

PROMOTION RECOMMENDATION
The University of Michigan
College of Engineering

Approved by the Regents
May 14, 2009

Anna M. Michalak, assistant professor of civil and environmental engineering, Department of Civil and Environmental Engineering, and assistant professor of atmospheric, oceanic and space sciences, Department of Atmospheric, Oceanic and Space Sciences, College of Engineering, is recommended for promotion to associate professor of civil and environmental engineering, with tenure, Department of Civil and Environmental Engineering, and associate professor of atmospheric, oceanic and space sciences, without tenure, Department of Atmospheric, Oceanic and Space Sciences, College of Engineering.

Academic Degrees:

Ph.D.	2003	Stanford University, Civil and Environmental Engineering, Palo Alto, CA
M.S.	1998	Stanford University, Civil and Environmental Engineering, Palo Alto, CA
B.Sc.	1997	University of Guelph, Environmental Engineering, Ontario, Canada

Professional Record:

2005-Present	Assistant Professor, Atmospheric, Oceanic and Space Sciences, University of Michigan
2004-Present	Assistant Professor, Civil and Environmental Engineering, University of Michigan
2003-2004	NOAA Climate and Global Change Postdoctoral Fellow, NOAA Climate Monitoring and Diagnostics Laboratory, Boulder, Colorado

Summary of Evaluation:

Teaching: Professor Michalak is an excellent teacher who demonstrates a commanding grasp of a challenging subject. Her teaching responsibility has included three courses: CEE 270 (490) – Statistical Methods for Data Analysis and Uncertainty Modeling; CEE 570/NRE 569 – Introduction to Geostatistics; and CEE 682 – Inverse Problems in Environmental Science and Engineering. Professor Michalak, in her passion for her work, boldly developed this series of classes for our curriculum to fill a recognized gap. Professor Michalak has consistently demonstrated her strength as a teacher by earning Q1 and Q2 averages of 4.3 and 4.7, respectively. It is fitting that Professor Michalak's achievements as a valued teacher were honored recently with the 2008 Association of Environmental Engineering and Science Professors (AEESP) Outstanding Educator Award (a national award, received by one person annually). Professor Michalak manages a very large research group and has done so with an eye toward excellence at every turn. She has graduated one Ph.D. student who she co-advised, and is on target for graduating two more Ph.D. students (sole advisor) during Winter 2009. She is advising five additional Ph.D. students. Three of these Ph.D. students completed M.S. degrees under Professor Michalak's guidance. She has mentored six undergraduate students on research projects that are very focused and contribute to the broader work of her group. Professor Michalak is committed to their professional development, responsive and focused on helping her students develop their professional network.

Research: Professor Michalak is credited with being a researcher solely responsible for bringing advanced geostatistical methods to bear on the globally challenging problem of understanding how carbon dioxide (CO₂) sources and sinks influence atmospheric CO₂ levels. Her Ph.D. work originally focused on groundwater transport processes and then shifted her application of geostatistical tools to atmospheric carbon modeling during her post-doctoral studies. In doing so, she transformed the state of science in how one approaches atmospheric CO₂ modeling. She has remained well recognized in both the ground water transport modeling and atmospheric carbon modeling communities. She received an NSF CAREER Award for her work on quantifying uncertainty in determining the concentration of

groundwater contamination sources using a novel numerical modeling approach. When Professor Michalak turned to apply these tools to atmospheric carbon modeling, she redefined how to manage data in order to produce reliable predictions of the state of the atmosphere's carbon. This application has opened Professor Michalak up to large dollar grant opportunities associated with global carbon cycle modeling using CO₂ data collected from space. Professor Michalak's trademark has become the introduction of new techniques that allow one to quantify answers for problems that are otherwise highly variable and hard to manage. Her impact on the field has been recognized with an invited talk at the February 2009 American Association for the Advancement of Science (AAAS) meeting. Professor Michalak has been very successful at acquiring funding to support her research in both groundwater and atmospheric carbon cycle modeling. Her publications are widely received and appear in the top journals in her field. To date, she has published 21 journal papers, two book chapters, eight conference proceedings papers and more than 40 refereed conference abstracts. Approximately half of her journal papers are published with her advisees. She has been invited to give over 30 talks nationally and internationally. Professor Michalak has been highly successful at acquiring external research funding, and many of those projects are very collaborative with multiple PIs. She has been part of \$8.0 million in research as PI or co-PI with \$2.4 million as her responsible share.

Recent and Significant Publications:

- K. Mueller, S. Gourjji, and A. M. Michalak (2008) "Globally monthly-averaged CO₂ fluxes recovered using a geostatistical inverse modeling approach: 1. Results using atmospheric measurements," *Journal of Geophysical Research – Atmospheres*, doi:10.1029/2007JD009734.
- S. Gourjji, K. Mueller, K. Schaefer, and A. M. Michalak (2008) "Global monthly-averaged CO₂ fluxes recovered using a geostatistical inverse modeling approach: 2. Results including auxiliary environmental data," *Journal of Geophysical Research – Atmospheres*, doi:10.1029/2007JD009733.
- A. M. Michalak (2008) "A Gibbs sampler for inequality-constrained geostatistical interpolation and inverse modeling," *Water Resources Research*, 44(9):W09437, doi:10.1029/2007WR006645.
- S. Shlomi, 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(3):W03412, doi:10.1029/2006WR005121.
- A. M. Michalak, 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(D24):D24107, doi:10.1029/2005JD005970.
- A. M. Michalak, 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.

Service: Professor Michalak's service record is very strong and she has been honored with requests to serve at the national level. Outside the University, Professor Michalak is currently serving as the co-chair of the scientific steering committee for the upcoming NASA Active Sensing of CO₂ Emissions over Night (ASCENDS) satellite mission. Most significantly, she recently became the co-chair of the committee assembled to develop the U.S. Carbon Cycle Science Plan that will guide federally-sponsored research in carbon cycling for the next decade. Her service as co-chair on this committee (assembled once a decade) as an assistant professor is unprecedented and speaks volumes of her reputation and recognition as a leader within the carbon cycle community. In addition, she is an associate editor for *Water Resources Research*, one of the premier journals in the groundwater transport field. Professor Michalak has also committed herself to educational service by volunteering to co-author the section pertaining to statistics education in the recently released Body of Knowledge II, which defines academic prerequisites for the civil engineering discipline. Within the University, Professor Michalak's contribution to service within the department, college and university have been excellent, including a commitment to enhancing diversity within the college.

External Reviewers:

Reviewer A: "I would say that at this early stage of her career, her influence on the community is highly exceptional, and in many ways comparable to well recognized senior scientists... ."

Reviewer B: "Dr. Michalak has the knowledge and ability that has allowed her to single-handedly raise the standard of statistical analysis of CO₂ data."

Reviewer C: "Into this relative static industry Professor Michalak has injected a geostatistical approach that could lead to step-wise, and not incremental, advances in our hunt for CO₂ sources and sinks."

Reviewer D: "I have closely interacted with one of Dr. Michalak's PhD students who visited my research Center...two year[s] ago to conduct laboratory studies in a three-dimensional synthetic aquifer. I am very much impressed with the research training and academic preparation this student has received under Dr. Michalak."

Reviewer E: "...I think her work on geostatistical interpolation and inverse modeling (Michalak 2008a, b) will have considerable impact on the field."

Reviewer F: "Dr. Michalak's work is well known and highly respected within the international community. Her work has transformed the field... ."

Reviewer G: "I find it remarkable that a freshly minted academic had the wisdom and skill to be a NOAA Postdoctoral Fellow and move into an area so different from the groundwater domain of her graduate career."

Reviewer H: "Prior to the appearance of Anna Michalak on the scene, atmospheric inverse models seemed to be delivering diminishing returns. Global models were essentially incapable of utilizing new, high-resolution sources of data. ... Anna has set out to decisively change this whole field. She has developed a set of very innovative, adaptive approaches that utilize the tools of geostatistics... ."

Summary of Recommendation: Professor Michalak is an outstanding faculty member who has excelled in all areas of the academic profession: teaching, research, service. She is a clear leader in a very international field of researchers addressing complex, global issues. It is with the support of the College of Engineering Executive Committee that I recommend Anna M. Michalak for promotion to associate professor of civil and environmental engineering, with tenure, Department of Civil and Environmental Engineering, and associate professor of atmospheric, oceanic and space sciences, without tenure, Department of Atmospheric, Oceanic and Space Sciences, College of Engineering.



David C. Munson, Jr.
Robert J. Vlasic Dean of Engineering
College of Engineering

May 2009