigan, *Principal advisor,* Ph.D. completed 02/2009.
- *Meng-Ying Li*, "The M-Scale model: A multi-scale model for decision support of on-site remediation," Department of Civil and Environmental Engineering, University of Michigan, *Co-advisor,* Ph.D. completed 02/2008.

Ph.D. advisor or co-advisor:

- *Yuntao Zhou*, Ph.D. Candidate, "Improving estimation of spatial distributions of water quality parameters using geostatistical data fusion," Department of Civil and Environmental Engineering, University of Michigan, *Principal advisor,* Ph.D. expected 2012
- *Abhishek Chatterjee*, Ph.D. Candidate, "Geostatistical data assimilation for atmospheric CO_2," Department of Civil and Environmental Engineering, University of Michigan, *Principal advisor,* Ph.D. expected 2012
- *Dorit Hammerling,* Ph.D. Candidate, "Global mapping of atmospheric CO_2 concentrations from satellite data," Department of Civil and Environmental Engineering, University of Michigan, *Principal advisor,* Ph.D. expected 2012
- *Dan Obenour*, Ph.D. Student, Dual Ph.D. degree in the School of Natural Resources and Environment, and the Department of Civil and Environmental Engineering, University of Michigan, *Co-advisor*, Ph.D. expected 2013
- *Yoichi Shiga*, Ph.D. Student, Department of Civil and Environmental Engineering, University of Michigan, *Principal advisor,* Ph.D. expected 2014

Postdoctoral research advisor:

- *Kimberly Mueller*, Postdoctoral Fellow, Department of Civil and Environmental Engineering, University of Michigan, 02/2011 – 08/2011
- *Sharon Gourdji*, Postdoctoral Fellow, Department of Civil and Environmental Engineering, University of Michigan, 02/2011 – 06/2011
- *Vineet Yadav*, Postdoctoral Fellow, Department of Civil and Environmental Engineering, University of Michigan, 02/2008 – present
- *Deborah Huntzinger*, Postdoctoral Fellow, Department of Civil and Environmental Engineering, University of Michigan, 10/2007 – 08/2011

Doctoral committee member:

- *Kai Zhang*, "Exposures and Health Risks Due to Traffic Congestion," Department of Environmental Health Sciences, School of Public Health, University of Michigan, *Doctoral committee member*, Ph.D. completed 2010
- *Sarah Rilling,* "Geochronological and geochemical assessment of Cenozoic volcanism from the Terror Rift region of the West Antarctic rift region," Department of Geological Sciences, College of Literature, Science and the Arts, University of Michigan, *Doctoral committee member,* Ph.D. completed 2009
- *Emily White,* "Source attribution, physicochemical properties and spatial distribution of wet deposited mercury to the Ohio River valley," Department of Atmospheric, Oceanic and Space Sciences, College of Engineering, University of Michigan, *Doctoral committee member*, Ph.D. completed 2009
- *Chunrong Jia*, "Volatile organic compounds in industrial, urban, and suburban areas: Sources and exposures," Department of Environmental Health Sciences, School of Public Health, University of Michigan, *Doctoral committee member,* Ph.D. completed 2007
- *Andrew Keats*, Department of Mechanical Engineering, University of Waterloo, Canada, *External examiner,* Ph.D. completed 2009
- *Arun Kansal*, Department of Civil and Environmental Engineering, Indian Institute of Technology, *Member of panel of external examiners,* Ph.D. completed 2007
- *Cedric Wannaz*, Ph.D. candidate, Department of Environmental Health Sciences, School of Public Health, University of Michigan, *Doctoral committee member*

Other research group alumni:

- *Charles Antonelli*, Research Computer Specialist, Department of Civil and Environmental Engineering, University of Michigan, *Supervisor* 2009 – 2011
- *Sophia Christian*, B.S. 2011, Department of Industrial and Operations Engineering of Michigan, *Research advisor* 2008 – 2011
- *Jill Ostrowski*, B.S. 2007, M.S. 2010, Department of Civil and Environmental Engineering, University of Michigan, *Research advisor* 05/2007 – 03/2008 and 04/2009 – 05/2010
- *David Sena*, M.S. 2010, School of Natural Resources and Environment, University of Michigan, *Research advisor* 05/2009 – 04/2010
- *Christopher Baik*, Undergraduate student, Computer Science and Engineering, College of Engineering, University of Michigan, *Research advisor* 09/2008 – 08/2009, class of 2012
- *Landon Smith*, Undergraduate student, Computer Science and Engineering, College of Engineering, University of Michigan, *Research* advisor 09/2008 – 04/2009, class of 2012

- *Charles Humphriss*, B.S. 2006, Department of Civil and Environmental Engineering, University of Michigan, *Research advisor* 05/2005 – 08/2005
- *Miranda Malkin*, B.S. 2008, College of Literature, Science and the Arts, University of Michigan, *Research advisor* 01/2005 – 12/2005

FUNDING HISTORY

Current Funding

1. *Multivariate Data Fusion and Uncertainty Quantification for Remote Sensing*
   Co-Investigator, with Amy Braverman (PI, JPL) and Noel Cressie (Co-I, Ohio State U.), National Aeronautics and Space Administration (NASA), Research Opportunities in Space and Earth Sciences (ROSES), Advanced Information Systems Technology (AIST) program, $1,496,280, June 1, 2012 - May 31, 2015.
2. *Extension of Data Assimilation and Mapping Projects to Ingest Data from OCO-2*
   Principal Investigator, with Vineet Yadav (Co-I, Carnegie Inst. Sci.), National Aeronautics and Space Administration (NASA), Research Opportunities in Space and Earth Sciences (ROSES), Science Team for the OCO-2 Mission program, $265,949, start date pending NASA budget deliberations.
3. *Modeling Activities in Support of ASCENDS Satellite Design*
   Principal Investigator, National Aeronautics and Space Administration (NASA), $154,396, September 19, 2001 – September 18, 2012.
4. *Carbon Monitoring System Science Definition Team Membership*
   Principal Investigator, National Aeronautics and Space Administration (NASA), Research Opportunities in Space and Earth Sciences (ROSES), Carbon Monitoring System program, $34,623, April 17, 2011 – October 16, 2012.
5. *PECASE Extension to Mapping Global CO_2: Development and Application of Geostatistical Algorithms for Gap Filling and Uncertainty Assessment for the Orbiting Carbon Observatory*
   Principal Investigator, National Aeronautics and Space Administration (NASA), $198,613, April 1, 2008, to March 31, 2011.
6. *SI2-SSI: Real-Time Large-Scale Parallel Intelligent CO2 Data Assimilation System*
   Principal Investigator, with V. Yadav (Co-PI, U. Michigan), C. Scott (Co-PI, U. Michigan), M. Cafarella (Co-PI, U. Michigan), X. Nguyen (Co-PI, U. Michigan), K. Lefevre (Co-PI, U. Michigan), Software Infrastructure of Sustained Innovation Program, National Science Foundation, $1,914,243, September 15, 2010, to August 31, 2014.
7. *WSC: Category 2: Extreme Events Impacts on Water Quality in the Great Lakes: Prediction and Management of Nutrient Loading in a Changing Climate*
   Principal Investigator, with 11 Co-PIs and 15 other investigators, Water Sustainability and Climate Program, National Science Foundation, $4,992,916, January 1, 2011, to December 31, 2015.
8. *CO2.0: Assessing the Impact of a Combined in Situ and Satellite CO_2 Monitoring Network on Constraining Biospheric and Anthropogenic Fluxes for North America*
   Principal Investigator, with V. Yadav (Co-I, U. Michigan), T. Erickson (Co-I, Michigan Tech Research Institute), National Aeronautics and Space Administration (NASA), Research Opportunities in Space and Earth Sciences (ROSES), Atmospheric CO_2 Observations from Space program, $751,718, September 1, 2010, to August 31, 2013.

9. *Kalman-Filtered Compressive Sensing for High Resolution Estimation of Anthropogenic Greenhouse Gas Emissions from Sparse Measurements*
   Co-Investigator, with J. Ray (PI, Sandia National Laboratories), B.G. Van Bloemen Waanders (Co-I, Sandia National Laboratories), S.A. McKenna (Co-I, Sandia National Laboratories), DoE Sandia National Laboratories, Laboratory Directed Research and Development Program, $1,839,000, October 1, 2010, to September 30, 2013. *Recommended for funding July 16, 2010.*
10. *The North American Carbon Program (NACP) Multi-Scale Synthesis and Terrestrial Model Intercomparison Project*
    Principal Investigator, with D. Huntzinger (Sci-PI, U. Michigan), R. Cook (co-I, ORNL), W. Post (Co-I, ORNL), K. Shaefer (Co-I, University of Colorado), A. Jacobson (Co-I, University of Colorado and NOAA-ESRL), Terrestrial Ecology Program, National Aeronautics and Space Administration (NASA) Research Opportunities in Space and Earth Sciences (ROSES), $1,439,840, March 15, 2010, to March 14, 2013.
11. *CAREER: Development of Geostatistical Data Assimilation Tools for Water Quality Monitoring*
    Principal Investigator, National Science Foundation (NSF), Division of Chemical, Bioengineering, Environmental and Transport Systems (CBET), Directorate for Engineering (ENG), $445,000, July 1, 2007, to June 30, 2012.
12. *Role of Diesel and Other Vehicular Exhaust in Exacerbation of Childhood Asthma*
    Co-Investigator, with T.G. Robins (PI, UM School of Public Health), S. Batterman (Co-I, UM SPH), B. Israel (Co-I, UM SPH), T. Lewis (Co-I, UM Pediatrics), and E. Parker (Co-I, UM SPH), National Institutes of Health (NIH), $3,986,456, July 1, 2007, to June 30, 2012.
13. *Validation of GOSAT Data Products and Joint GOSAT-OCO Intercomparisons*
    Co-Investigator, with C. Miller (PI, Jet Propulsion Laboratory), and 23 other Co-Investigators, Japan Aerospace Exploration Agency (JAXA), National Institute for Environment Studies (NIES), and Ministry of Environment (MOE), Award gives access to data from Japanese GOSAT satellite, September 1, 2008, to December 31, 2013.
14. *Intercomparison of CO_2 fluxes estimated using inverse modeling of GOSAT and OCO measurements*
    Co-Investigator, with S. Houweling (PI, Netherlands Institute for Space Research (SRON)), and 9 other Co-Investigators, Japan Aerospace Exploration Agency (JAXA), National Institute for Environment Studies (NIES), and Ministry of Environment (MOE), Award gives access to data from Japanese GOSAT satellite, September 1, 2008, to December 31, 2013.

Prior Funding

1. *Diagnosing the Effects of Climatic Variability on Ecosystem-Atmosphere Exchange of CO_2*
   Principal Investigator, with S. Wofsy (PI, Harvard), Department of Energy (DoE) National Institute for Climate Change Research, $250,000, April 1, 2009, to November 30, 2011.
2. *Supplement to CAREER: Development of Geostatistical Data Assimilation Tools for Water Quality Monitoring*
   Principal Investigator, National Science Foundation (NSF), Division of Chemical, Bioengineering, Environmental and Transport Systems (CBET), Directorate for Engineering (ENG), $25,523, October 1, 2008, to March 31, 2012.
3. *Geostatistical Data Fusion for Remote Sensing Applications*
   Co-investigator, with A. Braverman (PI, JPL), and N. Cressie (Co-I, Ohio State University), National Aeronautics and Space Administration (NASA) Research Opportunities in Space and Earth Sciences (ROSES), Advanced Information Systems Technology, $1,300,000, March 1, 2009, to February 28, 2012.

4. *Mapping Global CO_2: Development and Application of Geostatistical Algorithms for Gap Filling and Uncertainty Assessment for the Orbiting Carbon Observatory*
   Principal Investigator, with N. Cressie (Co-I, Ohio State U.), A. Braverman (Co-I, Jet Propulsion Laboratory), Carbon Cycle Science, National Aeronautics and Space Administration (NASA) Research Opportunities in Space and Earth Sciences (ROSES), $807,562, April 1, 2008, to March 31, 2012.
5. *Feasibility of Geostatistical Carbon Dioxide Data Assimilation using Data from OCO*
   Principal Investigator, National Aeronautics and Space Administration (NASA) Jet Propulsion Laboratory (JPL), $62,500, March 15, 2009, to March 14, 2011.
6. *Constraining North American Fluxes of CO_2 and Inferring Their Spatiotemporal Covariances through Assimilation of Remote Sensing and Atmospheric Data in a Geostatistical Framework*
   Principal investigator, with A. Hirsch (Co-I, NOAA, U. Colorado), J.C. Lin (Co-I, U. Waterloo), A. Andrews (Co-I, NOAA), North American Carbon Program, National Aeronautics and Space Administration (NASA) Research Opportunities in Space and Earth Sciences (ROSES), $815,649, September 1, 2006, to August 31, 2010.
7. *Equipment Supplement to Support Project: Constraining North American Fluxes of Carbon Dioxide and Inferring Their Spatiotemporal Covariances through Assimilation of Remote Sensing and Atmospheric Data in a Geostatistical Framework*
   Principal investigator, National Aeronautics and Space Administration (NASA) Research Opportunities in Space and Earth Sciences (ROSES), $25,948, June 1, 2008, to August 31, 2010.
8. *The Detroit Asthma Morbidity, Air Quality and Traffic (DAMAT) Study*
   Co-Principal Investigator, with R. Wahl (PI, Michigan Department of Community Health), S. Batterman (Co-PI, UM School of Public Health), E. Wasilevich (Co-PI, Michigan Department of Community Health), M.L. Hultin (Co-PI, Michigan Department of Environmental Quality), B. Mukherjee (Co-PI, UM Biostatistics), K. Dombkowski (Co-PI, UM General Pediatrics), Environmental Protection Agency (EPA) G2007 STAR A1, $500,000, September 1, 2007, to August 31, 2010.
9. *Conceptual Design of the WATer and Environmental Research Systems Network (WATERS Network)*
   Senior Investigator, with J. Dozier (UCSB, PI), J.B. Braden (Co-PI, UIUC), R.P. Hooper (Co-PI, CUAHSI), B.S. Minsker (Co-PI, UIUC), J.L. Schnoor (Co-PI, U. Iowa), and 13 other senior investigators, National Science Foundation, $750,000, October 1, 2008, to March 31, 2010.
10. *Sampling and Inversion Methods for Quantifying Effect of Incomplete Subsurface Characterization on Uncertainty Associated with Recovery of Contamination History*
    Principal Investigator, National Science Foundation (NSF), Division of Chemical, Bioengineering, Environmental and Transport Systems (CBET), Directorate for Engineering (ENG), $179,996, September 1, 2006, to August 31, 2009.
11. *REU supplement for Grant 0607002 "Sampling and Inversion Methods for Quantifying Effect of Incomplete Subsurface Characterization on Uncertainty Associated with Recovery of Contamination History"*
    Principal Investigator, National Science Foundation (NSF), Division of Chemical, Bioengineering, Environmental and Transport Systems (CBET), Directorate for Engineering (ENG), $5,885, January 1, 2007, to August 31, 2009.
12. *Development of a Subsampling Strategy for the Orbiting Carbon Observatory Satellite*
    Principal Investigator, Jet Propulsion Laboratory (JPL), National Aeronautics and Space Administration (NASA), $108,456, May 8, 2006, to September 30, 2008.

13. *Characterization of Spatio-temporal Covariance of Remote Sensing Data from Earth-observing Satellites with Applications to Data Fusion, Sampling Design, and Measurement Gap-filling*
    Co-Investigator, with C. Miller (PI, Jet Propulsion Laboratory) and A. Braverman (Co-I, Jet Propulsion Laboratory), NASA Jet Propulsion Laboratory Strategic University Research Partnership, Director's Research and Development Fund, $50,000, March 08, 2007, to September 5, 2008.
14. *Geostatistical Analysis of NOAA Climate Monitoring and Diagnostics Laboratory Carbon Dioxide Data for 1997-2001*
    Principal Investigator, National Oceanic and Atmospheric Administration (NOAA), Climate Monitoring and Diagnostics Laboratory, $96,500, July 15, 2005, to September 30, 2007.
15. *Use of Remote Sensing Data and Geostatistical Inverse Modeling for Validating Process-based Parameterizations in Biospheric Models*
    Principal Investigator, National Aeronautics and Space Administration (NASA), Michigan Space Grant Consortium, $10,000, July 1, 2006, to June 30, 2007.
16. *Geostatistical Analysis of the Spatial Covariance Structure of Modeled Column Average Dry Air Carbon Dioxide Mole Fraction Distributions*
    Principal Investigator, Jet Propulsion Laboratory (JPL), National Aeronautics and Space Administration (NASA), $10,984, August 24, 2005, to July 31, 2006.
17. *Auxiliary Environmental Data Assimilation in Geostatistical Inverse Modeling*
    Principal Investigator, Elizabeth Caroline Crosby Research Fund, NSF ADVANCE at the University of Michigan, $20,000, May 1, 2005, to April 30, 2006.
18. *Quantification of Global Sources and Sinks of Methane Using Geostatistical Inverse Modeling*
    Principal Investigator, UCAR Visiting Scientist Programs, NOAA Postdoctoral Program in Climate & Global Change, University Corporation for Atmospheric Research (UCAR), $96,000, May 1, 2003, to April 30, 2005, Declined remaining support starting 07/2004.

PUBLICATIONS

Journal Papers (***** indicates corresponding author, denotes Michalak group student authors, denotes Michalak group postdoctoral researcher authors)

1. Chatterjee, A.*, A.M. Michalak, J.L. Anderson, K.L. Mueller, V. Yadav (*in review)* "Accuracy of ensemble Kalman filter estimates of CO_2 fluxes," *Journal of Geophysical Research – Atmospheres.*
2. Yadav, V.,* K.L. Mueller, A.M. Michalak (*in review*) "A backward elimination discrete optimization algorithm for model selection in spatio-temporal regression models," *Environmental Modeling and Software.*
3. Obenour, D.R.*, A.M. Michalak, Y. Zhou, D. Scavia (2012) "Quantifying the impacts of stratification and nutrient loading on hypoxia in the Northern Gulf of Mexico," *Environmental Science and Technology,* 46(10), 5489-5496, doi:10.1021/es204481a
4. Huntzinger, D.N.,* W.M Post, Y. Wei, A.M. Michalak, T.O. West, A.R. Jacobson, I.T. Baker, J.M. Chen, K.J. Davis, D.J. Hayes, F.M. Hoffman, A.K. Jain, S. Liu, A.D. McGuire, R.P. Neilson, B. Poulter, H.Q. Tian, P. Thornton, E. Tomelleril, N. Viovy, J. Xiao, N. Zeng, M. Zhao, and R. Cook (2012) "North American Carbon Program (NACP) Regional Interim Synthesis: Terrestrial Biospheric Model Intercoparison," *Ecological Modelling,* 232, 144-157, doi:10.1016/j.ecolmodel.2012.02.004.

5. Hammerling, D.M., A.M. Michalak*, C. O'Dell, S.R. Kawa (2012) "Global CO2 distributions over land from the Greenhouse Gases Observing Satellite (GOSAT)," *Geophysical Research Letters,* 39, L08804, doi:10.1029/2012GL051203.

6. Miller, S.M., E.A. Kort, A.I. Hirsch, E.J. Dlugokencky, A.E. Andrews, X. Xu, H. Tian, T. Nehrkorn, J. Eluszkiewicz, A.M. Michalak, S.C. Wofsy (2012) "Regional sources of nitrous oxide over the United States: Seasonal variation and spatial distribution," *Journal of Geophysical Research – Atmospheres*, 117, D06310, doi:10.1029/2011JD016951.

7. Hammerling, D.M., A.M. Michalak*, S.R. Kawa (2012) "Mapping of CO_2 at high spatiotemporal resolution using satellite observations: Global distributions from OCO-2," *Journal of Geophysical Research – Atmospheres,* 117, D06306, doi:10.1029/2011JD017015.

8. Gourdji, S.M.,* K.L. Mueller, V. Yadav, D.N. Huntzinger, A.E. Andrews, M. Trudeau, G. Petron, T. Nehrkorn, J. Eluszkiewicz, J. Henderson, D. Wen, J. Lin, M. Fischer, C. Sweeney, A.M. Michalak (2012) "North American CO_2 exchange: Inter-comparison of modeled estimates with results from a fine-scale atmospheric inversion," *Biogeosciences,* 9, 1, 457-475, doi:10.5194/bg-9-457-2012.

9. Vasys, V.N., A.R. Desai*, G.A. McKinley, V. Bennington, A.M. Michalak, A.E. Andrews (2011) "The influence of carbon exchange of a large lake on regional tracer-transport inversions: results from Lake Superior," *Environmental Research Letters,* 6, 3, 034016, doi:10.1088/1748-9326//6/3/034016.

10. Huntzinger, D.N.,* S.M. Gourdji, K.L. Mueller, A.M. Michalak, (2011) "A systematic approach for comparing modeled biospheric carbon fluxes across regional scales," *Biogeosciences,* 8, 6, 1579-1593, doi:10.5194/bg-8-1579-2011.

11. Bruhwiler, L.M.P.*, A.M Michalak, and P.P. Tans (2011), "Spatial and temporal resolution of carbon flux estimates for 1983-2002," *Biogeosciences*, 8, 1309-1331, doi:10.5194/bg-8-1309-2011.

12. Erickson, T.A.,* A.M. Michalak, and J.C. Lin (2011) "A data system for visualizing 4-D atmospheric CO_2 models and data," *OSGeo Journal,* 8, 37-47.

13. Huntzinger, D.N.,* S.M. Gourdji, K.L. Mueller, A.M. Michalak, (2011) "The utility of continuous atmospheric measurements for identifying biospheric CO_2 Flux Variability," *Journal of Geophysical Research - Atmospheres*, 116, D06110, doi:10.1029/2010JD015048.

14. Goeckede, M.,* D.P. Turner, A.M. Michalak, D. Vickers, B.E. Law (2010) "Sensitivity of a sub-regional scale atmospheric inverse CO2 modeling framework to boundary conditions." *Journal of Geophysical Research – Atmospheres*, 115, D24112, doi:10.1029/2010JG014443.

15. Steiner, A.L.,* A.J. Davis, S. Sillman, R.C. Owen, A.M. Michalak, A.M. Fiore (2010) "Observed suppression of ozone formation at extremely high temperatures due to chemical and biophysical feedbacks." *Proceedings of the National Academy of Sciences,* 107:46, 19685-19690, 10.1073/pnas.1008336107.

16. Kort, E.A.,* A. Andrews, E. Dlugokencky, C. Sweeney, A. Hirsch, J. Eluszkiewicz, T. Nehrkorn, A. Michalak, B. Stephens, C. Gerbig, J. Miller, J. Kaplan, S. Houweling, B.C. Daube, P. Tans, S.C. Wofsy (2010) "Atmospheric constraints on 2004 emissions of methane and nitrous oxide in North America from atmospheric measurements and receptor-oriented modeling framework," *Journal of Integrative Environmental Sciences,* Vol. 7, No. S1, 125–133, doi: 10.1080/19438151003767483.

17. Yadav, V.* K.L. Mueller, D. Dragoni, A.M. Michalak (2010) "A geostatistical synthesis study of factors affecting gross primary productivity in various ecosystems of North America," *Biogeosciences,* 7, 2655-2671, doi:10.5194/bg-7-2655-2010.

18. Chatterjee, A., A.M. Michalak,* S.R. Paradise, C.E. Miller, A.J. Braverman, R.S. Kahn (2010) "A geostatistical data fusion technique for merging remote sensing and ground-based observations of aerosol optical thickness," *Journal of Geophysical Research – Atmospheres*, 115, D20207, doi:10.1029/2009JD013765.

19. Mueller, K.L., V. Yadav, P.S. Curtis, C. Vogel, and A.M. Michalak* (2010) "Attributing the variability of eddy-covariance CO2 flux measurements across temporal scales using geostatistical regression for a mixed northern hardwood forest," *Global Biogeochemical Cycles*, 24, GB3023, doi:10.1029/2009GB003642.

20. Goeckede, M.,* A.M. Michalak, D. Vickers, D.P. Turner, and B.E. Law (2010), "Atmospheric inverse modeling to constrain regional-scale CO2 budgets at high spatial and temporal resolution," *Journal of Geophysical Research – Atmospheres*, 115, D15113, doi: 10.1029/ 2009JD012257.

21. Gourdji, S., A.I. Hirsch, K. Mueller, A.E. Andrews, and A.M. Michalak* (2010) "Regional-scale geostatistical inverse modeling of North American CO_2 fluxes: A synthetic data study," *Atmospheric Chemistry and Physics*, 10, 6151–6167, 2010, doi:10.5194/acp-10-6151-2010.

22. Zhou, Y., and A.M. Michalak,* (2009), "Characterizing attribute distributions in water sediments by geostatistical downscaling," *Environmental Science and Technology,* 43 (24), 9267-9273, doi:10.1021/es901431y.

23. Batterman, S.*, J. Eisenberg, R. Hardin, M.E. Kruk, M.C. Lemos, A.M. Michalak, B. Mukherjee, E. Renne, H. Stein, C. Watkins, and M.L. Wilson (2009), "Sustainable Control of Water-Related Infectious Diseases: A Review and Proposal for Interdisciplinary Health-Based Systems Research," *Environmental Health Perspectives*, 117:7, doi:10.1289/ehp.0800423.

24. Alkhaled, A.A.*, A.M. Michalak, S.R. Kawa (2008), "Using CO_2 spatial variability to quantify representation errors of satellite CO_2 retrievals," *Geophysical Research Letters,* 35, L16813, doi:10.1029/2008GL034528.

25. Mueller, K., S. Gourdji, and A.M. Michalak* (2008), "Global monthly-averaged CO_2 fluxes recovered using a geostatistical inverse modeling approach: 1. Results using atmospheric measurements" *Journal of Geophysical Research – Atmospheres,* 113, D21114, doi:10.1029/2007JD009734.

26. Gourdji, S., K. Mueller, K. Schaefer, and A.M. Michalak* (2008), "Global monthly-averaged CO_2 fluxes recovered using a geostatistical inverse modeling approach: 2. Results including auxiliary environmental data," *Journal of Geophysical Research – Atmospheres,* 113, D21115, doi:10.1029/2007JD009733.

27. Alkhaled, A.A.*, A.M. Michalak, S. Olsen, S.R. Kawa, J.-W. Wang (2008), "A global evaluation of the regional spatial variability of column integrated CO_2 distributions," *Journal of Geophysical Research – Atmospheres,* 113, D20303, doi:10.1029/2007JD009693.

28. Michalak, A.M.* (2008), "A Gibbs sampler for inequality-constrained geostatistical interpolation and inverse modeling," *Water Resources Research,* 44, W09437, doi:10.1029/2007WR006645.

29. Michalak, A.M.* (2008), "A geostatistical fixed-lag Kalman smoother for atmospheric inversions," *Atmospheric Chemistry and Physics,* 8, 6789–6799.

30. Miller, C.E.*, D. Crisp, P.L. DeCola, S.C. Olsen, J.T. Randerson, A.M. Michalak, A. Alkhaled, P. Rayner, D.J. Jacob, P. Suntharalingam, D. Jones, A.S. Denning, M.E. Nicholls, S.C. Doney, S. Pawson, H. Boesch, B.J. Connor, I.Y. Fung, D. O'Brien, R.J. Salawitch. S.P. Sander, B. Sen, P. Tans, G.C. Toon, P.O. Wennberg, S.C. Wofsy, Y.L. Yung, R.M. Law (2007), "Precision requirements for space-based X_{CO2} data," *Journal of Geophysical Research*, 112, D10314, doi: 10.1029/2006JD007659.

31. Michalak, A.M.*, and S. Shlomi (2007), "A geostatistical data assimilation approach for estimating groundwater plume distributions from multiple monitoring events," Invited paper, *Subsurface Hydrology: Data Integration for Properties and Processes,* American Geophysical Union (AGU) Geophysical Monograph Series 171, doi:10.1029/171GM08.

32. Shlomi, S.* and A.M. Michalak (2007), "A geostatistical framework for incorporating transport information in estimating the distribution of a groundwater contaminant plume," *Water Resources Research*, 43, W03412, doi:10.1029/2006WR005121.

33. Adriaens, P.*, M.-Y. Li, and A.M. Michalak (2006), "Scaling methods of sediment bioremediation processes and applications," *Engineering in Life Sciences*, 6(3), 217-227, doi:10.1002/elsc.200520127.

34. Hirsch, A.I.*, A.M. Michalak, L.M. Bruhwiler, W. Peters, E.J. Dlugokencky, and P.P. Tans (2006), "Inverse modeling estimates of the global nitrous oxide surface flux from 1998-2001," *Global Biogeochemical Cycles,* 20, GB1008, doi:10.1029/2004GB002443.

35. Michalak, A.M.*, A. Hirsch, L. Bruhwiler, K.R. Gurney, W. Peters, and P.P. Tans (2005), "Maximum likelihood estimation of covariance parameters for Bayesian atmospheric trace gas surface flux inversions," *Journal of Geophysical Research*, 110, D24107, doi:10.1029/ 2005JD005970.

36. Bruhwiler, L.M.P.*, A.M. Michalak, W. Peters, D.F. Baker, and P. Tans (2005), "An improved Kalman smoother for atmospheric inversions," *Atmospheric Chemistry & Physics,* 5, 2691-2702.

37. Michalak, A.M.*, and P.K. Kitanidis (2005), "A method for the interpolation of nonnegative functions with an application to contaminant load estimation," *Stochastic Environmental Research and Risk Assessment*, 19, 8 - 23, doi:10.1007/s00477-004-0189-1.

38. Michalak, A.M.*, L. Bruhwiler, and P.P. Tans (2004), "A geostatistical approach to surface flux estimation of atmospheric trace gases," *Journal of Geophysical Research*, 109, D14109, doi:10.1029/2003JD004422.

39. Michalak, A.M.*, and P.K. Kitanidis (2004), "Estimation of historical groundwater contaminant distribution using the adjoint state method applied to geostatistical inverse modeling," *Water Resources Research*, 40, W08302, doi:10.29/2004WR003214.

40. Michalak, A.M.*, and P.K. Kitanidis (2004), "Application of geostatistical inverse modeling to contaminant source identification at Dover AFB, Delaware," *IAHR Journal of Hydraulic Research*, 42 (special issue), 9-18.

41. Michalak, A.M.*, and P.K. Kitanidis (2003), "A method for enforcing parameter nonnegativity in Bayesian inverse problems with an application to contaminant source identification," *Water Resources Research*, 39(2), 1033, doi:10.1029/2002WR001480.

42. Michalak, A.M.* (2002), "Environmental contamination with multiple potential sources and the common law: Current approaches and emerging opportunities," *Fordham Environmental Law Journal*, XIV(1), 147-206.

43. Michalak, A.M.*, and P.K. Kitanidis (2000), "Macroscopic behavior and random walk particle tracking of kinetically sorbing solutes," *Water Resources Research*, 36(8), 2133-2146.

Book Chapters

1. Michalak, A.M. (*in press*), "Chapter 6: Identifying geographical sources and sinks of carbon from atmospheric observations," in Land Use and the Carbon Cycle: Science and Applications in Human Environment Interactions, Cambridge Press.
2. Michalak, A.M. (2004), "Feasibility of contaminant source identification for property rights enforcement," in *Incentives and Conservation, The Next Generation of Environmentalists*, pp. 81-106, edited by Daniel K. Benjamin, PERC, Bozeman, Montana.
3. Michalak, A.M. (2001), "Feasibility of contaminant source identification for property rights enforcement," in *The Technology of Property Rights*, pp. 123-145, edited by Terry L. Anderson and Peter J. Hill, Rowman and Littlefield Publishers, Inc., Lanham, Maryland.

Conference Proceedings (denotes Michalak group student authors)

1. Erickson, T.A., J.C. Lin, A.M. Michalak (2009) "A data system for visualizing 4-D atmospheric CO_2 models and data," in Proceedings of the Free and Open Source Software for Geospatial (FOSS4G) conference, Sydney, Australia, October 2009.
2. Chatterjee, A., C. DeMarchi, A.M. Michalak, (2009) "Estimating over-lake precipitation in the Great Lakes combining radar and rain gages," in Proceedings of the International Conference of Science and Information Technologies for Sustainable Management of Aquatic Ecosystems, A joint meeting of the 7th International Symposium on Ecohydraulics, and the 8th International Conference on Hydroinformatics, ISE-3A6-ENV7, Concepción, Chile.
3. Alkhaled, A.A., A.M. Michalak, and J.W. Bulkley (2007), "Applications of risk assessment in the development of climate change adaptation policy," in Proceedings of the *American Society of Civil Engineers (ASCE) Environmental and Water Resources Institute (EWRI) World Environmental & Water Resources Congress 2007: Restoring Our Natural Habitat*, 10p., Tampa, Florida.
4. Shlomi, S., T. Sakaki, T. Illangasekare, and A.M. Michalak (2007), "Evaluation of geostatistical data assimilation methodologies for estimating groundwater plume distributions using 3D sand-tank tracer-tests," in Proceedings of the *37th Mid-Atlantic Industrial & Hazardous Waste Conference,* pp. 86-92, edited by G.A. Sorial and A. Bagtzoglou, Cincinnati, Ohio.
5. Erickson, T.A., and A.M. Michalak (2006), "Merging of variable-resolution imagery using geostatistics and sensor PSFs," in *American Society for Photogrammetry and Remote Sensing (ASPRS) 2006 Conference Proceedings*, 8p., Reno, Nevada.
6. Adriaens, P., K. Hayes, C. Lastoskie, A. Michalak, A.M. Sastry, S. Batterman, S. Cherniak, A. Franzblau, and M. Philbert (2004), "Fetal determinants of adult disease: Probabilistic application of genomic tools for pre- and post-remedial PDBE exposures," in *The Third International Workshop on Brominated Flame Retardants*, pp. 63-66, edited by M. Alacee, G. Arsenault, et al., Toronto, Canada.
7. Michalak, A.M., and P.K. Kitanidis (2002), "Application of Bayesian inference methods to inverse modeling for contaminant source identification at Gloucester Landfill, Canada," in *Computational Methods in Water Resources XIV, Volume 2*, pp.1259-1266, edited by S.M. Hassanizadeh, R.J. Schotting, W.G. Gray and G.F. Pinder, Elsevier, Amsterdam, Netherlands.

8. Michalak, A.M., and P.K. Kitanidis (2002), "Application of geostatistical inverse modeling to contaminant source identification at Dover AFB, Delaware," in *International Groundwater Symposium: Bridging the Gap between Measurement and Modeling in Heterogeneous Media*, pp. 137-139 (extended abstract), edited by A.N. Findikakis, IAHR, Madrid, Spain.
9. Michalak, A.M., and P.K. Kitanidis (2000), "Numerical investigations of mixing in physically heterogeneous porous media using the one- and two-particle covariance," in *Computational Methods in Water Resources XIII, Volume 1, Computational Methods for Subsurface Flow and Transport*, pp. 423-429, edited by L.R. Bentley, J.F. Sykes, C.A. Brebbia, W.G. Gray and G.F. Pinder, A.A. Balkema, Rotterdam, The Netherlands.

Other Significant Publications (denotes Michalak group student authors)

1. Michalak, A.M. R. Jackson, G. Marland, C. Sabine, and the Carbon Cycle Science Working Group (*in review*) "A U.S. Carbon Cycle Science Plan"
2. Michalak, A.M., R. Jackson, G. Marland, C. Sabine (2009) "The U.S. Carbon Cycle Science Plan First Meeting of the Carbon Cycle Science Working Group," *EOS Transactions, American Geophysical Union*, 90(11), 102-103, doi:10.1029/2009ES002558.
3. Michalak, A.M., R. Jackson, G. Marland, C. Sabine, and Carbon Cycle Science Working Group (2009) "US Carbon Cycle Science Program Scoping Paper," Report presented to the Climate Change Science Program, 6p., http://www.carboncyclescience.gov/documents/Carbon-Cycle-Scoping-Paper-27Mar09.pdf.
4. Body of Knowledge Committee of the Committee on Academic Prerequisites for Professional Practice (2008), "Civil Engineering Body of Knowledge for the 21st Century: Preparing the Civil Engineer for the Future," Second Edition, American Society of Civil Engineers, 181p., Reston, Virginia, Contributor to Outcome 12: Risk and Uncertainty.
5. Birdsey, R.A., R. Cook, S. Denning, W. Emanuel, P. Griffith, B.E. Law, J. Masek, A.M. Michalak, S. Ogle, D. Ojima, Y. Pan, C.L. Sabine, E. Sheffner, E.T. Sundquist (2007), "NACP Investigators Share Improved Understanding of the North American Carbon Cycle," *EOS Transactions, American Geophysical Union*, 88(24), 255.
6. Michalak, A.M.. (2004), "Use of geostatistical inverse modeling for constraining trace gas budgets," in *Climate Monitoring and Diagnostics Laboratory Summary Report #27 2002-2003*, pp. 53-54, edited by Russell C. Schnell, U.S. Department of Commerce, Boulder, Colorado.
7. Michalak, A.M. (2003), "Application of Bayesian Inference Methods to Inverse Modeling for Contaminant Source Identification," *Ph.D. Dissertation submitted to the Department of Civil and Environmental Engineering*, Stanford University, Stanford, California, 292 p.

INVITED PRESENTATIONS

(Note: denotes Michalak group students, denotes Michalak group postdoctoral researchers)

2012

1. Michalak, A.M., "A bird's eye view of the carbon cycle," Invited talk presented at Lawrence Livermore National Laboraty, Livermore, California, May 2012.
2. Michalak, A.M., R.B. Jackson, G. Marland, C.L. Sabine "A U.S. Carbon Cycle Science Plan, Invited talk presented at the National Aeronautics and Space Administration headquarters, Washington, D.C., March 2012.
3. Michalak, A.M., R.B. Jackson, G. Marland, C.L. Sabine "A U.S. Carbon Cycle Science Plan, Invited talk presented at the United States Department of Agriculture headquarters, Washington, D.C., March 2012.
4. Michalak, A.M., R.B. Jackson, G. Marland, C.L. Sabine "A U.S. Carbon Cycle Science Plan, Invited talk presented at the Department of Energy headquarters, Germantown, Maryland, March 2012.
5. Michalak, A.M., D. Hammerling, C. O'Dell, S.R. Kawa "ACOS GOSAT Level 3 data products," Invited talk presented at The GOSAT Workshop 2012 – Towards GOSAT-2 Mission, Tokyo, Japan, February/March 2012.

2011

6. Michalak, A.M., K.L. Mueller, S. Gourdji, V. Yadav "Uncertainty quantification and parameter estimation for multi-scale systems: Lessons learned from inverse problems aimed at constraining the CO2 budget from atmospheric observations," Abstract H11J-03 presented at 2011 Fall Meeting, AGU, San Francisco, California, December 2011.
7. Michalak, A.M., "WSC Category 2: Extreme events impacts on water quality in the Great Lakes: Prediction and management of nutrient loading in a changing climate," Invited talk presented at the Water Sustainability and Climate PI meeting, Washington, DC, December 2011.
8. Michalak, A.M., "Mining sparse water quality data using spatial statistics," Invited talk presented at the Environmental Engineering and Science seminar series, Department of Civil and Environmental Engineering, Stanford University, Stanford, California, December 2011.
9. Michalak, A.M., "A bird's eye view of the carbon cycle," Invited talk presented at the Department of Plant Biology seminar series, Carnegie Institution for Science, Stanford, California, November 2011.
10. Michalak, A.M., "A bird's eye view of the carbon cycle," Invited talk presented at the Department of Environmental Earth System Science seminar series, Stanford University, Stanford, California, October 2011.
11. Michalak, A.M., "Why can't we (yet) exploit the Earth Sciences data tsunami," Invited talk presented at the *What can't we (yet) do to exploit the Earth Sciences data tsunami* Computational Earth Sciences Forum, Stanford University, Stanford, California, September 2011.
12. Michalak, A.M., "Assimilations and inversions from simulated measurements of CO2 mixing ratio: A pro-typical example," Invited talk presented at the ASCENDS (Active Sensing of CO_2 Emissions over Nights, Days, and Seasons) workshop, Greenbelt, Maryland, April 2011.

13. Michalak, A.M., "Assimilations and inversions from simulated measurements: Issues, approaches, and value," Invited talk presented at the ASCENDS (Active Sensing of CO_2 Emissions over Nights, Days, and Seasons) workshop, Greenbelt, Maryland, April 2011.
14. Michalak, A.M., "Towards a global carbon monitoring system: Assimilating environmental data in a geostatistical framework," Invited talk presented at the Environmental Science and Engineering seminar series, Colorado School of Mines, Golden, Colorado, March 2011.
15. Michalak, A.M., "Bridging across spatial and temporal scales in carbon dioxide flux estimation," Invited talk presented at the National Ecological Observing Network, Boulder, Colorado, February 2011.
16. Michalak, A.M., G. Marland, R. Jackson, and C. Sabine, "The New U.S. Carbon Cycle Science Plan," Plenary talk presented at the North American Carbon Program All Investigators Meeting, New Orleans, Louisiana, February 2011.
17. Michalak, A.M., "Towards a global carbon monitoring system: Novel approaches for characterizing fluxes, and ongoing research needs," Invited talk presented at the Jet Propulsion Laboratory, Pasadena, California, January 2011.

2010

18. Michalak, A.M., "Research needs and current approaches for a global carbon monitoring system: Monitoring requirements, synthesis of existing data streams, and emissions verification," Abstract GC41G-05 presented at 2010 Fall Meeting, AGU, San Francisco, California, December 2010.
19. Michalak, A.M., "Evaluation of constraint provided by current atmospheric monitoring network for quantifying anthropogenic emissions and biospheric carbon fluxes" Abstract A24A-06 presented at 2010 Fall Meeting, AGU, San Francisco, California, December 2010.
20. Michalak, A.M., "The C-Train: Highlights of A-Train Contributions to Carbon Cycle Science," Invited keynote address presented at the NASA International Symposium on the A-Train Satellite Constellation, New Orleans, Louisiana, October 2010.
21. Michalak, A.M., G. Marland, R. Jackson, and C. Sabine, "A New U.S. Carbon Cycle Science Plan," Invited talk presented at the NASA Carbon Monitoring System Scoping Workshop, Boulder, Colorado, July 2010.
22. Michalak, A.M., G. Marland, R. Jackson, and C. Sabine, "A New U.S. Carbon Cycle Science Plan," Invited talk presented at the Carbon Cycle Science Steering Group meeting, Washington, D.C., June 2010.
23. Michalak, A.M. "Geostatistical inverse modeling for characterizing the global carbon cycle," Invited seminar presented to the Department of Statistics, University of Michigan, Ann Arbor, Michigan, May 2010.
24. Michalak, A.M. "Towards a global carbon monitoring system: Assimilating in situ and remote sensing observations in a geostatistical framework," Invited talk presented to Sandia National Laboratories, Livermore, California, April 2010.
25. Michalak, A.M. "Towards a global carbon monitoring system: Assimilating in situ and remote sensing observations in a geostatistical framework," Invited seminar presented to the Department of Global Ecology of the Carnegie Institution at Stanford University, California, April 2010.
26. Michalak, A.M. "Overview of Research in Carbon Cycle Science," Invited plenary talk presented at the NASA Terrestrial Ecology meeting, LaJolla, California, March 2010.

27. Michalak, A.M. "Monitoring Future Climate Treaties," Invited public panel presentation at the *Quantifying the Sources and Sinks of Atmospheric* CO_2 workshop, Keck Institute for Space Studies, California Institute of Technology, Pasadena, California, March 2010.

28. Michalak, A.M., P. Rayner "Overview of top-down methods," Invited presentation at the *Quantifying the Sources and Sinks of Atmospheric* CO_2 workshop, Keck Institute for Space Studies, California Institute of Technology, Pasadena, California, March 2010.

2009

29. Michalak, A.M., A. Chatterjee, S.R. Paradise, A.J. Braverman, C.E. Miller "A geostatistical data fusion technique for merging remote sensing and ground-based observations of aerosol optical thickness," Invited presentation at the *American Geophysical Union Fall Meeting*, *EOS Transactions, American Geophysical Union* 90 (52), Fall Meeting Supplement, Abstract A21G-01, December 2009.

30. Michalak, A.M. "Merging Across Spatial and Temporal Scales in North American Carbon Dioxide Flux Estimation," Invited seminar presented to the Department of Atmospheric and Oceanic Sciences, University of Wisconsin, Madison, Wisconsin, October 2009.

31. Michalak, A.M. "Mapping Global CO_2 using AIRS data," Invited talk presented at the Atmospheric Sounding Science Team Meeting, Greenbelt, Maryland, October 2009.

32. Michalak, A.M. "Modeling studies in support of the development of the ASCENDS instrument," Invited talk presented at the 3rd International Workshop on CO_2 Active Remote Sensing by DiAL, Hampton, Virginia, October 2009.

33. Michalak, A.M. "Prior Error Structures," Invited talk presented at the TransCom 2009 meeting, Jena, Germany, September 2009.

34. Michalak, A.M. "Geostatistical inverse modeling for characterizing the global carbon cycle," Invited talk presented at the opening workshop of the Program on Space-time Analysis for Environmental Mapping, Epidemiology, and Climate Change, at the Statistical and Applied Mathematical Science Institute, Research Triangle Park, North Carolina, September 2009.

35. Michalak, A.M., "Contribution of terrestrial land surface to the carbon cycle, evidence from atmospheric models." Invited plenary talk presented at the Workshop on Land Use / Land Cover Change and the Carbon Cycle, Ann Arbor, Michigan, June 2009.

36. Michalak, A.M., G. Marland, R. Jackson, and C. Sabine, "Status and Review of New Carbon Cycle Science Plan," Invited talk presented at the Carbon Cycle Science Steering Group meeting, Reston, Virginia, June 2009.

37. Michalak, A.M., "Atmospheric Inverse Modeling, Data Assimilation, and Top-down / Bottom-up Reconciliation," Invited talk presented at the Greenhouse Gas Information System Workshop, Sandia National Laboratory, Albuquerque, New Mexico, May 2009.

38. Michalak, A.M., "Bridging across Spatial and Temporal Scales in North American Carbon Dioxide Flux Estimation," Invited seminar presented to the Department of Physics, University of Toronto, Ontario, Canada, April 2009.

39. Michalak, A.M., "Inferring historical forcing using geostatistical methods: Examples from atmospheric and water quality monitoring," Invited seminar presented to the Department of Civil and Environmental Engineering, University of Illinois at Urbana-Champaign, April 2009.

40. Michalak, A.M. "Improving understanding of carbon flux variability using atmospheric inverse modeling," Invited talk presented at the symposium "The Carbon Budget: Can We Reconcile Flux Estimates," at the Annual Meeting of the *American Association for the Advancement of Science (AAAS)*, Chicago, Illinois, February 2009.

41. Michalak, A.M., C. Sabine, R. Jackson, G. Marland, "The New U.S. Carbon Cycle Science Plan," Invited plenary talk presented at the 2009 North American Carbon Program (NACP) Investigators' Conference, San Diego, California, February 2009.

42. Michalak, A.M. "The global carbon cycle and the role of the Orbiting Carbon Observatory," Invited talk presented at the *Launch Minus 30 Days* press briefing for the Orbiting Carbon Observatory, Washington, D.C., January 2009.

43. Michalak, A.M., G. Marland, R. Jackson, and C.Sabine, "Status and Review of New Carbon Cycle Science Plan," Invited talk presented at the North American Carbon Program (NACP) Interim Synthesis Meeting, Oak Ridge National Laboratory, Tennessee, January 2009.

2008

44. Michalak, A.M., K. Mueller, V. Yadav, A. Alkhaled, Y. Zhou, S. Gourdji, D. Huntzinger, A. Hirsch, A. Andrews, S. Wofsy, "Applications of Geostatistics to Data Assimilation in Biogeochemical Models," Invited presentation at the *American Geophysical Union Fall Meeting*, *EOS Transactions, American Geophysical Union* 89 (53), Fall Meeting Supplement, Abstract B33A-0391, December 2008.

45. Michalak, A.M., G. Marland, R. Jackson, and C. Sabine, "Status and Review of New Carbon Cycle Science Plan," Invited presentation at the Carbon Cycle Science Steering Group meeting, Washington, D.C., December 2008.

46. Michalak, A.M. "Differences in terminology, techniques, and approaches between statisticians and earth scientists," Invited plenary talk presented at the *Workshop on Uncertainty Management in Remote Sensing of Climate Data,*" organized by the National Academies' Climate Research Committee (CRC), Committee on Applied and Theoretical Statistics (CATS), and Committee on Earth Studies (CES), Washington, D.C., December 2008.

47. Michalak, A.M. "The role of atmospheric observations in improving understanding of the global carbon cycle," Invited talk presented at a press conference at NASA Headquarters and to be broadcast on NASA TV (http://www.nasa.gov/multimedia/nasatv/), Washington, D.C., November 2008.

48. Michalak, A.M. "Determining regional emissions patterns of non-CO_2 greenhouse gases," Invited talk presented at the *Spatial and Temporal Distributions of Sources of non-CO_2 Greenhouse Gases (CH_4, CO, N_2O) over North America* Workshop, Boulder, Colorado, October 2008.

49. Michalak, A.M., "Atmospheric CO_2 and ASCENDS Science Background," Invited plenary talk presented at the NASA ASCENDS Community Workshop, University of Michigan, Ann Arbor, Michigan, July 2008.

50. Michalak, A.M., "Improving Understanding of Global and Regional Carbon Dioxide Flux Variability through Assimilation of in Situ and Remote Sensing Data in a Geostatistical Framework," Invited talk presented at the 8th Summer Institute for the NOAA Climate and Global Change Postdoctoral Fellowship Program, Steamboat Springs, Colorado, July 2008.

51. Michalak, A.M., A.A. Alkhaled, N. Cressie, A. Braverman, S.R. Kawa, S.C. Olsen, J.-W. Wang, "Mapping global CO_2: Development and application of geostatistical algorithms for gap filling and uncertainty assessment for the Orbiting Carbon Observatory," Invited talk presented at the 5th International Workshop of Greenhouse Gas Measurements from Space (IWGGMS), California Institute of Technology, Pasadena, California, June 2008.

2007

52. Michalak, A.M., K. Mueller, S.M. Gourdji, A. Hirsch, A.E. Andrews, J.C. Lin, and T. Nehrkorn, "Bridging across spatial and temporal scales in North American CO_2 flux estimation through geostatistical analysis of scale-dependent relationships between carbon flux and auxiliary environmental data," Invited talk presented at the American Geophysical Union fall meeting, *EOS Transactions, AGU* 88 (52), Fall Meeting Supplement, Abstract B42C-01, December 2007.

53. Michalak, A.M., "Atmospheric inverse modeling as a tool for constraining the global and regional budgets of carbon dioxide," Invited talk presented to the interdisciplinary faculty-graduate student seminar series "Engineering Climate Change: Knowledge, Responsibilities, and Actions," University of Michigan, November 2007.

54. Michalak, A.M., "Inferring historical forcing using geostatistical inverse modeling: Examples from hydrogeology and atmospheric monitoring," Invited talk presented to the *Department of Civil and Environmental Engineering*, Clarkson University, Potsdam, New York, April 2007.

55. Michalak, A.M., "Improving understanding of global and regional carbon dioxide flux variability through assimilation of in situ and remote sensing data in a geostatistical framework," Invited talk presented at the *Atmospheric Sciences Seminar Series*, Harvard University, Cambridge, Massachusetts, March 2007.

56. Michalak, A.M., "Improving understanding of global and regional carbon dioxide flux variability through assimilation of in situ and remote sensing data in a geostatistical framework," Invited talk presented at the *Department of Atmospheric Oceanic and Space Sciences Seminar Series*, University of Michigan, Ann Arbor, Michigan, March 2007.

57. Michalak, A.M., Invited plenary presentation at wrap-up panel session, U.S. North American Carbon Program (NACP) Investigators Meeting, Colorado Springs, Colorado, January 2007.

2006

58. Gourdji, S., K. Mueller, Y. Zhou, and A.M. Michalak, "Use of Remote Sensing Data and Geostatistical Inverse Modeling to Estimate Global Carbon Fluxes and Validate Process-Based Biospheric Models," Invited poster presented at the *Michigan Space Grant Consortium* conference, Ann Arbor, Michigan, September 2006.

59. Michalak, A.M., "Application of Geostatistical Tools for Quantifying Complexity and Uncertainty in Environmental Systems," Invited talk presented at the *International Symposium on Soil, Groundwater Environment & Waste Management*, The University of Seoul, Seoul, Korea, May 2006.

60. Michalak, A.M., "Application of Geostatistical Tools for Quantifying Complexity and Uncertainty in Environmental Systems," Invited talk presented at the *IIHR Hydroscience & Engineering seminar series*, University of Iowa, Iowa City, Iowa, March 2006.

61. Michalak, A.M., "Applications of geostatistical tools to constraining the global carbon cycle," Invited talk presented to the *Department of Chemical and Biochemical Engineering*, University of Iowa, Iowa City, Iowa, March 2006.

62. Michalak, A.M., "Quantifying the Spatial Covariance Structure of Modeled X_{CO2} Distributions: A Tool for Informing the Level 1b Subsampling Strategy," Invited talk presented at the *Orbiting Carbon Observatory (OCO) Science Team Meeting,* Pasadena, California, March 2006.

63. Michalak, A.M., "Improved Carbon Flux Estimates through Assimilation of Auxiliary Environmental Data," Invited talk presented at the *Data Assimilation Techniques for Regional Estimates of North American Carbon Fluxes* workshop, NOAA, Boulder, Colorado, February 2006.

2005

64. Michalak, A.M., "Estimating Sources and Sinks of Atmospheric Trace Gases Using Geostatistical Inverse Modeling," Invited talk presented to the *Physical Sciences group, Women in Science and Engineering group, and Natural Resources group* of the University of Michigan Undergraduate Research Opportunity Program, Ann Arbor Michigan, November 2005.

65. Michalak, A.M., "Estimating Sources and Sinks of Atmospheric Trace Gases Using Geostatistical Inverse Modeling, *or* Why Should Atmospheric Scientists Care about a South African Mining Engineer Named Dr. Krige?," Invited talk presented at the *Department of Atmospheric Oceanic and Space Sciences Seminar Series*, University of Michigan, Ann Arbor, Michigan, October 2005.

66. Michalak, A.M., "Inferring historical forcing using geostatistical inverse modeling: Examples from hydrogeology and atmospheric monitoring," Invited talk presented at the *Smith Lecture Series*, Department of Geological Sciences, University of Michigan, Ann Arbor, Michigan, September 2005.

67. Michalak, A.M., "Atmospheric Inverse Modeling as a Tool for Constraining the Global and Regional Budgets of Carbon Dioxide," Invited talk presented at the headquarters of the *Meteorological Service of Canada,* Toronto, Ontario, Canada, May 2005.

68. Michalak, A.M., "Data-driven Inverse Modeling Methods for Constraining Global and Regional Budgets of Carbon Dioxide," Invited talk presented at the *Department of Geography,* University of Toronto, Toronto, Ontario, Canada, May 2005.

69. Michalak, A.M. and I.G. Enting "Residual analysis as a statistical diagnostics tool for carbon flux inversions," Invited talk presented at the *Orbiting Carbon Observatory (OCO) Science Team Meeting*, California Institute of Technology, Pasadena, California, March 2005.

2004

70. Michalak, A.M., "Application of Geostatistical Inverse Modeling to High Resolution Carbon Flux Estimation Involving Disparate Data Types," Invited talk presented at the *Modeling and Data Analysis of Atmospheric CO_2 Observations in North America* workshop, Boulder, Colorado, October 2004.

71. Michalak, A.M., "Using Geostatistics to Constrain Groundwater Contaminant Source Identification… and more!" Invited talk presented to the *Hydrologic Science and Water Resources Seminar Series* at the Department of Civil, Environmental and Architectural Engineering at the University of Colorado, Boulder, Colorado, February 2004.

1999-2003

72. Michalak, A.M., "Environmental Contamination with Multiple Potential Sources: Scientific Methods for Source Identification and Their Legal Applicability," Invited talk presented to the *Environmental and Energy Systems Institute* at Rice University, Houston, Texas, November 2002.

73. Michalak, A.M., "Environmental Contamination with Multiple Potential Sources and the Common Law: Problems, Opportunities and Statistics," Invited talk presented at *The Association of Private Enterprise Education International Convention*, Cancun, Mexico, April 2002.

74. Michalak, A.M., "Approaches to Contaminant Source Identification for Environmental Law Enforcement," Invited talk presented at the *Environmental Crime Prevention Program (ECPP) Plenary Inter-Ministerial Meeting*, EPA Region 2 Headquarters, New York City, New York, November, 2000.

75. Michalak, A.M., "Feasibility of Contaminant Source Identification for Property Rights Enforcement," Invited talk presented at the *1999 Political Economy Forum*, Chico, Montana, December 1999.

CONTRIBUTED PUBLISHED ABSTRACTS AND CONFERENCE PRESENTATIONS

Over 150 contributed published abstracts and conference presentations in 1997 - 2012, not listed individually here for brevity.