

## ANNA M. MICHALAK

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### RESEARCH INTERESTS

Dr. Michalak’s research interests lie in two areas. The first is understanding and quantifying the cycling and emissions of greenhouse gases at the Earth surface at urban to global scales – scales directly relevant to informing climate and policy – primarily through the use of atmospheric observations that provide the clearest constraints at these critical scales. The second area is assessing the impacts of climate change on inland and coastal water quality via influences on nutrient delivery to, and on conditions within, water bodies. Her approach is highly data-driven, with a common methodological thread being the development and application of spatiotemporal statistical data fusion methods for optimizing the use of limited in situ and remote sensing environmental data.

### 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

<i>Faculty Member</i>	2011 – present
Department of Global Ecology, Carnegie Institution for Science, Stanford, California	
<i>Professor, by courtesy</i>	2016 – present
<i>Associate Professor, by courtesy</i>	2011 – 2016
Department of Earth System Science, Stanford University, Stanford, California	
<i>Affiliated Faculty</i>	2011 – present
Emmett Interdisciplinary Program in Environment and Resources, Stanford University, Stanford, California	
<i>ASP Faculty Fellow</i>	2010 – 2011
Institute for Mathematics Applied to Geosciences (IMAGE), Computational and Information Systems Laboratory, National Center for Atmospheric Research (NCAR), Boulder, Colorado	
<i>Adjunct Associate Professor</i>	2011 – 2015
<i>Frank and Brooke Transue Faculty Scholar</i>	2010 – 2011
<i>Associate Professor, with tenure</i>	2009 – 2011
<i>Assistant Professor</i>	2004 – 2009
Environmental and Water Resources Engineering, Department of Civil and Environmental Engineering, University of Michigan, Ann Arbor, Michigan	

<i>Associate Professor, with tenure</i>	2009 – 2011
<i>Assistant Professor</i>	2005 – 2009
Atmospheric Sciences, Department of Atmospheric, Oceanic and Space Sciences, University of Michigan, Ann Arbor, Michigan	
<i>NOAA Climate and Global Change Postdoctoral Fellow</i>	2003 – 2004
Climate Monitoring and Diagnostics Laboratory (CMDL) National Oceanic and Atmospheric Administration, Boulder, Colorado	

## **PROFESSIONAL SERVICE (selected)**

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### **Scientific advisory board and committee service**

- *Chair of Scientific Advisory Board*, Integrated Carbon Observation System (ICOS) European Research Infrastructure Consortium (ERIC), 2016 – present
- *Scientific Advisory Board*, Oak Ridge National Laboratory Climate Change Science Institute, Oak Ridge, Tennessee, 2013 – present
- *External Advisory Committee*, Vermont Experimental Program to Stimulate Competitive Research (EPSCoR), 2011 – present
- *Earth Science Subcommittee*, NASA Advisory Council, 2009 – 2017
- *Scientific Advisory Board*, Max Planck Institute for Biogeochemistry, Jena, Germany, 2014 – 2016
- *Earth Sciences Division Director's Review Board*, Lawrence Berkeley National Laboratory, Berkeley, California, 2014
- *North American Carbon Program Science Steering Group*, U.S. Global Change Research Program, 2010 – 2014
- *Body of Knowledge Second Edition (BOK2) task committee*, Committee on academic prerequisites for professional practice, American Society of Civil Engineers (ASCE), 2006 – 2008

### **Scientific community roles**

- *Chapter Co-Lead*, 2<sup>nd</sup> State of the Carbon Cycle Report (SOCCR-2), U.S. Global Change Research Program (USGCRP), 2016 – present
- *Member*, Orbiting Carbon Observatory 2 (OCO-2) satellite science team, 2011 – present
- *Member*, NASA Carbon Monitoring System Science Definition Team, 2011 – present
- *Member*, Steering Committee, ASCENDS (Active Sensing of CO<sub>2</sub> Emissions over Nights, Days, and Seasons) Satellite Mission, , 2011 – present; *Co-chair* 2008 – 2011
- *Member*, The National Academies of Sciences, Engineering, and Medicine, Division on Earth and Life Studies, and Division on Engineering and Physical Sciences, Committee for “Models of the World for the National Geospatial-Intelligence Agency,” 2015 – 2016
- *University of Michigan Representative*, University Corporation for Atmospheric Research (UCAR), 2009 – 2011
- *Co-lead*, U.S. Carbon Cycle Science Working Group (CCS WG) charged with the development of the U.S. Carbon Cycle Science Plan, U.S. Global Change Research Program, 2008 – 2011
- *Associate*, Orbiting Carbon Observatory (OCO) satellite science team, 2005 – 2009

### **Editorial roles**

- *Editor*, Water Resources Research, American Geophysical Union, 2013 – 2017; *Associate Editor* 2008 – 2013

- *Editorial board member*, Advances in Water Resources, Elsevier, 2009 – present
- *Guest Editor*, Inter-journal special issue on “9<sup>th</sup> International Carbon Dioxide Conference (ICDC9)” in European Geophysical Union journals of Atmospheric Chemistry and Physics, Earth System Dynamics, as well as Biogeosciences, 2013 – 2015
- *Co-editor*, Special issue on Water for Dædalus, the journal of the American Academy of Arts and Sciences, 2013 – 2015

### **Scientific conference planning and organization**

- *Member of scientific steering committee*, 10<sup>th</sup> International Carbon Dioxide Conference, Interlaken, Switzerland, August 2017.
- *Co-lead*, American Academy of Arts & Sciences event on “Water: California in a Global Context,” Stanford, California, February 2016.
- *Member of scientific steering committee*, 9<sup>th</sup> International Carbon Dioxide Conference, Beijing, China, June 2013.
- *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.
- *Invited member*, Planning Committee, 2<sup>nd</sup> North American Carbon Program (NACP) Investigators’ Meeting, February 2009.
- *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.
- *Invited member*, International Scientific Committee, 6<sup>th</sup> International Conference on Inverse Problems in Engineering: Theory and Practice (ICIPE), Paris, France, June 2008
- American Geophysical Union Fall Meetings, special session planning and organization:
  - *Co-organizer*, Special session entitled “Remote Sensing of CH<sub>4</sub> and CO<sub>2</sub> from Space: The Advancing Observing System,” New Orleans, Louisiana, December 2017
  - *Co-organizer*, Special session entitled “Combining Physical Simulation and Machine Learning across Geophysical Sciences,” New Orleans, Louisiana, December 2017
  - *Co-organizer and convener*, Special session entitled “Remote Sensing of CO<sub>2</sub> and CH<sub>4</sub> from space: Moving towards an observing system,” San Francisco, California, December 2016
  - *Co-organizer and convener*, Special session entitled “Remote Sensing of CO<sub>2</sub> and CH<sub>4</sub> from space: Exploiting New Measurements,” San Francisco, California, December 2015
  - *Co-organizer and convener*, Special session entitled “Remote Sensing of the Carbon Cycle: Exploiting New Measurements and Linkages to the Water Cycle,” San Francisco, California, December 2014
  - *Co-organizer and convener*, Special session entitled “Remote sensing of CO<sub>2</sub>, CO, and CH<sub>4</sub>: From missions to science,” San Francisco, California, December 2013
  - *Co-organizer and convener*, Special session entitled “Model Intercomparisons: Syntheses That Inform Scientific Understanding,” San Francisco, California, December 2013

- *Co-organizer and convener*, Special session entitled “*Remote sensing of CO<sub>2</sub>, CO, and CH<sub>4</sub>*,” San Francisco, California, December 2012
- *Co-organizer and convener*, Special session entitled “*Remote sensing of CO<sub>2</sub>: Observations, modeling, and synthesis*,” San Francisco, California, December 2011
- *Co-organizer and convener*, Special session entitled “*Remote sensing of CO<sub>2</sub> emissions and atmospheric transport*,” San Francisco, California, December 2010
- *Co-organizer and convener*, Special session entitled “*Atmospheric carbon dioxide: Observation, validation, modeling, and assimilation*,” San Francisco, California, December 2009
- *Co-organizer and convener*, Special session entitled “*Towards a policy-relevant, open and transparent global greenhouse gas monitoring and information system (GHGIS)*,” San Francisco, California, December 2009
- *Co-organizer and convener*, Special session entitled “*Space Observations of Atmospheric Carbon Dioxide: Retrieval, Validation, Modeling, and Assimilation*,” San Francisco, California, December 2008
- *Co-organizer and convener*, Special session entitled “*Space Observations of Atmospheric Carbon Dioxide: Retrieval, Validation, Modeling and Assimilation*,” San Francisco, California, December 2007
- *Co-organizer and convener*, Special session entitled “*Remote Sensing and Modeling of Greenhouse and Related Gases and Implications for Understanding Their Sources and Sinks*,” San Francisco, California, December 2005
- *Co-organizer and convener*, Special session entitled “*Inverse Modeling and Conditional Uncertainty Propagation in Heterogeneous Aquifers*,” San Francisco, California, December 2005
- *Co-organizer and convener*, Special session entitled “*Use of Inverse Modeling for Constraining Global and Regional Budgets of Atmospheric Trace Gases*,” San Francisco, California, December 2004
- *Co-organizer and convener*, Special session entitled “*Use of Inverse Modeling for Constraining Global Budgets of Atmospheric Trace Gases*,” San Francisco, California, December 2003

## TEACHING EXPERIENCE

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### New Courses Introduced at Stanford University

#### ***ESS 214 Introduction to Geostatistics and Modeling of Spatial Uncertainty***

*Department:* Earth System Science  
*Introduced:* Spring 2012  
*Taught:* Spring 2012, 2013, 2016

#### ***CEE 333 / GES 333, Water Policy Colloquium***

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

## **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

### ***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, 2006, 2007; Fall 2009

### ***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, 2006, 2007, 2008, 2009

## **Short Courses Taught**

### ***Autumn School on Data Assimilation in Biogeochemical Cycles***

*Location:* International Centre for Theoretical Physics, Trieste, Italy

*Dates:* September 20-27, 2014

*Role:* Co-organizer and lecturer

### ***Workshop on Geostatistical Inverse Modeling***

*Location:* University of Michigan, Ann Arbor, Michigan

*Dates:* August 3 – 6, 2009

*Role:* Organizer and lead lecturer

### ***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

### ***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)

### ***Ecosystem Modeling Workshop***

*Location:* University of Michigan Biological Station (UMBS), Pellston, Michigan

*Dates:* July 31, 2006

*Role:* Organizer and instructor

### ***Mathematical Geophysics Summer School***

*Location:* Stanford University, Stanford, California

*Dates:* August 6-10, 2001

*Role:* Course instructor (with several others)

## **HONORS AND AWARDS**

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Leopold Leadership Fellow	2015
Frank and Brooke Transue Faculty Scholar	2010 – 2011
University of Michigan Henry Russel Award	2011
National Center for Atmospheric Research (NCAR) ASP Faculty Fellowship	2010 – 2011
Department of Civil and Environmental Engineering Merit Award	2010
University of Michigan College of Engineering 1938E Award	2009
AEESP Outstanding Educator Award for “ Outstanding Teaching in Environmental Engineering and Science”	2008
Presidential Early Career Award for Scientists and Engineers (PECASE)	2007
Michigan Memorial Phoenix Energy Institute (MMPEI) Faculty Fellow	2007 – 2011
NSF CAREER Award, National Science Foundation	2007
Elizabeth Crosby Research Award, University of Michigan	2005
NOAA Postdoctoral Program in Climate and Global Change Fellowship, University Corporation for Atmospheric Research	2003 – 2005
Roe Legal Fellowship, Property and Environmental Research Center	2002
PERC Summer Fellowship, Property and Environmental Research Center	2001
Hydrology Section Outstanding Student Paper Award, American Geophysical Union	1999
Gabilan Fellowship, Stanford University	1999
Stanford Graduate Fellowship, Stanford University	1997 – 2000
Department of Civil & Environmental Engineering Fellowship, Stanford University	1997 – 2000
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	2007
A&WMA Scholarship for Post-Secondary Studies in Air and Waste Management, Air and Waste Management Association	1995 and 1996

## STUDENTS AND RESEARCHERS SUPERVISED

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

- *Daniel R. Obenour*, University of Michigan, *Co-advisor*, Ph.D. completed 08/2013
- *Yuntao Zhou*, University of Michigan / Carnegie Institution for Science, *Principal advisor*, Ph.D. completed 01/2013
- *Abhishek Chatterjee*, University of Michigan / Carnegie Institution for Science, *Principal advisor*, Ph.D. completed 11/2012
- *Dorit Hammerling*, University of Michigan, *Principal advisor*, Ph.D. completed 11/2012
- *Kimberly Mueller*, University of Michigan, *Principal advisor*, Ph.D. completed 02/2011
- *Sharon Gourdji*, University of Michigan, *Principal advisor*, Ph.D. completed 02/2011
- *Alanood Alkhaled*, University of Michigan, *Principal advisor*, Ph.D. completed 03/2009
- *Shahar Shlomi*, University of Michigan, *Principal advisor*, Ph.D. completed 02/2009
- *Meng-Ying Li*, University of Michigan, *Co-advisor*, Ph.D. completed 02/2008

### Current service as Ph.D. advisor or co-advisor:

- *Yoichi Shiga*, Department of Civil and Environmental Engineering, Stanford University, *Co-advisor*
- *Jeff Ho*, Department of Civil and Environmental Engineering, Stanford University, *Co-advisor*
- *Eva Sinha*, Department of Earth System Science, Stanford University, *Co-advisor*
- *Nina Randazzo*, Department of Earth System Science, Stanford University, *Co-advisor*
- *Matthew Shultz*, Department of Earth System Science, Stanford University, *Co-advisor*

### Postdoctoral research advisor:

- *Dario del Giudice*, Carnegie Institution for Science, 11/2015 – present
- *Scot Miller*, Carnegie Institution for Science, 07/2015 – present
- *Yuanyuan Fang*, Carnegie Institution for Science, 08/2012 – present
- *Chao Li*, Carnegie Institution for Science, 07/2013 – 07/2016
- *Jovan Tadic*, Carnegie Institution for Science, 03/2013 – 06/2016
- *Yuntao Zhou*, Carnegie Institution for Science, 02/2013 – 02/2015
- *Kimberly Mueller*, University of Michigan, 02/2011 – 08/2011
- *Sharon Gourdji*, University of Michigan, 02/2011 – 06/2011
- *Vineet Yadav*, University of Michigan and Carnegie Institution for Science, 02/2008 – 09/2014
- *Deborah Huntzinger*, University of Michigan, 10/2007 – 08/2011

### Completed service as doctoral external examiner (international):

- *Martine Rivest*, Génie civil, géologique et des mines, Université de Montréal, Canada, 2012
- *Andrew Keats*, Department of Mechanical Engineering, University of Waterloo, Canada, 2009
- *Arun Kansal*, Department of Civil and Environmental Engineering, Indian Institute of Technology, 2007

## FUNDING HISTORY

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### Current Funding

1. *Merging top-down and bottom-up approaches to partition carbon and water fluxes between the atmosphere and biosphere*, Co-Investigator, with T. Keenan (PI, Lawrence Berkeley National Laboratory), J. Fisher (Co-I, Jet Propulsion Laboratory (JPL)), NASA Interdisciplinary Science Program, \$1,559,021, July 1, 2017 – June 30, 2020.
2. *Quantifying CO<sub>2</sub> and CH<sub>4</sub> Fluxes from Vulnerable Arctic-Boreal Ecosystems across Spatial and Temporal Scales*, Co-Investigator, with C. Miller (PI, JPL), V. Yadav (Co-I, JPL), C. Sweeney, (Co-I, NOAA Earth System Research Laboratory (ESRL)) NASA Terrestrial Ecology Program, \$1,890,000, January 1, 2016 – December 31, 2019.
3. *Developing global maps of algal blooms in large freshwater lakes since 1985*, Google Earth Engine, \$50,000, May 1, 2015 – April 30, 2018.
4. *Extension of Data Assimilation and Mapping Projects to Ingest Data from OCO-2*, Principal Investigator, NASA OCO-2 Science Team Program, \$168,784, April 1, 2015 – March 31, 2018.
5. *Atmospheric Carbon and Transport – America*, Co-Investigator, with K.J. Davis (PI, Penn State University) and many others, NASA Earth Venture Suborbital – 2 program, \$30M, February 1, 2015 – January 31, 2020.
6. *Multi-scale Synthesis and Terrestrial Model Intercomparison Project (MsTMIP) Phase II* Co-Investigator, with D.N. Huntzinger (PI, Northern Arizona University (NAU)), Y. Fang (Co-I, Carnegie Institution for Science (CIS)), Y. Wei (Co-I, Oak Ridge National Laboratory (ORNL)), K. Schaefer (National Snow and Ice Data Center (NSIDC)), C. Schwalm (Co-I, NAU), J. Fisher (Co-I, JPL), A. Jacobson (Co-I, NOAA ESRL), and R. Cook (Co-I, ORNL), NASA Carbon Cycle Science Program, \$1,599,833, June 1, 2014 - May 31, 2017.
7. *Regional Inverse Modeling in North and South America for the NASA Carbon Monitoring System* Co-Investigator, with A. Andrews (PI, NOAA ESRL) J. Miller (Co-I, NOAA ESRL), C. O'Dell (Co-I, Colorado State University (CSU)), T. Nehrkorn (Co-I, Atmospheric & Environmental Research, Inc. (AER)), and M. Mountain (Co-I, AER), NASA Carbon Monitoring System Program, \$828,164, October 1, 2014 – September 30, 2017.
8. *Extension of Data Assimilation and Mapping Projects to Ingest Data from OCO-2* Principal Investigator, with V. Yadav (Co-I, JPL), NASA Science Team for the OCO-2 Mission program, \$265,949, January 1, 2013, - December 31, 2017.
9. *SI2-SSI: Real-Time Large-Scale Parallel Intelligent CO<sub>2</sub> Data Assimilation System* Principal Investigator, with V. Yadav (Co-PI, JPL), C. Scott (Co-PI, University of Michigan (UM)), M. Cafarella (Co-PI, UM), X. Nguyen (Co-PI, UM), K. Lefevre (Co-PI, UM), NSF Software Infrastructure of Sustained Innovation Program, \$1,914,243, September 15, 2010, to August 31, 2017.

### Prior Funding

1. *WSC: Category 2: Extreme Events Impacts on Water Quality in the Great Lakes: Prediction and Management of Nutrient Loading in a Changing Climate*, PI, with 11 Co-PIs and 15 other investigators, NSF Water Sustainability and Climate Program, \$4,992,916, January 1, 2011, to September 30, 2016.
2. *CO<sub>2</sub>.0: Assessing the Impact of a Combined in Situ and Satellite CO<sub>2</sub> Monitoring Network on Constraining Biospheric and Anthropogenic Fluxes for North America*, PI, with V. Yadav (Co-I, UM), T. Erickson (Co-I, Michigan Tech Research Institute), NASA Atmospheric CO<sub>2</sub> Observations from Space program, \$751,718, 9/01/2010 – 9/11/2015.



3. *Multivariate Data Fusion and Uncertainty Quantification for Remote Sensing*, Co-I with A. Braverman (PI, JPL) and N. Cressie (Co-I, Ohio State University (OSU)), NASA Advanced Information Systems Technology program, \$1,496,280, 06/01/2012 – 05/31/2015.
4. *Modeling Activities in Support of ASCENDS Satellite Design*, PI, NASA, \$154,396, 09/19/2011 – 09/18/2014.
5. *PECASE Extension to Mapping Global CO<sub>2</sub>: Development and Application of Geostatistical Algorithms for Gap Filling and Uncertainty Assessment for the Orbiting Carbon Observatory*, PI, NASA, \$198,613, 04/01/2008 – 03/31/2014.
6. *The North American Carbon Program (NACP) Multi-Scale Synthesis and Terrestrial Model Intercomparison Project*, PI, with D. Huntzinger (Sci-PI, UM), R. Cook (co-I, ORNL), W. Post (Co-I, ORNL), K. Schaefer (Co-I, NSIDC), A. Jacobson (Co-I, NOAA ESRL), NASA Terrestrial Ecology program, \$1,439,840, 03/15/2010 – 05/31/2014.
7. *CAREER: Development of Geostatistical Data Assimilation Tools for Water Quality Monitoring* PI, NSF Division of Chemical, Bioengineering, Environmental and Transport Systems (CBET), Directorate for Engineering (ENG), \$445,000, 07/01/2007 – 06/30/2014.
8. *North American regional-scale flux estimation and observing system design for the NASA Carbon Monitoring System*, Co-I, with A. Andrews (PI, NOAA ESRL), L. Bruhwiler (Co-I, NOAA ESRL), G. Petron (Co-I, NOAA ESRL), P. Tans (Co-I, NOAA ESRL), J. Eluszkiewicz (Co-I, AER), E. Novakovskaia (Co-I, Earth Networks, Inc.), C. O'Dell (Co-I, CSU), NASA Carbon Monitoring System program, \$367,745, 07/01/2012 – 12/31/2013.
9. *Kalman-Filtered Compressive Sensing for High Resolution Estimation of Anthropogenic Greenhouse Gas Emissions from Sparse Measurements*, Co-I, with J. Ray (PI, Sandia National Laboratories (SNL)), B.G. Van Bloemen Waanders (Co-I, SNL), S.A. McKenna (Co-I, SNL), DOE Sandia National Laboratories, Laboratory Directed Research and Development Program, \$1,839,000, 10/01/2010 – 9/30/2013.
10. *Exploring the Potential of Remotely Sensed Chlorophyll Fluorescence to Evaluate Terrestrial Ecosystem Models*, Co-I with C. Frankenberg (PI, JPL), J. Berry (Co-I, CIS), C. Field (Co-I, CIS), J. Fisher (Co-I, JPL), and C. Miller (Co-I, JPL), NASA Jet Propulsion Laboratory Strategic University Research Partnership, \$100,000, 06/24/2012 – 06/23/2013.
11. *Carbon Monitoring System Science Definition Team Membership*, PI, NASA Carbon Monitoring System program, \$34,623, 04/17/2011 – 10/16/2012.
12. *Role of Diesel and Other Vehicular Exhaust in Exacerbation of Childhood Asthma*, Co-I with T.G. Robins (PI, UM), S. Batterman (Co-I, UM), B. Israel (Co-I, UM), T. Lewis (Co-I, UM), and E. Parker (Co-I, UM), NIH, \$3,986,456, 07/01/2007 – 06/30/2012.
13. *Diagnosing the Effects of Climatic Variability on Ecosystem-Atmosphere Exchange of CO<sub>2</sub>*, PI with S. Wofsy (PI, Harvard), DOE National Institute for Climate Change Research, \$250,000, 04/01/2009 – 11/30/2011.
14. *Supplement to CAREER: Development of Geostatistical Data Assimilation Tools for Water Quality Monitoring*, PI, NSF Division of Chemical, Bioengineering, Environmental and Transport Systems (CBET), \$25,523, 10/1/2008 – 03/31/2012.
15. *Geostatistical Data Fusion for Remote Sensing Applications*, Co-I with A. Braverman (PI, JPL), and N. Cressie (Co-I, OSU), NASA Advanced Information Systems Technology, \$1,300,000, 03/1/2009 – 02/28/2012.
16. *Mapping Global CO<sub>2</sub>: Development and Application of Geostatistical Algorithms for Gap Filling and Uncertainty Assessment for the Orbiting Carbon Observatory*, PI with N. Cressie (Co-I, OSU), A. Braverman (Co-I, JPL), NASA Carbon Cycle Science, \$807,562, 04/1/2008 – 03/31/2013.
17. *Feasibility of Geostatistical Carbon Dioxide Data Assimilation using Data from OCO*, PI, NASA Jet Propulsion Laboratory (JPL), \$62,500, 03/15/2009 – 03/14/2011

18. *Constraining North American Fluxes of CO<sub>2</sub> and Inferring Their Spatiotemporal Covariances through Assimilation of Remote Sensing and Atmospheric Data in a Geostatistical Framework*; PI, with A. Hirsch (Co-I, NOAA ESRL), J.C. Lin (Co-I, U. Waterloo), A. Andrews (Co-I, NOAA ESRL), NASA North American Carbon Program, \$815,649, 09/01/2006 – 08/31/2010.
19. *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*, PI, NASA, \$25,948, 06/01/2008 – 08/31/2010.
20. *The Detroit Asthma Morbidity, Air Quality and Traffic (DAMAT) Study*, Co-PI, with R. Wahl (PI, Michigan Department of Community Health), S. Batterman (Co-PI, UM), E. Wasilevich (Co-PI, Michigan Department of Community Health), M.L. Hultin (Co-PI, Michigan Department of Environmental Quality), B. Mukherjee (Co-PI, UM), K. Dombkowski (Co-PI, UM), EPA G2007 STAR A1, \$500,000, 09/01/2007 – 08/31/2010.
21. *Conceptual Design of the WATer and Environmental Research Systems Network (WATERS Network)*, Senior Investigator, with J. Dozier (University of California, Santa Barbara, PI), J.B. Braden (Co-PI, University of Illinois at Urbana Champaign (UIUC)), R.P. Hooper (Co-PI, CUAHSI), B.S. Minsker (Co-PI, UIUC), J.L. Schnoor (Co-PI, University of Iowa), and 13 other senior investigators, NSF, \$750,000, 10/01/2008- 03/31/2010.
22. *Sampling and Inversion Methods for Quantifying Effect of Incomplete Subsurface Characterization on Uncertainty Associated with Recovery of Contamination History*, PI, NSF Division of Chemical, Bioengineering, Environmental and Transport Systems (CBET), \$179,996, 09/01/2006 – 08/31/2009.
23. *REU supplement for Grant 0607002 “Sampling and Inversion Methods for Quantifying Effect of Incomplete Subsurface Characterization on Uncertainty Associated with Recovery of Contamination History”*, PI, NSF Division of Chemical, Bioengineering, Environmental and Transport Systems (CBET), \$5,885, 01/01/2007 – 08/31/2009.
24. *Development of a Subsampling Strategy for the Orbiting Carbon Observatory Satellite*, PI, NASA Jet Propulsion Laboratory (JPL), \$108,456, 05/08/2006 – 09/30/2008.
25. *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-I with C. Miller (PI, JPL) and A. Braverman (Co-I, JPL), NASA Jet Propulsion Laboratory Strategic University Research Partnership, \$50,000, 03/08/2007 – 09/05/2008.
26. *Geostatistical Analysis of NOAA Climate Monitoring and Diagnostics Laboratory Carbon Dioxide Data for 1997-2001*, PI, NOAA Climate Monitoring and Diagnostics Laboratory, \$96,500, 07/15/2005 – 09/30/2007.
27. *Use of Remote Sensing Data and Geostatistical Inverse Modeling for Validating Process-based Parameterizations in Biospheric Models*, PI, NASA Michigan Space Grant Consortium, \$10,000, 07/01/2006 – 06/30/2007.
28. *Geostatistical Analysis of the Spatial Covariance Structure of Modeled Column Average Dry Air Carbon Dioxide Mole Fraction Distributions*, PI, NASA Jet Propulsion Laboratory, \$10,984, 08/24/2005 – 07/31/2006.
29. *Auxiliary Environmental Data Assimilation in Geostatistical Inverse Modeling*, PI, Elizabeth Caroline Crosby Research Fund, NSF ADVANCE at the University of Michigan, \$20,000, 05/01/2005 – 04/30/2006.
30. *Quantification of Global Sources and Sinks of Methane Using Geostatistical Inverse Modeling*, PI, UCAR Visiting Scientist Programs, NOAA Postdoctoral Program in Climate & Global Change, \$96,000, 05/01/2003 – 04/30/2005, Declined remaining support starting 07/2004.

## PUBLICATIONS

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**Journal Publications** (double underline denotes Michalak group students, dashed underline denotes Michalak group postdoctoral and other researchers)

**2017**

1. Zheng, Y., N. Unger, J.M. Tadić, R. Seco, A.B. Guenther, M.P. Barkley, M.J. Potosnak, L. Murray, A.M. Michalak, X. Qiu, S. Kim, T. Karl, L. Gu, S.G. Pallardy (*in press*) "Drought impacts on photosynthesis, isoprene emission and atmospheric formaldehyde in a mid-latitude forest," *Atmospheric Environment*.
2. Schwalm, C.R., W.R.L. Anderegg, A.M. Michalak, J.B. Fisher, F. Biondi, G. Koch, M. Litvak, K. Ogle, J.D. Shaw, A. Wolf, D.N. Huntzinger, K. Schaefer, R. Cook, Y. Wei, Y. Fang, D. Hayes, M. Huang, A. Jain, H. Tian (2017) "Global patterns of drought recovery," *Nature*, 548 (7666), 202–205, doi:10.1038/nature23021
3. Sinha, E., A.M. Michalak, V. Balaji (2017) "Eutrophication will increase during the 21st century as a result of precipitation changes," *Science*, 357 (6349), 405-408, doi:10.1126/science.aan2409.
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## Book Chapters, Conference Proceedings, and Other Significant Publications

1. National Academies of Sciences, Engineering, and Medicine (2016) *From Maps to Models: Augmenting the Nation's Geospatial Intelligence Capabilities*, Washington, D.C.: The National Academies Press, doi:10.17226/23650.
2. Michalak, A.M. (2013) "Atmospheric observations and inverse modeling approaches for identifying geographical sources and sinks of carbon", in *Land Use and the Carbon Cycle: Advances in Integrated Science, Management, and Policy*, pp. 144-177, edited by D.G. Brown, D.T. Robinson, N.H. French, and B.C. Reed, Cambridge University Press, New York, NY.
3. Michalak, A., D. Huntzinger, G. Shrestha (2013) "Progress and Future Directions in North American Carbon Cycle Science," *EOS Transactions, American Geophysical Union*, 94(20), 184, doi:10.1029/2013EO200004.
4. Michalak, A.M., R. Jackson, G. Marland, C. Sabine, and the Carbon Cycle Science Working Group (2011) "A U.S. Carbon Cycle Science Plan," a report of the University Corporation for Atmospheric Research, Boulder, Colorado, <https://www.carboncyclescience.us/USCarbonCycleSciencePlan-August2011>
5. 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.
6. Erickson, T.A., J.C. Lin, A.M. Michalak (2009) "A data system for visualizing 4-D atmospheric CO<sub>2</sub> models and data," in Proceedings of the Free and Open Source Software for Geospatial (FOSS4G) conference, Sydney, Australia, October 2009.
7. 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 7<sup>th</sup> International Symposium on Ecohydraulics, and the 8<sup>th</sup> International Conference on Hydroinformatics, ISE-3A6-ENV7, Concepción, Chile.
8. Body of Knowledge Committee of the Committee on Academic Prerequisites for Professional Practice (2008), "Civil Engineering Body of Knowledge for the 21<sup>st</sup> 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.
9. 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.
10. 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.
11. 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 37<sup>th</sup> *Mid-Atlantic Industrial & Hazardous Waste Conference*, pp. 86-92, edited by G.A. Sorial and A. Bagtzoglou, Cincinnati, Ohio.
12. 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.

13. 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.
14. 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.
15. 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.
16. 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.
17. 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.
18. 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.
19. 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.

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**INVITED PRESENTATIONS** (selected; major conference plenary or keynote addresses marked with \*)

***2017 and upcoming***

1. \* Michalak, A.M., Plenary lecture to be presented to the Society for Industrial and Applied Mathematics (SIAM) Imaging Science conference, University of Bologna, Italy, June 2018.
2. Michalak, A.M., V. Balaji, D. Del Giudice, J.C. Ho, E. Sinha, Y. Zhou "Are extreme hydro-meteorological events a prerequisite for extreme water quality impacts? Exploring climate impacts on inland and coastal waters," Invited talk to be presented at the American Geophysical Union Fall Meeting, New Orleans, Louisiana, December 2017.
3. Michalak, A.M. "Exploring climate impacts on inland and coastal waters," Invited talk to be presented at the 9<sup>th</sup> US Symposium on Harmful Algae, Baltimore, Maryland, November 2017.
4. Michalak, A.M., Invited talk to be presented at the Berkeley Geography Colloquium, Berkeley, California, September 2017.
5. \* Michalak, A.M., "From 'missing sink' to process understanding: The expanding role of top-down studies in carbon cycle science," Keynote address to be presented at the Fourth International Conference on Earth System Modelling, Hamburg, Germany, August/September 2017.

6. \* Michalak, A.M., “Missing sink or moving target? The expanding landscape of top-down studies in carbon cycle science,” Keynote address to be presented at the 10<sup>th</sup> International Carbon Dioxide Conference (ICDC10), Interlaken, Switzerland, August 2017.
7. Michalak, A.M., “Key opportunities and challenges in using space-based observations for greenhouse gas flux estimation at regional to global scales,” Invited talk presented at the 13<sup>th</sup> International Workshop on Greenhouse Gas Measurements from Space (IWGGMS), Helsinki, Finland, June 2017.
8. Michalak, A.M., “Moving from quantity to quality: Exploring climate impacts on inland and coastal waters,” Invited talk presented at the Geophysical Fluid Dynamics Laboratory seminar series, Princeton, New Jersey, March 2017.

### **2016**

9. Michalak, A.M. “Inverse problems for process understanding in carbon cycle science,” Invited talk presented to the Society for Industrial and Applied Mathematics (SIAM) Imaging Science conference, Albuquerque, New Mexico, May 2016.
10. Michalak, A.M. “The role of sustained observations in the US Carbon Cycle Science Plan,” Invited talk presented to the Workshop on Sustained Observations for Carbon Cycle Science and Decision Support, NOAA Earth System Research Laboratory, Boulder, Colorado, April 2016.
11. Michalak, A.M. “Statistical and computational challenges of constraining greenhouse gas budgets,” Invited seminar presented to the Computational Infrastructure for Geodynamics webinar series, University of California at Davis, California, March 2016.
12. Michalak, A.M. “Atmosphere as an integrator of the carbon cycle system,” Invited talk presented to the Development of Predictive Carbon Cycle Science workshop, College Park, Maryland, March 2016.

### **2015**

13. Michalak, A.M. “The North American Carbon Program: It take a village,” Invited talk presented at the American Geophysical Union Fall Meeting, San Francisco, California, December 2015.
14. Michalak, A.M. “Level 3 constraint provided by OCO-2,” Invited talk presented at the OCO-2 Science Team Meeting, Pasadena, California, November 2015.
15. Michalak, A.M. “Convergence of data-intensive and numerically intensive computing in environmental modeling and inverse problems,” Invited talk presented at the White House National Strategic Computing Initiative Workshop, McLean, Virginia, October 2015.
16. Michalak, A.M. “A bird’s eye view of the carbon cycle: Using the atmosphere to inform processes at the land surface,” seminar presented to the Biogeochemical Signals seminar series, Max Planck Institute for Biogeochemistry, Jena, Germany, May 2015.
17. \* Michalak, A.M. “Closing science gaps: Bridging across scales and integrating across platforms,” Plenary talk presented to the NASA Carbon Cycle & Ecosystems Joint Science Workshop, College Park, Maryland, April 2015.
18. Michalak, A.M. “Inverse methods,” Invited talk presented to the NRC Committee on Models of the World, Washington, D.C., March 2015.
19. Michalak, A.M. “Extremes in Lake Erie in the 2010s,” Invited talk presented at the 2015 Science-Policy Confluence Conference: Great Lakes Nutrient Management & Water Quality, Environmental Law & Policy Center, Chicago, Illinois, March 2015.

20. \* Michalak, A.M. “Statistical and computational challenges of constraining greenhouse gas budgets,” Plenary talk presented at the SIAM Conference on Computational Science and Engineering, Salt Lake City, Utah, March 2015.
21. Michalak, A.M. “The promise of OCO-2 in addressing new questions in carbon cycle science,” Invited talk presented at the OCO-2 Science Team meeting, California Institute of Technology, Pasadena, California, February 2015.
22. Michalak, A.M. “A bird’s eye view of the carbon cycle: Using the atmosphere to inform processes at the land surface,” presented to the Harvard Atmospheric Sciences Seminar Series, Cambridge, Massachusetts, February 2015.
23. \* Michalak, A.M. “The view from above: How have atmospheric observations informed our understanding of the North American carbon cycle?” Plenary talk presented to the North American Carbon Program (NACP) All Investigators’ Meeting, Washington, D.C., January 2015.

#### **2014**

24. Michalak, A.M., Y. Fang, V. Yadav, S. Gourjji, K.L. Mueller “Environmental controls on CO<sub>2</sub> flux variability across spatial and temporal scales,” Invited talk presented at the American Geophysical Union Fall Meeting, San Francisco, California, December 2014.
25. Michalak, A.M., J. Ray, Y.P. Shiga, V. Yadav “Assessing regional anthropogenic emissions from observations of atmospheric CO<sub>2</sub>,” Invited talk presented at the American Geophysical Union Fall Meeting, San Francisco, California, December 2014.
26. Michalak, A.M., “The \*est: Extremes in Lake Erie in the 2010s,” seminar presented to the Environmental Engineering Seminar Series, University of California at Berkeley, November 2014.
27. Michalak, A.M., “The 2011/2012 one-two punch to Lake Erie: Impacts of agricultural management and meteorological trends on eutrophication,” seminar presented to the Environmental & Water Studies Summer Program seminar series, Stanford University, Stanford, California, July 2014.
28. \* Michalak, A.M., D.R. Obenour, Y. Zhou “Statistical approaches for assessing and predicting hypoxic extent,” Keynote address presented at the Computational Methods in Water Resources XX. International Conference, University of Stuttgart, Germany, June 2014.
29. Michalak, A.M., “A bird’s eye view of the carbon cycle: Using the atmosphere to inform processes at the land surface,” seminar presented to the Yale School of Forestry & Environmental Studies Seminar Lecture Series, Yale University, New Haven, Connecticut, February 2014.
30. Michalak, A.M., “The 2011/2012 one-two punch to Lake Erie: Impacts of agricultural management and meteorological trends on eutrophication,” seminar presented to the Yale School of Forestry & Environmental Studies, Yale University, New Haven, Connecticut, February 2014.
31. 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, District of Columbia, January 2013.

## 2013

32. Michalak, A.M., Y. Fang, S.M. Miller, J. Ray, Y.P. Shiga, V. Yadav, J. Zscheischler, “Targeting patterns: A path forward for uncertainty quantification in carbon cycle science?” Abstract GC34C-04 presented at 2013 Fall Meeting, AGU, San Francisco, California, December 2013.
33. Michalak, A.M., “A Bird's-Eye View of the Carbon Cycle: Using the atmosphere to inform processes at the land surface,” Seminar presented to The Centre for Global Change Science, University of Toronto, Toronto, Canada, October 2013.
34. Michalak, A.M., “The 2011/2012 one-two punch to Lake Erie: Impacts of agricultural management and meteorological trends on eutrophication,” Seminar presented to Center for Applied Geoscience, University of Tübingen, Tübingen, Germany, October 2013.
35. Michalak, A.M., “Large scale inverse problems in quantifying emissions and uptake of atmospheric greenhouse gases,” Seminar presented to the Water Earth System Science competence cluster and the Integrated Hydrosystem Modelling International Research Training Group, University of Tübingen, Tübingen, Germany, October 2013.
36. Michalak, A.M., “A Bird's-Eye View of the Carbon Cycle: Spatiotemporal Tools for Constraining the CO<sub>2</sub> Budget from Atmospheric Observations,” Invited talk presented at the Joint Statistical Meeting, Montréal, Canada, August 2013.
37. Michalak, A.M., “Big data meets big models in carbon cycle science: Spatiotemporal tools for constraining the CO<sub>2</sub> budget from atmospheric observations,” Invited talk presented at the Workshop on Large-Scale Inverse Problems and Quantification of Uncertainty: Big Data Meets Big Models, Santa Fe, New Mexico, May 2013.
38. Michalak, A.M., “A bird’s eye view of the carbon cycle: Using the atmosphere to inform processes at the land surface,” Seminar presented to the Atmosphere and Energy Program, Department of Civil and Environmental Engineering, Stanford University, Stanford, California, May 2013.
39. Michalak, A.M., “Big data meets big models in carbon cycle science,” Invited talk presented at the UC Davis Statistical sciences symposium 2013: Analysis of complex and Massive Data, April 2013.
40. \* Michalak, A.M., “State of the carbon cycle (NACP and GCP): Have components and their uncertainties changed over time?” Invited plenary talk presented at the NASA Terrestrial Ecology meeting, La Jolla, California, April 2013.
41. Michalak, A.M., “Big data meets big models in carbon cycle science,” Invited talk presented at the Society for Industrial and Applied Mathematics (SIAM) Computational Sciences conference, Boston, Massachusetts, February 2013.
42. \* Michalak, A.M., “Mapping NACP progress onto long-term carbon cycle science goals,” Invited plenary talk presented at the 4<sup>th</sup> North American Carbon Program All-Investigators Meeting, Albuquerque, New Mexico, February 2013.
43. 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, District of Columbia, January 2013.



## 2012

44. Michalak, A.M., M. Goeckede, S.M. Gourdji, D. Huntzinger, S.M. Miller, K. Mueller, V. Yadav “Informing improvements to terrestrial biogeochemical models through statistical integration of environmental datasets,” Abstract B34B-07 presented at 2012 Fall Meeting, AGU, San Francisco, California, December 2012.
45. Michalak, A.M., “A bird’s eye view of the carbon cycle,” Invited talk presented at opening workshop for the Program on Statistical and Computational Methodology for Massive Datasets, Statistical and Applied Mathematical Science Institute, Raleigh, North Carolina, September 2012.
46. \* Michalak, A.M., “A bird’s eye view of the carbon cycle: Geostatistical approaches for constraining the CO<sub>2</sub> budget from atmospheric observations,” Invited plenary talk presented at the 9<sup>th</sup> Conference on Geostatistics for Environmental Applications (GeoENV), Valencia, Spain, September 2012.
47. Michalak, A.M., “A bird’s eye view of the carbon cycle,” Invited talk presented at New Methods for Measurements of Photosynthesis from Space, Keck Institute for Space Studies, Caltech, Pasadena, California, August 2012.
48. Michalak, A.M., “A bird’s eye view of the carbon cycle,” Invited talk presented at Lawrence Livermore National Laboratory, Livermore, California, May 2012.
49. 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.
50. 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.
51. 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.
52. 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

53. 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 CO<sub>2</sub> budget from atmospheric observations,” Abstract H11J-03 presented at 2011 Fall Meeting, AGU, San Francisco, California, December 2011.
54. 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, District of Columbia, December 2011.
55. 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.
56. 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.

57. 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.
58. 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.
59. Michalak, A.M., “Assimilations and inversions from simulated measurements of CO<sub>2</sub> mixing ratio: A pro-typical example,” Invited talk presented at the ASCENDS (Active Sensing of CO<sub>2</sub> Emissions over Nights, Days, and Seasons) workshop, Greenbelt, Maryland, April 2011.
60. Michalak, A.M., “Assimilations and inversions from simulated measurements: Issues, approaches, and value,” Invited talk presented at the ASCENDS (Active Sensing of CO<sub>2</sub> Emissions over Nights, Days, and Seasons) workshop, Greenbelt, Maryland, April 2011.
61. 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.
62. 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.
63. \* 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.
64. 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**

65. 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.
66. 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.
67. \* 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.
68. 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.
69. 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.
70. 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.

71. 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.
72. 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.
73. \* Michalak, A.M. “Overview of Research in Carbon Cycle Science,” Invited plenary talk presented at the NASA Terrestrial Ecology meeting, LaJolla, California, March 2010.
74. Michalak, A.M. “Monitoring Future Climate Treaties,” Invited public panel presentation at the *Quantifying the Sources and Sinks of Atmospheric CO<sub>2</sub>* workshop, Keck Institute for Space Studies, California Institute of Technology, Pasadena, California, March 2010.
75. Michalak, A.M., P. Rayner “Overview of top-down methods,” Invited presentation at the *Quantifying the Sources and Sinks of Atmospheric CO<sub>2</sub>* workshop, Keck Institute for Space Studies, California Institute of Technology, Pasadena, California, March 2010.

## 2009

76. 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.
77. 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.
78. Michalak, A.M. “Mapping Global CO<sub>2</sub> using AIRS data,” Invited talk presented at the Atmospheric Sounding Science Team Meeting, Greenbelt, Maryland, October 2009.
79. Michalak, A.M. “Modeling studies in support of the development of the ASCENDS instrument,” Invited talk presented at the 3<sup>rd</sup> International Workshop on CO<sub>2</sub> Active Remote Sensing by DiAL, Hampton, Virginia, October 2009.
80. Michalak, A.M. “Prior Error Structures,” Invited talk presented at the TransCom 2009 meeting, Jena, Germany, September 2009.
81. 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.
82. 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.
83. 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.
84. 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.

85. 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.
86. 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.
87. 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.
88. \* 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.
89. 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.
90. 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**

91. Michalak, A.M., K. Mueller, V. Yadav, A. Alkhaled, Y. Zhou, S. Gourdjji, 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.
92. 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.
93. 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.
94. 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.
95. Michalak, A.M. “Determining regional emissions patterns of non-CO<sub>2</sub> greenhouse gases,” Invited talk presented at the *Spatial and Temporal Distributions of Sources of non-CO<sub>2</sub> Greenhouse Gases (CH<sub>4</sub>, CO, N<sub>2</sub>O) over North America* Workshop, Boulder, Colorado, October 2008.
96. Michalak, A.M., “Atmospheric CO<sub>2</sub> and ASCENDS Science Background,” Invited plenary talk presented at the NASA ASCENDS Community Workshop, University of Michigan, Ann Arbor, Michigan, July 2008.

97. 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.
98. Michalak, A.M., A.A. Alkhaled, N. Cressie, A. Braverman, S.R. Kawa, S.C. Olsen, J.-W. Wang, "Mapping global CO<sub>2</sub>: 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**

99. Michalak, A.M., K. Mueller, S.M. Gourdjij, A. Hirsch, A.E. Andrews, J.C. Lin, and T. Nehrkorn, "Bridging across spatial and temporal scales in North American CO<sub>2</sub> 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.
100. 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.
101. 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.
102. 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.
103. 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.
104. \* 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**

105. 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.
106. Michalak, A.M., "Application of Geostatistical Tools for Quantifying Complexity and Uncertainty in Environmental Systems," Invited talk presented at the *IHR Hydroscience & Engineering seminar series*, University of Iowa, Iowa City, Iowa, March 2006.
107. 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.

108. Michalak, A.M., “Quantifying the Spatial Covariance Structure of Modeled X<sub>CO2</sub> 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.
109. 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**

110. 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.
111. 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.
112. 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.
113. 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.
114. 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.
115. 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.

#### **1999-2004**

116. 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<sub>2</sub> Observations in North America* workshop, Boulder, Colorado, October 2004.
117. 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.
118. 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.

119. 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.
120. Michalak, A.M., “Approaches to Contaminant Source Identification for Environmental Law Enforcement,” Invited talk presented at the *Environmental Crime Prevention Program (ECP) Plenary Inter-Ministerial Meeting*, EPA Region 2 Headquarters, New York City, New York, November, 2000.
121. 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**

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Contributed published abstracts and conference presentations are not listed for brevity.