

SUSAN E. TOLWINSKI- WARD

Program in Applied Mathematics
University of Arizona
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EDUCATION

University of Arizona, Ph.D. Candidate in Applied Mathematics, degree completion expected Spring 2012

Dissertation: Assimilating Science-Based Information about Tree-Ring Width Formation into Probabilistic Reconstructions of Paleoclimate using Bayesian Hierarchical Models

Advisor: Dr. Mike Evans, Department of Geosciences, University of Maryland

University of Arizona, Ph.D. Minor in Atmospheric Science, expected Spring 2012

University of Arizona, M.A. in Applied Mathematics, December 2008

Recent Coursework: Numerical Methods, Real Analysis, Theoretical Probability, Theory of Statistics, Time Series Analysis, Dynamic Meteorology, Physical Mechanisms of Climate Change, Paleoclimatology, Stochastic Processes, Mesoscale Meteorological Modeling

Brown University, B.S. with Honors in Physics, May 2005

RESEARCH APPOINTMENTS AND PROJECTS

Dissertation Fellow, Fall 2011-Spring 2012

American Association of University Women

Visiting Scientist, Institute for Mathematics Applied to Geosciences, Summer 2011

National Center for Atmospheric Research, Boulder, CO

Graduate Research Assistant, Spring 2008-Spring 2010, Spring 2011

NSF-Collaboration in Mathematical Geosciences grant: Development of Bayesian Hierarchical Models to Reconstruct Climate over the Past Millennium

Supervisor: Dr. Michael Evans, University of Arizona Laboratory of Tree Ring Research, Tucson, AZ

Semester Research Project, Fall 2007

“Statistical Methods for the Geosciences and Beyond”

Supervisor: Dr. Xubin Zeng, Dept. of Atmospheric Sciences, University of Arizona

Semester Research Project, Spring 2007

“The Hilbert Transform and Huang’s Empirical Mode Decomposition as Tools for Data Analysis.”

Supervisor: Dr. Hermann Flaschka, Dept. of Mathematics, University of Arizona

Consultant to Division of Applied Mathematics, Summer 2006

Computational investigation of polymer dynamics.

Supervisor: Dr. Govind Menon, Brown University

Undergraduate Senior Thesis, 2004-2005 Academic Year

“Quantum Gravity vis Matrix Models and Bubbling AdS Spaces”

Advisor: Dr. Antal Jevicki, Department of Physics, Brown University

Research Experiences for Undergraduates, Summer 2004

“Lorentz-Violating Vector Fields Cause Anisotropic Expansion.”

Supervisor: Dr. Sean Carroll, Dept. of Physics, University of Chicago

Deep-Lensing Survey Research Group, Summers 2002 and 2003

Mapping of dark matter distributions based on gravitational lensing signal in deep-field telescope images.

Supervisor: Dr. Ian Dell’Antonio, Dept. of Physics, Brown University

AWARDS AND HONORS

American Association of University Women, American Dissertation Fellowship, Fall 2011-Spring 2012

University of Arizona College of Science, Galileo Circle Scholar (Nominating Department: Laboratory of Tree Ring Research, Spring 2011)

University of Arizona Department of Mathematics, Outstanding Scholarship Award, Spring 2011

University of Arizona College of Science, Galileo Circle Scholar (Nominating Department: Program in Applied Mathematics, Spring 2010)

University of Arizona Graduate College, Diversity Fellowship and Arizona Scholars Award, Fall 2006

Brown University Department of Physics, Mildred Widgoff Prize for outstanding presentation of senior thesis research, Spring 2005

Sigma Xi Research Society, Nominated as member, Spring 2004

PUBLICATIONS

Tolwinski-Ward, S.E., Tingley, M. P., M.N. Evans, A probabilistic technique for reconstructing local temperature and soil moisture using a nonlinear, biologically-motivated model of tree-ring width variability (*in prep.*)

Tolwinski-Ward, S.E., M.N. Evans, M.K. Hughes, K.J. Anchukaitis, An efficient forward model of the climate controls on interannual variation in tree-ring width, *Climate Dynamics* (2010), doi:10.1007/s00382-010-0945-5

PUBLISHED CODE

Tolwinski-Ward, S.E., *VS-Lite* model MATLAB code, documentation, Bayesian parameter calibration algorithm, and test data. Archived on the National Oceanic and Atmospheric Administration’s World Climate Data Center for Paleoclimatology Software Library, <http://www.ncdc.noaa.gov/paleo/softlib/softlib.html>

SELECTED TALKS AND PRESENTATIONS

American Geophysical Union Fall Meeting, December 8, 2011

Contributed Talk: “Probabilistic Bivariate Climate Reconstructions Using a Biologically-Motivated Model of Tree-Ring Width”

Session: Climate of the Common Era I, San Francisco, CA

Climate Seminar Series, October 11, 2011

Invited Talk: “Forward, Backward, Around and Through: Modeling the nonlinear relationship between tree-ring width and climate”

Earth and Planetary Sciences Department, Harvard University

- Workshop on Uncertainty Quantification for Climate Modeling**, August 29-31, 2011
Poster: “Inverting a Nonlinear Model of Tree-Ring Width to Reconstruct Past Temperature and Moisture”
Statistical and Mathematical Sciences Institute Opening Workshop, Pleasanton, CA
- PaleoCarbon Working Group Meeting**, May 5, 2011
Invited Talk: “Bayesian Inference Tutorial for PaleoCarbon Dynamicists”
Delivered via web-based conference call, working group of the Mathematics and Climate Research Network
- Modeling and Computation Seminar**, March 24, 2011
Talk: “Process-Based Climate Reconstructions from Tree-Ring Width”
Department of Mathematics, University of Arizona
- Bayesian Paleoclimate Workshop**, March 24, 2011
Talk: “(Mis)Adventures in Nonlinearity and Nonstationarity: Modeling the Relationship between Climate and Tree-Ring Width”
National Center for Atmospheric Research, Boulder, CO
- Uncertainty Quantification Group seminar**, February 4, 2011
Talk: “Introduction to Particle Filtering”
Department of Mathematics, University of Arizona
- SAMSI Paleoclimate Working Group Meeting**, November 4, 2010
Invited Talk: “Toward Process-Based Modeling of Tree-Ring Width for Bayesian Climate Reconstructions”, given via web-based conference call to the Statistical and Mathematical Sciences Institute Paleoclimate Working Group
- 11th International Meetings of Statistical Climatology**, July 12-16, 2010
Contributed Talk: “Toward Process-Based Modeling of Tree-Ring Width for Bayesian Climate Reconstructions”, Edinburgh, Scotland
- Workshop on Data Hierarchies for Climate Modeling**, May 24-28, 2010
Poster: “An Efficient Forward Model of Tree Ring Width Formation for Bayesian Climate Reconstructions”
Institute for Pure and Applied Mathematics, Los Angeles, CA
- Climate Change Workshop**, February 17-19, 2010
Poster: “An Efficient Forward Model of Tree Ring Width Formation for Bayesian Climate Reconstructions”
Statistical and Mathematical Sciences Institute, Research Triangle Park, NC
- Applied Mathematics Brown Bag Seminar**, November 20, 2009
Talk: “Monte Carlo Markov Chain Methods 101”
Department of Mathematics, University of Arizona
- Uncertainty Quantification Group seminar**, February 6, 2009
Talk: “The Axiomatic Basis of Bayesian Decision Theory”
Department of Mathematics, University of Arizona
- Los Alamos Days Conference**, January 30, 2009
Talk: “Mechanistic Forward Models in Bayesian Hierarchies for Better Climate Reconstruction”
Arizona State University, Phoenix AZ

TEACHING EXPERIENCE

Graduate Mentor, Spring 2011

Mentored a small group of undergraduate math majors in MATH 485, Mathematical Modeling.
Guided a project on the effects of pathogen mutation on the spread of epidemics in small-world networks, including a literature search, simulation development, paper-writing, and oral and poster presentations.
Department of Mathematics, University of Arizona

Graduate Instructor, Fall 2010

Taught one section of MATH 263, Introduction to Statistics and Biostatistics.
Created lectures, lesson plans, testing materials, and evaluated student performance.
Department of Mathematics, University of Arizona

Graduate Super-TA, Fall 2007

Ran review and homework sessions for MATH 583, Principles and Methods of Applied Mathematics.
Department of Mathematics, University of Arizona

High School Physics and Astronomy Teacher, 2005-2006 Academic Year.

Designed curricula for introductory physics course as well as a pilot course teaching introductory physics through applications in astronomy and cosmology. Lectured, ran labs and astronomical observing nights, held office hours, wrote exams and evaluated student performance.
Concord Academy, Concord, Massachusetts

Physics Instructor and Science Project Coordinator, Summer 2005.

Taught and mentored students through science in a college preparatory program for first-generation college-bound youth.
Upward Bound Program, Simmons College, Boston, Massachusetts

Physics Tutor, 2003-2005 Academic Years.

Courses tutored: Topics in Modern Physics, Introduction to Electricity and Magnetism, Advanced Mechanics, Quantum Mechanics.
Department of Physics, Brown University.

OUTREACH AND SYNERGISTIC ACTIVITIES

Organizer for Uncertainty Quantification Journal Club, Academic Year 2011-2012

Started, organized, and ran a journal club on quantitative uncertainty quantification methods
Department of Mathematics, University of Arizona

Mentor for Arizona Assurance Program, Academic Year 2010-2012

Mentor two undergraduate freshmen women each year who plan to major in STEM fields through the Arizona Assurance Scholars program for Arizona students from low-income backgrounds.
University of Arizona

Graduate Representative, Academic Year 2009-2010

Elected graduate representative by students in Interdisciplinary Program in Applied Mathematics. In this role, proposed, developed and organized "Class-to-Class Meetings," an informal peer advising system

which has since become an institutionalized part of the applied math graduate program education.
Program in Applied Mathematics, University of Arizona

“Big Sister”, January 2008-June 2010

Mentored a Tucson high-school student whose goal was being the first in her family to attend college.
Big Brother Big Sister of Tucson

Member and Webmaster, Uncertainty Quantification Group, Spring 2009 -present

Active member of group meetings and research discussions, and group webmaster.
Department of Mathematics, University of Arizona

Organizer, Bayesian Study Group, Spring & Summer 2009

Ran an informal study group to read about, discuss, and learn the theory of Bayesian statistics.
Department of Mathematics, University of Arizona

Society in Industrial and Applied Mathematics (SIAM), Tucson Chapter, 2007-Present

Helped organize research talks by professional industrial and applied mathematicians to expose mathematics students to varied career possibilities.
Department of Mathematics, University of Arizona

Physics Affinity Group Leader, Women in Science and Engineering Club (WiSE), 2003-2005

Organized faculty research talks, graduate student panels, discussion groups, peer advising system for Brown physics majors. Chosen by the Dean of Science to represent Brown at a national conference for Women and Minorities in engineering, Las Vegas, April 2005
Department of Physics, Brown University

PROFESSIONAL AFFILIATIONS/SERVICE

Affiliations: American Geophysical Union, Society for Industrial and Applied Mathematics

Referee/Reviewer for: *Climate Dynamics*, *Climate of the Past*

COMPUTING SKILLS

Scientific programming experience in MATLAB and Fortran, trained in theory of numerical methods; experience running the Weather Research and Forecasting (WRF) Model on a parallel computing architecture; basic knowledge of CSS, HTML web design, and R Statistical Software. Comfortable on Macintosh, PC and Unix platforms.