# JORGE BALBÁS

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## EDUCATION

**University of California, Los Angeles**, California

Ph.D., Applied Mathematics, June 2004

- Dissertation: *Non-oscillatory central schemes for the equations of ideal magnetohydrodynamics in one- and two-space dimensions.*
- Advisor: Eitan Tadmor

M.A., Applied Mathematics, June 2000

B.S., Applied Mathematics, June 2000

## ACADEMIC POSITIONS

Assistant Professor, California State University, Department of Mathematics, Northridge, CA 91330

Assistant Professor (Post-doc.), University of Michigan, Department of Mathematics, Ann Arbor, MI 48109

VIGRE Assistant Professor, University of Michigan, Department of Mathematics, Ann Arbor, MI 48109

## PUBLICATIONS

- Jorge Balbás & Smadar Karni, *A Central Scheme for Two-Layer Shallow Water Flows with Area Variation* ,"Proceedings of the 9th international conference on Numerical Analysis and Applied Mathematics", American Institute of Physics, 1421 - 1424, 2009

- Jorge Balbás & Xin Qian, *Non-oscillatory Central Schemes for 3D Hyperbolic Conservation Laws*, "Proceedings of the 12th international conference on Hyperbolic Problems: Theory, Numerics and Applications", American Mathematical Society, 389 - 398, 2009

- X. Qian, J. Balbás, A. Bhattacharjee, & H. Yang *A Numerical Study of Magnetic Reconnection: A Central Scheme for Hall MHD*, "Proceedings of the 12th international conference in Hyperbolic Problems: Theory, Numerics and Applications", American Mathematical Society, 879 - 888, 2009

- J. Balbás and S. Karni, *A central scheme for shallow water flows along channels with irregular geometry*, M2AN, 43 (2): 333 - 351, 2009

- J. Balbás and E. Tadmor, *Non-oscillatory central schemes for one- and two-dimensional MHD equations. II: High-order semi-discrete schemes*, SIAM J. Sci. Comput., 28 (2):533-560, 2006

- J. Balbás, E. Tadmor, *A central differencing simulation of the Orszag-Tang vortex system*, 4th Triennial Special Issue of the IEEE Transactions on Plasma Science, 33 (2):470-471, April 2005

- J. Balbás, E. Tadmor, and C.C. Wu, *Non-oscillatory central schemes for one- and two-dimensional MHD equations. I*, J. of Comput. Phys., 201 (20):261-285, 2004

## MATHEMATICAL SOFTWARE

CENTPACK: *A Package of high-resolution central schemes for nonlinear conservation laws and related problems*, available at: www.cscamm.umd.edu/centpack/, July 2006

## RESEARCH INTERESTS

- Design, Analysis and Implementation of High Resolution Methods for PDEs
- Scientific Data Visualization
- Mathematical Aspects of Scientific Computing
- Non Linear Conservation Laws

## AWARDS AND HONORS

- NSF VIGRE Post-doctoral Fellowship, University of Michigan, 2004 – 2005
- NSF VIGRE Doctoral Fellowship, UCLA, 2000 – 2004
- Research Assistantship, UCLA, January 2003 – April 2003
- Graduated Cum Laude and with Highest Departmental Honors, UCLA Department of Mathematics, June 2000
- Daus Award, UCLA Department of Mathematics, 2000
- Aerojet Scholarship, UCLA Department of Mathematics, 1999
- Departmental Scholar Nomination, UCLA Department of Mathematics, 1998

## COLLOQUIUM AND SEMINAR TALKS

**2010:** CSUN, IPAM (UCLA).

**2009:** University of Michigan.

**2007:** University of Michigan, Cal State Polytechnic, San Luis Obispo, Cal State University, Northridge, University of Ontario Institute of Technology, and University of New Hampshire.

**2006:** University of Valencia (Spain), Universidad Autonoma de Madrid (Spain), Instituto de Astrofísica de Canarias (Spain), University of Utah.

**2005:** ETH (Zurich) and University of Michigan.

**2003:** University of California, Los Angeles.

## CONFERENCE TALKS AND PRESENTATIONS

- Towards a Kinetic Scheme for Shallow-Water Flows along Channels with Varying Geometry, Workshop on Modeling and Computations of Shallow-water Coastal Flows,Center for Scientific Computation and Mathematical Modeling, University of Maryland, College Park, MD, October 2010

- Steady-State Two-Layer Shallow-Water Flows with Area Variation, Model and Data Hierarchies for Simulating and Understanding Climate, Culminating conference, Institute for Pure and Applied Mathematics, University of California, Los Angeles, Lake Arrowhead, CA, June 2010
- A Central Scheme for Two-Layer Shallow Water Flows with Area Variation, 9th international conference on Numerical Analysis and Applied Mathematics', Crete (Grece), September 2009
- Central Schemes for Hyperbolic Conservation Laws in 3D Space, 12th International Conference on Hyperbolic Problems: Theory, Numerics, Applications, University of Maryland, College Park, June 2008
- *Central Schemes for Shallow Water Flows along Channels with Irregular Geometry*, 6th International Congress on Industrial and Applied Mathematics, Zurich (Swiztzerland), July 2007
- *A Central Scheme for Vlasov–Poisson and Euler–Poisson Plasmas*, SIAM Conference in Computational Science and Engineering, Costa Mesa, California, February 2007
- CENTPACK: *A Package of High-resolution Central Schemes for Nonlinear Conservation Laws and Related Problems*, Eleventh International Conference on Hyperbolic Problems Theory, Numerics, Applications, Lyon (France), July 2006 (Poster)
- MHD, the $\nabla \cdot \mathbf{B}$ constraint, and Central Schemes, Fifth International Conference in the Foundations of Computational Mathematics, Universidad de Cantabria, Santander (Spain), July 2005
- *MHD, the* $\nabla \cdot \mathbf{B} = 0$ *constraint, and Central Schemes*, International Conference in Parallel Computational Fluid Dynamics, University of Maryland, College Park, May 2005

## OTHER PRESENTATIONS

- *Learning Objects for Advnaced Math Courses*, Teaching and Learning Bytes, Oviatt Library, Cal State University, Northridge, November 2009
- **Poster:** *Central Schemes for Multi Dimensional MHD Equations*, Numerical Methods for Plasma Astrophysics: From Particle Kinetics to MHD, Center for Scientific Computation and Mathematical Modeling, University of Maryland, College Park, April 2004

## WORKSHOP AND PROGRAMS ATTENDED

- Model and Data Hierarchies for Simulating and Understanding Climate, Institute for Pure and Applied Mathematics, University of California, Los Angeles, Spring 2010
- Higher Order Geometric Evolution Equations: Theory and Applications from Microfluidics to Image Understanding, Institute for Mathematics and its Applications, University of Minnesota, March 23-26, 2009
- Optimal Transport, Institute for Pure and Applied Mathematics, University of California, Los Angeles, Spring 2008
- Non-equilibrium Interface and Surface Dynamics, Experiment and Simulation from Atomistic to Continiuum Scales, Center for Scientific Computation and Mathematical Modeling, University of Maryland, College Park, April 23 - 27, 2007

- PCA Workshop I: Astrophysical Fluid Dynamics, Institute for Pure and Applied Mathematics, University of California, Los Angeles, April 2005
- Numerical Methods for Plasma Astrophysics: From Particle Kinetics to MHD, Center for Scientific Computation and Mathematical Modeling, University of Maryland, College Park, April 2004
- Geometrically Based Motions Program, Institute for Pure and Applied Mathematics, University of California, Los Angeles, Spring 2001

## PROFESSIONAL SERVICE

Awarded (jointly with V. Panferov) funds under CSUN's 2009-2010 Distinguished Visiting Speakers Program to organize the visit of Prof. Eitan Tadmor to CSUN in Spring 2010.

Currently working on creating electronic learning objects for CSUN's Scholar Works Learning Object Repository.

Organized a Mini-symposium on *Shallow Water Flows: Numerical Methods and Applications* at the 9th International Conference in Numerical Analysis and Applied Mathematics, held at Rethymno, Crete, Grece, Sept. 18 - 22, 2009.

Referee for ESAIM: Mathematical Modeling and Numerical Analysis, and International Journal for Numerical Methods in Fluids, Journal of Computational Physics, and SIAM Journal of Scientific Computing.

## ACADEMIC AND TEACHING EXPERIENCE

**Institute for Pure and Applied Mathematics, UCLA**, California

*Academic Mentor*, RIPS June – August, 2009

Mentored a group of four undergraduate students working on the analysis and implementation of Lambert solvers for determining orbital transfers, a project proposed and sponsored by the Aerospace Corporation as part of IPAM's *Research in Industrial Projects for Students* program. Duties included guidance and supervision of students research efforts, weekly meetings with program director, students, and industry sponsors.

**California State University, Northridge**, California

*Assistant Professor* August 2007 –

Created and taught graduate and undergraduate mathematics courses and participated in different research activities (preparation of grant proposals, attended seminars and colloquia, etc.)

**University of Michigan, Ann Arbor**, Michigan

*Post-doc. Assistant Professor* June 2005 – July 2007

*VIGRE Assistant Professor* September 2004 – June 2005 Taught undergraduate mathematics courses and participated in different research activities (preparation of grant proposals, attended seminars and colloquia, etc.)

**University of California, Los Angeles**, California

*Graduate Student Researcher* October 2003 – June 2004

Designed and administered several experimental materials for a NSF funded research project (ROLE) in Perceptual Learning in Math and Science.

*Teaching Assistant* October 2001 – June 2003

Held weekly discussion sessions and office hours, collected and graded assignments, and created additional on-line course materials (solutions, examples, review problems, sample codes, etc.). Courses taught included graduate and undergraduate Numerical Analysis, Differential Equations, Methods for Applied Mathematics, and Intermediate Programming in C++.

*Workshop Facilitator* October 1999 – June 2000

Held weekly problem solving workshops in Multi-variable Calculus and Linear Algebra for advanced undergraduate students.

**Johns Hopkins University Center for Talented Youth**, Baltimore, Maryland

*Academic Dean* June – August, 2003

Supervised over 30 academic staff members with a variety of educational backgrounds and teaching skills and coordinated the academic program by conducting classroom observations, holding weekly faculty meetings, supervising facilities and providing materials to instructors.

*Mathematics Subject Area Coordinator and Instructor* June – August, 2002

Supervised and coordinated a variety of courses in different areas of mathematics, taught two three-week courses of Self Paced Mathematics to groups of 15 students.

*Math and Science Instructor* June – August, 2000, 2001, 2004

Designed and taught several three-week courses in Mathematics and Flight Science, including design of syllabi, organization and preparation of classroom and lab activities and field trips.

## OTHER PROFESSIONAL EXPERIENCE

**UCLA Earth and Space Science Department and Southern California Earthquake Center**, Los Angeles, California

*GPS Surveyor* June – October, 1999

Used GPS equipment to measure and record tectonic plate movements in the Los Angeles area.

**UCLA Department of Mathematics**, Los Angeles, California

*Tutor and Reader* October, 1998 – May, 1999

Tutored Calculus students and read and graded homework assignments for undergraduate math courses.

**Trans Pacific Aviation**, Santa Monica, California

*Flight Instructor* April, 1997 – May 1998

Instructed student pilots in the maneuvers and procedures required to obtain FAA certification at various levels (private, commercial, instrument flight, and multi-engine aircraft).

**Mt. San Antonio College**, Walnut, California

*Math and Science Tutor* February, 1996 – May, 1997

Tutored students in pre-college and college math and science courses.

## ADDITIONAL INFORMATION

**Programming Skills:** C++, Python, Fortran, Lisp, RIB scripting.

**Computer Skills:** Matlab, Maple, Mathematica, Unix/Linux, LaTeX, HTML, Blender, RenderMan.

**Languages:** Fluent in English and Spanish (Native Speaker).