

Jared Whitehead

2860 East Hall

530 Church St.

Ann Arbor, MI 48109

jaredwh@umich.edu

Education

- **B.S. Mathematics**, Brigham Young University, April 2006 (Magna Cum Laude).
 - Graduate with University Honors
- **PhD Candidate in Applied and Interdisciplinary Mathematics**, University of Michigan.
 - Expected date of graduation (December 2011).
 - Academic Advisors: Charles R. Doering, (734) 936-2913, doering@umich.edu.
Richard Rood, (734) 647-3530, rbrood@umich.edu.
Christiane Jablonowski, (734) 763-6238, cjablono@umich.edu.

Teaching Experience

- **Graduate Student Instructor: delivered lectures, held office hours, graded homework and assisted in grading uniform exams**
 - Calculus I (MATH 115), University of Michigan Fall 2007.
 - Calculus I (MATH 115), University of Michigan Winter 2007.
 - Pre-Calculus (MATH 105), University of Michigan Fall 2006.
- **Graduate Student Instructor: delivered technology based lectures, held office hours, graded homework and assisted in grading uniform exams**
 - Multivariable Calculus (MATH 215), University of Michigan Fall 2008.
 - Elementary Linear Algebra (MATH 343), Brigham Young University Winter 2006.
- **Grader: Graded homework and occasionally assist grading quizzes/mid-terms**
 - University of Michigan:
 - Advanced Ordinary Differential Equations (MATH 558: Fall 2011, 2010, 2009).
 - Methods of Applied Math II: Asymptotic Analysis (MATH 557: Winter 2011, 2010).
 - Stochastic Processes (MATH 526: Fall 2011).
 - Brigham Young University: Calculus I, Multivariable Calculus, Introduction to Analysis, Elementary Linear Algebra.

Research Interests: I am interested in the dynamics of fluid flow. I use numerical simulations (and the available tools of numerical analysis), asymptotics, the calculus of variations, and other methods inherent to applied mathematics to gain physical insight into the dynamic interactions thought to describe the evolution of a fluid. Thus far my research has focused on two regions of what is commonly referred to as geophysical fluid dynamics: 1) Rigorous bounds on the transport of heat in, and numerical simulation of, idealized convective processes. 2) Analysis of the accuracy and reliability of general circulation models meant to describe the motion of the earth's atmosphere.

Refereed Publications

In preparation:

1. *The logarithm persists: infinite Prandtl number convection with mixed thermal boundary conditions* (with C. R. Doering and R. Wittenberg).
2. *Rigid bounds on convective heat transport with non-rigid boundaries* (with C. R. Doering).
3. *Potential Vorticity: a diagnostic tool for General Circulation Models* (with C. Jablonowski, J. Kent, and R. B. Rood).
4. *The impact of vertical resolution on tracer transport in a finite volume dynamical core* (in revision for publication at Monthly Weather Review, with J. Kent, C. Jablonowski, and R. B. Rood).

Published:

5. *The ultimate regime of two-dimensional Rayleigh-Benard convection with stress-free boundaries* (with C. R. Doering) Physics Review Letters, Vol. 106, 244501,p1-p4 (2011).
6. *Internal heating driven convection at infinite Prandtl number* (with C. R. Doering) Journal of Mathematical Physics, Vol. 52, 093101, 11 pages (2011).
7. *A stability analysis of divergence damping on a latitude-longitude grid* (with C. Jablonowski, R. B. Rood, and P. H. Lauritzen) Monthly Weather Review, Vol. 139, No. 9, 2976—2993 (2011).
8. *Asymptotic values, pre-poles, and periodic points* (with L. Bakker) International Journal of Bifurcations and Chaos, Vol. 20, No 4 (2010).

Other Publications

1. *Topics in geophysical fluid dynamics* (November 2011) Phd Dissertation, University of Michigan.
2. *Topological bifurcations of Julia sets* (April 2006) Brigham Young University Honors Thesis.

Selected Presentations

1. *The Ultimate State of Two-dimensional Rayleigh Benard Convection between Free-Slip Fixed-Temperature Boundaries*, APS Division of Fluid Dynamics Meeting, Baltimore, MD, USA (November 2011).
2. *Bounds on Heat Transport for Fixed Flux Thermal Boundary Conditions at Infinite Prandtl Number*, SIAM Partial Differential Equations Meeting, San Diego, CA, USA (November 2011).
3. *Internal heating driven convection at Infinite Prandtl number*, Incompressible Fluids, Turbulence and Mixing, Carnegie Mellon University, Pittsburgh, PA, USA (October 2011).
4. *Bounds on the turbulent transport of heat driven by an internal heat source*, International Congress on Industrial and Applied Mathematics, Vancouver, BC, Canada (July 2011).
5. *Bounds on the turbulent transport of heat at infinite Prandtl number with no-slip boundaries* (March 2011), Midwest PDE, Urbana-Champaign, IL, USA.
6. *Bounds on the transport of heat in Rayleigh Benard convection* (February 2011), University of Michigan student AIM seminar, Ann Arbor, MI, USA.
7. *A generalized Hardy-Rellich inequality and improved bounds for convection driven by internal heating* (November 2010), University of Michigan SIAM Student Conference, Ann Arbor, MI, USA.
8. *A stability analysis of divergence damping on a latitude-longitude grid* (August 2010), Partial Differential Equations on the Sphere, Potsdam, Germany.

9. *The Mathematics of climate change* (October 2008 and October 2009), Student applied and interdisciplinary mathematics seminar, University of Michigan, Ann Arbor, MI, USA.
10. *Functional representation of families of minimal surfaces* (March 2005) Intermountain Sectional Meeting of the Mathematical Association of America, Pocatello, ID, USA.
11. Topological bifurcations of Julia sets (March 2005 and March 2006) Brigham Young University Spring Research Conference, Provo, UT, USA.

Posters (1st author only)

1. *Evaluating the impact of dissipative subgrid-scale mixing processes in the dynamical cores of NCAR's Community Atmosphere Model*, DOE-BER PI meeting, Washington, D.C., USA (September 2011).
2. *Potential Vorticity: a diagnostic tool for General Circulation Models*, Michigan Geophysical Union student poster competition, Ann Arbor, MI, USA (March 2011).
3. *Divergence damping: is additional diffusion good for stability?*, Michigan Geophysical Union student poster competition, Ann Arbor, MI, USA (March 2010).

Workshops/Conferences Attended (without presenting)

- Workshop on 'Analysis and Computation of Incompressible Fluid Flow', Institute for Mathematics and its Applications (February 2010).
- Workshop on Analysis of Fluid Stability, University of Edinburgh (June 2009), primary organizers: Susan Friedlander, Rich Kerswell & Jacques Vanneste.
- SIAM Conference on Applications of Dynamical Systems (May 2009).
- Workshop on Reducing the Uncertainty in the Prediction of Global Warming, Institute for Advanced Studies, Hebrew University (January 2009), primary organizers: Isaac Held & Eli Tziperman.
- MSRI 'The Mathematics of Climate Change' (July 2008), primary organizers: Chris Jones & Mary Lou Zeeman.
- NCAR ASP 'Summer Colloquium on Numerical Techniques for Global Atmospheric Models' (June 2008), primary organizers: Christianne Jablonowski & Peter Lauritzen.
- Lipschitz Lecture at the Hausdorff Center for Mathematics, University of Bonn, Germany (April-May 2007). "Advection, Convection and Turbulent Transport of Heat, Mass and Momentum," Charles R. Doering.

Academic Honors

- 2nd Place Michigan Geophysical Union Poster competition, March 2010.
- **Orson Pratt Award**, April 2005 (Outstanding Senior in Mathematics Department, Brigham Young University).
- **Session Winner** for the Spring Research Conference, March 2006, Brigham Young University.

Non-academic Work Experience

MIT Lincoln Laboratories Summer Internship: May 2006-August 2006.

Supervisor: Dale G. Fried (781) 981-6806, dgf@ll.mit.edu.

National Security Agency: Director's Summer Program, Summer 2005:

Applications of the Calculus of Variations and Numerical Methods in Matlab