

# JOSEPH A. BIELLO

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**Employment** UNIVERSITY OF CALIFORNIA, DAVIS, Davis, CA  
Assistant Professor July 2005 - present

COURANT INSTITUTE, NYU (CIMS), New York, NY  
Research Scientist July 2003 - June 2005

RENSSELAER POLYTECHNIC INSTITUTE (RPI), Troy, NY  
Vigre Postdoctoral Fellow September, 2000 - June 2003

**Education** UNIVERSITY OF CHICAGO, Chicago, IL  
Ph.D. in Astrophysics March, 2001

UNIVERSITY OF CAMBRIDGE, Cambridge, United Kingdom  
Honours Pass, Part III of the Mathematics Tripos June, 1995

COLUMBIA UNIVERSITY, COLUMBIA COLLEGE, New York, NY  
A.B., Magna Cum Laude, Phi Beta Kappa May, 1994

## Awards and Grants

NSF DMS-0604947, PRINCIPAL INVESTIGATOR: J.A. BIELLO  
“Multiscale Asymptotics and PDEs for Tropical Atmospheric Dynamics” 2006-2009

MCCORMICK FELLOWSHIP  
University of Chicago 1995-1997

NATIONAL SCIENCE FOUNDATION GRADUATE FELLOWSHIP  
Universities of Cambridge and Chicago 1994-1997

I.I. RABI FELLOWSHIP  
Columbia University 1990-1994

## Scientific Program Organization/Participation

MATHEMATISCHES FORSCHUNGSINTITUT OBERWOLFACH, GERMANY  
Mathematical Theory and Modeling in Atmosphere/Ocean Science  
Workshop Participant August, 2006  
Workshop Participant August, 2002

NCAR IMAGE THEME OF THE YEAR, BOULDER, CO  
EMERGING MATHEMATICAL STRATEGIES FOR MULTI-SCALE AND STOCHASTIC MODEL-  
ING OF THE ATMOSPHERE AND CLIMATE,  
Workshop Participant 2005-2006

GEOPHYSICAL FLUID DYNAMICS SUMMER SCHOOL  
Woods Hole Oceanographic Institution  
Visiting Scientist 2001, 2003, 2005  
Graduate Assistant 1998  
Graduate Fellow 1996  
Summer Student Fellow 1994

IPAM WORKSHOP, UCLA  
MODERN APPLIED MATHEMATICS FOR ATMOSPHERE OCEAN SCIENCE,  
Postdoctoral Assistant July 2003

SIAM CONFERENCE ON APPLICATIONS OF DYNAMICAL SYSTEMS, SNOWBIRD UTAH  
Minisymposium Organizer: Recent Results on the Fermi-Pasta-Ulam Problem  
May 2003

INTERNATIONAL SCHOOL OF PHYSICS, ENRICO FERMI, VARENNA, ITALY  
Student Participant July 1999

LUNAR AND PLANETARY INSTITUTE, JOHNSON SPACE CENTER  
Summer Intern June-August, 1993

## Publications

Biello, J.A., A.J. Majda & M.W. Moncrieff, "Meridional momentum flux and superrotation in the multiscale IPESD MJO model" *J. Atmos. Sci.* (in press).

Biello, J.A. & A.J. Majda, "Modulating synoptic scale convective activity and boundary layer dissipation in the IPESD models of the Madden-Julian Oscillation", *Dyn. Atmos. Oceans* (in press).

Biello, J.A. & A.J. Majda, "Transformations for temperature flux in multiscale models of the Tropics" troposphere", *Theor. Comp. Fluid Dyn.* (online first: 10.1001/s00162-006-0021-1)

Biello, J.A. & A.J. Majda, "A new Multiscale Model for the Madden-Julian Oscillation", *J. Atmos Sci.* **62** pp 1694-1721 (2005).

Majda, A.J. & J.A. Biello, "A Multiscale Model for Tropical Intraseasonal Oscillations", *P. Natl. Acad. Sci. USA* **101** pp 4736-4741 (2004).

Biello, J.A. & A.J. Majda, "The Effect of Meridional and Vertical Shear on the Interaction of Equatorial Baroclinic and Barotropic Rossby Waves", *Stud. Appl. Math.* **112** (4) pp 341-390 (2004).

Biello, J.A. & A.J. Majda, "Boundary Layer Dissipation and the Nonlinear Interaction of Equatorial Baroclinic and Barotropic Rossby Waves", *Geophys. Astro. Fluid.* **98** (2), pp 85-127 (2004).

Dimonte G, Youngs DL, Dimits A, Weber S, Marinak M, Wunsch S, Garasi C, Robinson A, Andrews MJ, Ramaprabhu P, Calder AC, Fryxell B, Biello J, Dursi L, MacNeice P, Olson K, Ricker P, Rosner R, Timmes F, Tufo H, Young YN, Zingale M, "A comparative

study of the turbulent Rayleigh-Taylor instability using high-resolution three-dimensional numerical simulations”, *Phys. Fluids*, **16** (5), 1668-1693 (2004).

Majda, A.J. & J.A. Biello, “The Nonlinear Interaction of Barotropic and Equatorial Baroclinic Rossby Waves”, *J. Atmos. Sci.* **60** (15) pp 1809-1821 (2003).

Biello, J.A., P. Kramer & Y. Lvov, “The stages of energy transfer in the FPU problem”, *Discrete Contin. Dyn. Syst.* (2003) suppl., 482-491

Kramer, P, J.A. Biello, & Y. Lvov, “Application of weak turbulence theory to FPU model” *Discrete Contin. Dyn. Syst.* (2003) suppl., 113-122.

Biello, J.A. “Layer Formation in Semiconvection”, Ph.D. Dissertation, Department of Astrophysics University of Chicago, (not refereed).

Biello, J.A., K.I. Saldanha & N.R. Lebovitz, “Instabilities of exact, time-periodic solutions of the incompressible Euler equations” *J. Fluid Mech.* **404** pp 269-287 (2000).

Balmforth, N.J. & J.A. Biello “Double Diffusive Instability in a tall thin slot”, *J. Fluid Mech* **375** pp 203-233 (1998).

Biello, J.A., “Aspects of double diffusion in a thin slot” *Woods Hole Oceanog. Inst. Tech Rept.*, WHOI-97-10, pp 196-215 (1997), (not refereed).

Zhao, H.S., R.M. Rich & J.A. Biello “Proper Motion Anisotropy, Rotation and the Shape of the Galactic Bulge” *Astrophys. J.* **470** 506-512 (1996).

## Invited Presentations

A NEW MULTI-SCALE MODEL FOR THE MADDEN-JULIAN OSCILLATION  
Mathematisches Forschungsinstitut Oberwolfach, Germany August, 2006  
Courant Institute, NYU, Colloquium in Atmosphere-Ocean Science, December, 2004

ROSSBY WAVE INTERACTION CONNECTING THE TROPICS AND MIDLATITUDES:  
A NEW ASYMPTOTIC THEORY AND SOLITARY WAVES  
Canadian Mathematical Society Winter Meeting, Victoria, BC December, 2005  
SIAM Nonlinear Waves and Coherent Structures, Orlando, Florida October, 2004

PDES AND ASYMPTOTICS FOR THE TROPICAL ATMOSPHERE  
University of California, Davis, Math Grad Student Seminar November, 2005  
University of California, Davis, Atmospheric Sciences October, 2005  
Purdue University February, 2005  
Texas A&M January, 2005  
University of Utah January, 2005  
Florida State University January, 2005  
University of California, Davis, Mathematics Dep’t January, 2005  
Rensselaer Polytechnic Institute December, 2004

THE IPESD MJO MODELS  
NCAR IMAGE Theme of the Year September, 2005

THE NONLINEAR INTERACTION OF EQUATORIAL BAROCLINIC AND BAROTROPIC ROSSBY WAVES  
CMG-2004: Conference on Math. Geophysics, Columbia University June, 2004  
Courant Institute, NYU, Applied Mathematics Seminar October, 2003  
RPI Mathematics Colloquium November, 2002

University of Massachusetts at Amherst, Applied Math Seminar, October, 2002  
MFO, Oberwolfach, Germany August, 2002

STAGES OF ENERGY TRANSFER IN THE FPU MODEL  
SIAM Conference on Dynamical Systems, FPU Minisymposium, Snowbird, Utah  
May, 2003

NONCANONICAL HAMILTONIAN FORMULATION OF THE RIEMANN ELLIPSOIDS  
Brown University, Lefschetz Lecture April, 2002

LAYER FORMATION IN SEMICONVECTION  
Astrophysical Observatory of Arcetri Colloquium, Florence, Italy May, 2001  
Columbia University, Department of Applied Physics April, 2001  
RPI Mathematics Colloquium February, 2001

INSTABILITIES OF EXACT, TIME-PERIODIC SOLUTIONS OF THE INCOMPRESSIBLE EULER EQUATIONS  
Northwestern University Applied Mathematics Seminar April, 2000

### Contributed Presentations

THE IPESD MJO MODELS  
27th Conference on Hurricanes and Tropical Meteorology, Monterrey, CA April, 2006

STAGES OF ENERGY TRANSFER IN THE FPU PROBLEM  
4th Int. Conf. on Dynamical Systems and Differential Equations, UNC Wilmington  
May, 2002

NONCANONICAL HAMILTONIAN FORMULATION OF THE RIEMANN ELLIPSOIDS  
APS, DFD, 54th Annual Meeting, San Diego November, 2001  
Astromathematics: Conference in Honour of Ed Spiegel, Gubbio, Italy May, 2001  
APS, DFD, 53rd Annual Meeting, Washington November, 2000

LAYER FORMATION IN SEMICONVECTION  
VIGRE Applied Math Days, RPI October, 2000

INSTABILITIES OF EXACT, TIME-PERIODIC SOLUTIONS OF THE INCOMPRESSIBLE EULER EQUATIONS  
APS, DFD, 52nd Annual Meeting, New Orleans November, 1999

### Teaching Experience

ASSISTANT PROFESSOR:  
DEP'T OF MATHEMATICS, UNIVERSITY OF CALIFORNIA, DAVIS July 2005 - present  
Mathematics 21B (Integral Calculus), Mathematics 168 (Linear Programming)

LECTURER:  
DEP'T OF MATH. SCIENCES, RPI September 2000 - May 2003

Graduate Courses:  
Introduction to Mathematical Fluid Dynamics, Introduction to General Relativity  
Undergraduate Courses:

Ordinary Differential Equations, Multivariable Calculus and Linear Algebra

TEACHING ASSISTANT:

DEPARTMENT OF ASTRONOMY, UNIVERSITY OF CHICAGO                      Autumns, 1997, 1998  
Natural Sciences

INSTRUCTOR:

DEPARTMENT OF PHYSICS, COLUMBIA UNIVERSITY                      Summer, 1995  
Summer High School Program

SPECIAL NEEDS INSTRUCTOR:

DEPARTMENT OF MATHEMATICS, MOHAWK COLLEGE, HAMILTON, CANADA  
Summer, 1991

## Service Activities

### Professional

- referee for the Journal of the Atmospheric Sciences
- referee for NOAA CLIVAR program
- reviewer for MathRev
- member American Mathematical Society

### Committee appointments at UC Davis

- Graduate Group in Applied Mathematics Executive Committee
- Undergraduate Research Committee
- Qualifying/Thesis committee, Erwan Monier, Atmospheric Sciences

### Other activities at UC Davis

- participation in RFG, Surface Water Waves, with S. Shkoller, J. Hunter
- proposed and organized first GGAM Minisymposium (April 2006) to expose graduate students to research across departments
- mentoring 2 undergraduates in the Research Experiences for Undergraduates program
- designing and building fluid dynamics/wave laboratory
- developing a 280 class with T. Nathan (Atmospheric Science) on wave/mean flow interaction
- organized Applied Mathematics Seminar, Spring 2006

## In Progress

- The interaction of large scale tropical and midlatitude waves: the effect of thermal forcing, boundary layer drag and mean shears.
- On unified multiple scales approach for the tropical waveguide.
- Moisture feedback on the multiscale models of the Madden-Julian (tropical intraseasonal) oscillation. (A.J. Majda, B. Khouider).
- Buoyancy reversal at cloud boundaries (B. Stevens)
- Multi-scale modulation of the Hadley circulation (A.J. Majda).
- Hamiltonian reduction for ideal fluid ellipsoids (N.R. Lebovitz, P.J. Morrison).
- The effect of a small Prandtl number on layer formation and disruption in a thermally destabilized, density stable, double diffusive fluid using direct numerical simulation (F. Rubini).

- Hamiltonian formulation of the reversible 1 : 1 resonance.

## References

**Andrew J. Majda**, Morse Professor of Arts and Sciences  
Courant Institute of Mathematical Sciences, New York University  
(212) 998-3323  
majda@cims.nyu.edu

**Mitch Moncrieff**, Mesoscale & Microscale Meteorology Division  
National Center for Atmospheric Research  
(303) 497 8960  
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**Rupert Klein**, Professor, Free University of Berlin  
and Department Head, Potsdam Institute for Climate Impact Research  
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**Robert Rosner**, Director, Argonne National Laboratory  
and Professor, Enrico Fermi Institute, University of Chicago  
(773) 702-0560  
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**Norman Lebovitz** Professor, Department of Mathematics,  
The University of Chicago  
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**Gregor Kovacic**, Professor, Department of Mathematical Sciences,  
Rensselaer Polytechnic Institute  
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