

KATHARINE F. GURSKI

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RESEARCH INTERESTS

Modeling physical and industrial problems using analytical and computational techniques.

EDUCATION

Ph.D. in Applied Mathematics, University of Maryland, College Park, August 1999

Thesis Title: Decay Rates of Internal Waves in Viscous Near-Critical Fluids

Advisor: Professor Robert Pego

M.S. in Applied Mathematics, University of Illinois at Urbana-Champaign, 1991

M.S. in Physics, University of Illinois at Urbana-Champaign, 1989

B.S. in Physics, Emory University, Atlanta, Georgia 1987, Summa Cum Laude

RESEARCH EXPERIENCE

National Research Council Research Associate NIST, Gaithersburg

January 2001 - present

Working with G.B. McFadden analyzing the effect of anisotropic surface energy on the Rayleigh instability with applications to nanowires and other rods. Modeling three-dimensional dendritic crystal growth using axisymmetric boundary integral method and iterative solvers.

Postdoctoral Fellow

NASA Goddard Space Flight Center

Contracting agencies:

November 2000 - December 2000

University of Maryland, Baltimore County

October 2000

Caelum Research Corporation

August 1999 - September 2000

Universities Space Research Association

Developed an approximate Riemann solver for ideal magnetohydrodynamics (MHD) based on the HLLC method for gas dynamics. The goal was to find a physically accurate and robust computational method for the model that has both extremely high particle velocities and very low particle density. Tested on the multidimensional problem with split magnetic fields and Lorentz equations working with D.S. Spicer for the problem of solar wind impinging on the Earth's magnetosphere.

Extended analytical results of internal gravity wave mode studies from dissertation work for general geophysical stratified fluids for 1-D (and 3-D) viscous stratified fluid in a layer (closed container).

Graduate Research Assistant

University of Maryland, College Park

May 1998 - August 1998, May 1997 - December 1997, May 1996 - August 1996

Modeled decay rates of internal waves in density stratified viscous critical fluids using asymptotic analysis and numerical computation. With operator-theoretic results, proved the existence of zero damping modes and determined that the internal waves are strongly damped as the fluid approaches the critical temperature.

Industrial Mathematical Modeling Workshop Institute for Mathematics and Its
July 22-31, 1998 Applications, University of Minnesota

Determined the necessary addition rates of silver and bromide solutions in a double jet reactor for the growth of uniform silver halide crystals for improved film quality.

Industrial Mathematical Modeling Workshop North Carolina State University
August 3-13, 1997 Center for Research in Scientific Computation

Studied the effect of noise and bias on an inverse problem pertaining to the extraction of meteorological data from a GPS measured projectile trajectory.

Mathematical Modeling Workshop Claremont Graduate School, California
June 5-15, 1994

Modeled the condensation process in an effort to improve the efficiency of heat transfer in power condenser designs.

Graduate Research Assistant University of Illinois, Urbana-Champaign
January 1989 - May 1990, June 1988 - August 1988

Designed and implemented software in FORTRAN to detect equipment faults in the trigger of the Stanford Linear Detector (SLD); translated SLD electronics environment monitor code from 8051 ASSEMBLER into C.

Department of Energy Summer Coop Lawrence Berkeley Laboratory
June 1987 - August 1987 Berkeley, California

Developed graphics application for streamer chamber track reconstruction to aid scanners; created program to graphically reconstruct 3-D trajectories from 2-D photographs.

TEACHING EXPERIENCE

Instructor of Mathematics Marymount University, Arlington, Virginia
January 2003 - May 2003

Teaching Intermediate Algebra.

Graduate Teaching Assistant University of Maryland, College Park
August 1991 - May 1997

Taught Finite Mathematics as principal instructor. Led recitations for Business Calculus I, Calculus I, and Linear Algebra. Used cooperative learning to teach Calculus II. Graded the undergraduate courses for Business Calculus II, Differential Equations, Analysis I, Computational Methods, and PDEs. Graded the graduate courses for Methods and Models in Applied Mathematics, Numerical Analysis I and II.

Graduate Teaching Assistant University of Illinois, Urbana-Champaign
August 1988 - December 1988, August 1987 - May 1988

Taught recitation and laboratory for Introduction to Modern Physics and Senior Modern Physics Laboratory.

Undergraduate Teaching Assistant Emory University, Atlanta, Georgia
September 1985 - May 1986, September 1986 - December 1986

Taught General Physics I and II laboratories.

COMPUTER EXPERIENCE

Programming experience in C, FORTRAN 77 and 90, BASIC, QuickBASIC, 8051 ASSEMBLER, FASTBUS, Mathematica, MATLAB, IDL, DCL, and RDB using UNIX, VMS, and Windows operating systems. Experience with HTML and LaTeX.

PUBLICATIONS

- *The Effect of Contact Lines on the Rayleigh Instability with Anisotropic Surface Energy*, (with G.B. McFadden and M.J. Miksis), in preparation.
- *Slow Damping of Internal Waves in Stably Stratified Fluid*, (with R. Kollar and R. L. Pego), submitted to Proceedings of the Royal Society of London.
- *The Effect of Anisotropic Surface Energy on the Rayleigh Instability*, (with G.B. McFadden), submitted to Proceedings of the Royal Society of London.
- *An HLLC-type Approximate Riemann Solver for Ideal Magnetohydrodynamics*, submitted to SIAM Journal of Scientific Computing.
- *The Effect of Anisotropic Surface Energy on the Rayleigh Instability*, (with G.B. McFadden), National Institute of Standards and Technology, Internal Report #6892 (2002).
- *Normal Modes for a Stratified Viscous Fluid Layer*, (with R. L. Pego), Royal Society of Edinburgh, 132A, pp. 1-15, 2002.
- *Decay Rates of Internal Waves in a Fluid Near the Liquid-Vapor Critical Point*, (with R. L. Pego), Physical Review E, July 1, 2000, Volume 62, Number 1, pp. 517-524.
- *Decay Rates of Internal Waves in Viscous Near-Critical Fluids*, Ph. D. thesis, June 1999.
- *Determining Addition Rates for the Growth of Uniform Silver Halide Crystals*, (with D. Ambrose, C.G. Fournelle, D. Peng, V. Shekhar, and V. Varghese), Proceedings for the Mathematical Modeling in Industry Workshop for Graduate Students, Institute for Mathematics and Its Applications, July 22-31 1998.
- *Extracting Meteorological Data from a Projectile Trajectory*, (with P. Hagerty, M. Hasson, M. Moisan, and C. Perez), Proceedings for the Industrial Mathematics Modeling Workshop for Graduate Students, Editor J. Scroggs, Center for Research in Scientific Computation, August 3-13, 1997.
- *Improved Estimation of Heat Transfer Characteristics of a Power Condenser*, (with A. Crowe, J. Pelesko, and J. Spencer), Proceedings for the Claremont Colleges Mathematics Modeling Workshop for Graduate Students, June 5-15, 1994.
- *Percolation in Correlated Growth Clusters*, undergraduate honors thesis, May 1987 .

NONTECHNICAL PUBLICATIONS

- *Hints for Finding Non-Academic Research Positions (Postdoctoral and Permanent)*, Association for Women in Mathematics Newsletter, Vol. 31, No. 5, September-October 2001, pp.17-19.
- *WIM Talk Series*, Association for Women in Mathematics Newsletter, Vol. 27, No. 3, May-June 1997, p. 9.

HONORS AND AWARDS

National Research Council Research Associate Fellowship, Phi Beta Kappa, Phi Sigma Iota, Phi Sigma Tau

INVITED PRESENTATIONS

- Fifteenth American Conference on Crystal Growth and Epitaxy, Keystone, CO, July 2003.
- Department of Engineering Sciences and Applied Mathematics Colloquium, Northwestern University, November 4, 2002.
- Department of Mathematics and Statistics Seminar, University of Maryland Baltimore County, October 28, 2002.
- Material Science Department Bag Lunch Seminar, NIST, October 17, 2002.
- Special Session on Real World Applications of Mathematics (sponsored by Project NExT), AMS Spring Southeastern Meeting, Atlanta, GA, March 2002.
- Mathematical and Computational Sciences Division Colloquium, NIST, November 13, 2001.
- Department of Mathematical Sciences Colloquium, George Mason University, Fairfax, VA, November 9, 2001.
- AWM Career Minisymposium, SIAM Annual Meeting, San Diego, CA, July 10, 2001.
- Laboratory for Computational Physics Seminar, Naval Research Laboratory, Washington, D. C. , October 30, 2000.
- Computational Modeling Seminar, NASA Goddard Space Flight Center, August 31, 2000.
- AWM Postdoctoral Workshop at SIAM Annual Meeting, San Juan, PR, July 10, 2000.
- Department of Mathematics and Statistics Seminar, University of Maryland Baltimore County, October 8, 1999.
- Center for Excellence in Space Data and Information Science Seminar, NASA Goddard Space Flight Center, September 7, 1999.
- AWM Graduate Student Workshop at SIAM Annual Meeting, Atlanta, GA, poster presentation, May 14, 1999.
- President's Commission on Women's Issues, 25th Anniversary Celebration, University of Maryland College Park, poster presentation, March 29, 1999.
- Applied Mathematics Department Seminar, SUNY Stony Brook, February 17, 1999.
- Special Project for Nonlinear Science Seminar, Naval Research Laboratory, February 16, 1999.
- Mathematics Department Seminar, Michigan Technological University, January 28, 1999.
- Acoustics and Electromagnetics Group Seminar, Johns Hopkins University Applied Physics Laboratory, January 14, 1999.

CONTRIBUTED PRESENTATIONS

- Mathematical and Computational Sciences Division Open House, NIST, May 16, 2002.
- Sigma Xi Postdoctoral Poster Presentation, NIST, February 28, 2002.
- APS Division of Computational Physics Conference, Boston, MA, June 25, 2001.
- AMS Annual Meeting, Washington, DC, January 20, 2000.
- USRA Science Council at CESDIS, December 9, 1999.
- APS Division of Fluid Dynamics Conference, New Orleans, LA, November 21, 1999.
- SIAM Annual Meeting, Atlanta, GA, poster presentation, May 13, 1999.

PROFESSIONAL MEMBERSHIPS

Society for Industrial and Applied Mathematics (SIAM), American Physical Society (APS), American Mathematical Society (AMS), Association for Women in Mathematics (AWM)

ADDITIONAL CONFERENCES AND WORKSHOPS

- AMS Annual Meeting, Baltimore, MD, January 2003.
- SIAM Annual Meeting, Philadelphia, PA, July 2002.
- APS Division of Fluid Dynamics Conference, San Diego, CA, November 2001.
- APS Division of Fluid Dynamics Conference, Washington, DC, November 2000.
- SIAM Annual Meeting, San Juan, PR, July 2000.
- IMA Workshop on Atmospheric Modeling, Institute for Mathematics and Its Applications, University of Minnesota, Minneapolis, MN, March 2000.
- AMS Short Course on Environmental Mathematics, Washington, DC, January 2000.
- SIAM Northeast Regional Mathematics in Industry Workshop, Worcester Polytechnic Institute, Worcester, MA, May 1998.
- AMS Short Course on Singular Perturbations, Baltimore, MD, January 1998.

SERVICE

- Participated in Career Day Panel at Marymount University, Arlington, VA, March 5, 2002.
- Mentoring graduate students through the Association for Women in Mathematics 2001-2003.
- Creator of Women In Mathematics (WIM) graduate student talk series in 1993. Co-chair of series in 1993-1994, 1996-1999.