

Dr. Michael F. Barad, P.E.

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Objective

To obtain a position in computational mathematics and/or engineering. Interests:

- Application-driven, high-performance numerical algorithm development.
- High-performance kernels such as: dense and sparse linear algebra, structured grids, particles, and Monte Carlo based methods.
- Numerical investigation of: fluid mechanics; particle systems; image and data search/analysis; time series; population dynamics; massive datasets; and many more.

Work Experience

2009-Present: *Lecturer*, Institute for Computational and Mathematical Engineering,
Stanford University

2006-Present: *Postdoctoral Fellow and Lecturer*, Civil and Environmental Engineering,
Stanford University

2002-Present: *Guest Scientist*, Applied Numerical Algorithms Group,
Lawrence Berkeley National Laboratory, Department of Energy

2002-2006: *Department of Energy Computational Science Graduate Fellow*,
Civil and Environmental Engineering, **U. of California, Davis**

2000-2002: *Research Assistant*, Civil and Environmental Engineering, **U. of California, Davis**

1997-2000: *Associate*, **Philip Williams and Associates**, San Francisco, CA

1996: *Computational Consultant*, **Montgomery Watson**, Sacramento, CA

1995: *Computational Consultant*, **Philip Williams and Associates**, San Francisco, CA

1992-1993: *Scientific Programmer*, CADSWES, **University of Colorado, Boulder**

Education

2000-2006: *Ph.D.* in Civil and Environmental Engineering, **University of California, Davis**
Dissertation title: An Adaptive Cartesian Grid Projection Method for Environmental Flows
Focus: Computational Environmental Fluid Mechanics

1996-1997: *M.S.* in Civil and Environmental Engineering, **University of California, Berkeley**
Focus: Computational Hydrology

1989-1993: *B.S.* in Civil and Environmental Engineering, **University of Colorado, Boulder**
Focus: Computational Hydrology

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Fellowships

2006-2009: *Mathematical Sciences Postdoctoral Research Fellowship*,
National Science Foundation

2002-2006: *Computational Science Graduate Fellowship*,
Department of Energy

2001-2002: *Ecotoxicology Fellowship*,
John Muir Institute for the Environment, U.C. Davis

Refereed Publications

Barad, M.F., P. Colella, and S.G. Schladow, 2008. "An adaptive cut-cell method for environmental fluid mechanics", *International Journal for Numerical Methods in Fluids*, 42 pages, doi:10.1002/fld.1893, in press.

Barad, M.F. and O.B. Fringer, 2007. "Numerical simulations of shear instabilities in open-ocean internal gravity waves" *Proceedings of the Fifth International Symposium on Environmental Hydraulics*, Tempe, Arizona, USA.

Barad, M.F., O.B. Fringer, and P. Colella, 2006. "Multiscale simulations of internal gravity waves", 722-727. *Proceedings of the Sixth International Symposium on Stratified Flows*, Perth, Australia. Edited by G.N. Ivey.

Schwartz, P.O., M.F. Barad, P. Colella, and T.J. Ligoeki, 2005. "A Cartesian grid embedded boundary method for the heat equation and Poisson's equation in three dimensions", *Journal of Computational Physics*, **211**(2), 531-550.

Barad, M.F. and P. Colella, 2005. "A fourth-order accurate local refinement method for Poisson's equation", *Journal of Computational Physics*, **209**(1), 1-18.

Ganju, N.K., D.H. Schoellhamer, J.C. Warner, M.F. Barad, and S.G. Schladow, 2004. "Tidal oscillation of sediment between a river and a bay: a conceptual model" *Estuarine, Coastal, and Shelf Science*, **60**(1), 81-90.

Juza, B., and M.F. Barad, 2000. "Dynamic and steady state modeling approaches to riverine hydraulic studies using 1-D, looped 1-D, and 2-Dimensional topological discretizations." *Hydroinformatics Conference Proceedings*, Iowa City, Iowa.

Publications in Review

Barad, M.F. and O.B. Fringer, "Simulations of shear instabilities in interfacial gravity waves", 35 pages. Submitted to the *Journal of Fluid Mechanics*.

Barad, M.F. and O.B. Fringer "Identifying bedforms from free-surface observations: a numerical study", 34 pages. Submitted to *Physics of Fluids*.

Proposal Writing Experience

2009: **DOE NERSC** computing resources. Awarded 750,000 supercomputer hours.

2008: **DOE NERSC** computing resources. Awarded 3,000,000 supercomputer hours.

2006-2009: **NSF** Mathematical Sciences Postdoctoral Research Fellowship. Awarded \$108,000.

2002-2006: **DOE** Computational Science Graduate Fellowship. Awarded over \$125,000.

1998-2000: Several successful \$300,000+ consulting proposals.

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Teaching Experience

- 2009: *Instructor, Stanford University*, Computational and Mathematical Engineering 212, *Introduction to Large-Scale Computing in Engineering*. (21 students, winter quarter)
- 2009: *Guest lecturer, Stanford University*, CEE 363C, Ocean and Estuarine Modeling. Lecture title: *Introduction to Block-Structured Adaptive Mesh Refinement*. (8 students)
- 2008: *Instructor, Stanford University*, Civil and Environmental Engineering 262C, *Modeling and Simulation for Civil and Env. Engineers*. (11 students, summer quarter)
- 2007: *Guest lecturer, Stanford University*, CEE 262C, Modeling and Sim. for Civil and Env. Engineers. Lecture title: *Eigenvalue and Boundary Value Problems*. (15 students)
- 2007: *Guest lecturer, Stanford University*, CEE 363C, Ocean and Estuarine Modeling. Lecture title: *Introduction to Block-Structured Adaptive Mesh Refinement*. (9 students)
- 1998: *Guest lecturer, University of California, Berkeley*, CEE 203, Surface Water Hydrology: Lecture title: *Numerical Simulation of Flood Hydrographs*. (19 students)

Computational Skills

Programming languages: C, C++, Fortran 77/90/95, some Python

Numerical tools: Chombo, Mathematica, Matlab, MPI

Other software: CVS, Emacs, GDB, GIS, GProf, L^AT_EX, Linux, Mac OSX, MS Office

Hardware: laptops, workstations, SMP systems, Linux clusters, massively parallel supercomputers (including early access to a 19,320 processor DOE supercomputer)

Professional License

1999-Present: *Professional Engineer, State of California*, license number 58798.

Professional Service

Reviewer for: International Journal for Numerical Methods in Fluids; National Science Foundation; US Department of Energy; US Geological Survey.

Professional Societies

American Geophysical Union; American Physical Society, Division of Fluid Dynamics; American Society of Civil Engineers; American Society of Limnology and Oceanography; Society for Industrial and Applied Mathematics.

References

- Prof. Oliver Fringer, fringer@stanford.edu, 650-725-6878.
- Dr. Phillip Colella, pcolella@lbl.gov, 510-486-5412.
- Prof. Robert Street, street@stanford.edu, 650-723-4969.
- Prof. Geoffrey Schladow, gschladow@ucdavis.edu, 530-752-6932.
- Prof. Elbridge Gerry Puckett, egpuckett@ucdavis.edu, 530-752-7543.