

## Pinaki Chakraborty

---

CONTACT INFORMATION	Department of Geology University of Illinois at Urbana-Champaign 208 Natural History Building 1301 W. Green St. Urbana, IL 61801-2939, USA	Voice: 1-217-244-5840 Fax: 1-217-244-4996 E-mail: chakrabo@illinois.edu
RESEARCH INTERESTS	Fluid mechanics (geological, environmental), turbulence, scaling, foam mechanics, thermal physics, granular flows.	
EDUCATION	<b>University of Illinois at Urbana-Champaign</b> , Urbana, Illinois, USA Ph.D., Theoretical and Applied Mechanics, May 2006 <ul style="list-style-type: none"><li>• Minor in Computational Science and Engineering</li></ul> <b>University of Illinois at Urbana-Champaign</b> , Urbana, Illinois, USA M.S., Theoretical and Applied Mechanics, May 2002 <ul style="list-style-type: none"><li>• Minor in Computational Science and Engineering</li></ul> <b>National Institute of Technology</b> , Surat, Gujarat, India B.Eng., Mechanical Engineering, May 2000	
EMPLOYMENT	<b>University of Illinois at Urbana-Champaign</b> , Urbana, Illinois, USA <i>Research Assistant Professor</i> <i>Roscoe G. Jackson II Research Fellow</i> (Department of Geology) <i>Research Scientist</i> (Department of Geology) <i>Walgreen-Chair Postdoctoral Research Associate</i> (Department of Geology) Geological fluid dynamics. Advisor: Susan W. Kieffer <i>Lecturer</i> (Department of Theoretical and Applied Mechanics, TAM) (Typical enrollment: 20 students; UG: Undergraduate course; G: Graduate course) <ul style="list-style-type: none"><li>❑ Summer 2001 : "Introduction to Fluid Mechanics" (UG; TAM 335)</li><li>❑ Fall 2004: "Intermediate Fluid Mechanics" (G/UG; TAM 435)</li><li>❑ Spring 2006: "Solid Mechanics Design" (UG; TAM 252)</li></ul> <i>Graduate Research Assistant</i> (Department of Theoretical and Applied Mechanics) Dissertation: Kinematics of vortices in turbulent flows Advisor: Ronald J. Adrian and S. Balachandar	<b>Dec 2010 - Present</b> <b>Oct 2009 - Present</b> <b>Aug 2009 - Dec 2010</b> <b>May 2006 - Aug 2009</b> <b>Aug 2001 - May 2006</b>

*Graduate Teaching Assistant*

(Department of Theoretical and Applied Mechanics)

- ❑ Fall 2000 : Laboratory sessions for “Introduction to Fluid Mechanics” (UG; TAM 335)
- ❑ Spring 2001 : Discussion sessions for “Introduction to Solid Mechanics” (UG; TAM 251)
- ❑ Spring 2002 : Grader for “Fluid Mechanics II: Viscous Flow” (G; TAM 532)
- ❑ Fall 2003 : Discussion sessions for “Introduction to Solid Mechanics” (UG; TAM 251)
- ❑ Fall 2005: ‘Super TA’ and discussion sessions for “Introduction to Statics” (UG; TAM 210/211)
- ❑ Spring 2006: ‘Super TA’ for “Introduction to Solid Mechanics” (UG; TAM 251)

HONORS AND  
AWARDS

*Robert E. Miller Award for Teaching of Mechanics*, 2006.

(Departmental award for excellence in teaching of mechanics.)

*Theoretical and Applied Mechanics Merit Award*, 2006.

(Departmental award for academic excellence, leadership, and service.)

*Campus Award for Excellence in Undergraduate Teaching*, 2005.

(Highest honor in the University for teaching excellence.)

*Mavis Memorial Fund Scholarship*, 2003 and 2004.

(Highest honor in the College of Engineering for research and teaching excellence.)

*James O. Smith Award for Most Effective Teaching Assistant*, 2002 and 2004.

(Departmental award for teaching effectiveness.)

*Computational Science and Engineering Fellowship*, 2001-02 and 2002-03.

(University fellowship for research in Computational Science and Engineering.)

*List of Teachers Ranked as Excellent by their Students*, Fall 2000, Spring 2001, Summer 2001, Spring 2002, Fall 2003, Fall 2004, Fall 2005, Spring 2006.

(Recognition by the University for teaching excellence; based on student evaluations.)

PUBLICATIONS

F. Huang, P. Chakraborty, C. C. Lundstrom, C. Holmden, J. J. G. Glessner, S. Kieffer, and C. E. Lesher. 2011. Reply to Brief Communications Arising: Isotope fractionation in silicate melts by thermal diffusion. **Nature**, 472, pp. E2–E3, 07 April 2011, DOI: 10.1038/nature09955.

G. Gioia, P. Chakraborty, S. F. Gary, C. Zuniga Zamalloa, and R. D. Keane. 2011. Residence time of buoyant objects in drowning machines. **Proceedings of the National Academy of Sciences**, DOI: 10.1073/pnas.1015183108 (published online 28 Mar 2011). (Featured in Research Highlights: Getting through a drowning machine, *Nature*, 472(9), 2011; PNAS Media Selections.)

P. Chakraborty, T. Tran, and G. Gioia. 2011. Leading-order dynamics of gravity-driven flows in free-standing soap films. **Journal of Elasticity**, DOI: 10.1007/s10659-011-9317-6 (Invited paper; published online 10 Feb 2011.)

G. Gioia, N. Guttenberg, N. Goldenfeld, and P. Chakraborty. 2010. Spectral theory of the turbulent mean-velocity profile. **Physical Review Letters** vol. 105, article 184501.

T. Tran, P. Chakraborty, N. Guttenberg, A. Prescott, H. Kellay, W. Goldberg, N. Goldenfeld, and G. Gioia. 2010. Macroscopic effects of the spectral structure in turbulent flows. **Nature Physics**, vol. 6, no. 6, pp. 438-441. (Cover Image.)

F. Huang\*, P. Chakraborty\*, C. C. Lundstrom, C. Holmden, J. J. G. Glessner, S. Kieffer, and C. E. Leshner. 2010. Isotope fractionation in silicate melts by thermal diffusion. **Nature**, vol. 464, no. 7287, pp. 396-400. (\* These authors contributed equally to this work.)

T. Tran, P. Chakraborty, G. Gioia, S. Steers, and W. Goldberg. 2009. Marangoni shocks in unobstructed soap-film flows. **Physical Review Letters**, vol. 103, article 104501.

P. Chakraborty, G. Gioia, and S. Kieffer. 2009. Volcanic Mesocyclones. **Nature**, vol. 458, no. 7237, pp. 497-500. (Featured in New view on erupting volcanoes, *Nature Hot Topics*, 26 March 2009; Volcano or tornado?, *Nature Podcast*, 26 March 2009; Inside the volcanoes plume a thunderstorm rages, *National Public Radio*, 25 March 2009; etc.)

G. Gioia, P. Chakraborty, S. Marshak, and S. Kieffer. 2007. Unified model of tectonics and heat transport in a frigid Enceladus. **Proceedings of the National Academy of Sciences**, vol. 105, no. 34, pp. 13578-13581. (Cover Image; Featured in *Physics Today*, October 2007; *This Week in PNAS*, Saturn Moon's geysers don't need liquid water?, *National Geographic News*, 17 August 2007; etc.)

P. Chakraborty, S. Balachandar, and R. J. Adrian. 2007. Kinematics of Local Vortex Identification Criteria. **Journal of Visualization**, vol. 10, no. 2, pp. 137-140. (Invited review paper.)

G. Gioia, P. Chakraborty, and S. Kieffer. 2006. Lava channel formation via the viscoplastic indentation of hot substrates. **Geophysical Research Letters**, vol. 33, L19305.

P. Chakraborty, G. Gioia, and S. Kieffer. 2006. Volcán Reventador's unusual umbrella. **Geophysical Research Letters**, vol. 33, L05313. (Featured in Research Highlights: Blowing its top, *Nature*, 440, 386, 2006; Editor's Choice: Collapsing umbrella, *Science*, 311, 1675, 2006; Odd eruption may mean new volcano danger, *National Geographic News*, 15 March 2006; etc.)

G. Gioia and P. Chakraborty. 2006. Turbulent friction in rough pipes and the energy spectrum of the phenomenological theory. **Physical Review Letters**, vol. 96, article 044502. (> 30 citations; Featured in New UI research looks into classic unsolved problem, *Chicago Tribune*, 2 April 2006; Turbulence - the last mystery of classical physics, *Softpedia*, 12 Feb 2006; etc.)

G. Gioia, P. Chakraborty, and F. Bombardelli. 2006. Rough-pipe flows and the existence of fully developed turbulence. **Physics of Fluids**, vol. 18, article 038107.

P. Chakraborty, S. Balachandar, and R. J. Adrian. 2006. Comment on "Axial stretching and vortex definition". **Physics of Fluids**, vol. 18, article 029101.

P. Chakraborty, S. Balachandar, and R. J. Adrian. 2005. On the relationships between local vortex identification schemes. **Journal of Fluid Mechanics**, vol. 535, pp. 189-214. (> 100 citations.)

CONFERENCE  
PRESENTATIONS

T. Tran, P. Chakraborty, N. Guttenberg, A. Prescott, H. Kellay, W. Goldberg, N. Goldenfeld, and G. Gioia. 2010. Macroscopic effects of the spectral structure in turbulent flows. Annual Meeting of American Physical Society – Division of Fluid Dynamics (APS–DFD), Long Beach, California, November 2010.

G. Gioia, N. Guttenberg, N. Goldenfeld, and P. Chakraborty. 2010. The turbulent mean-velocity profile: it is all in the spectrum. Annual Meeting APS–DFD, Long Beach, California, November 2010.

P. Chakraborty, G. Gioia, and S. Kieffer. 2010. Rotating Volcanic Plumes: Lobate Umbrellas, Tornadoes, and Lightning Sheaths. Dynamics Days 2010, Evanston, Illinois, January 2010.

C. Zuniga Zamalloa, P. Chakraborty, N. Goldenfeld, and G. Gioia. 2010. Relating turbulent friction and energy spectrum in rough-pipe flows. Dynamics Days 2010, Evanston, Illinois, January 2010.

G. Gioia, N. Guttenberg, N. Goldenfeld, and P. Chakraborty. 2010. The turbulent mean-velocity profile: it is all in the spectrum. Dynamics Days 2010, Evanston, Illinois, January 2010.

C. Zuniga Zamalloa, P. Chakraborty, N. Goldenfeld, and G. Gioia. 2009. Relating turbulent friction and energy spectrum in rough-pipe flows. Annual Meeting APS–DFD, Minneapolis, Minnesota, November 2009.

J. Kolinski, P. Chakraborty, G. Gioia, and S. Kieffer. 2009 Morphological transitions in rapidly expanding compressible foams. Fluid–DTU (Center for Fluid Dynamics at the Technical University of Denmark) Summer School—Complex Motion in Fluids, Krogerup, Humlebæk, Denmark, August 2009.

T. Tran, P. Chakraborty, G. Gioia, N. Guttenberg, N. Goldenfeld, A. Prescott, W. I. Goldberg, and H. Kellay. 2009. The friction factor of 2D turbulent flow in soap films. Nonlinear Science Gordon Research Conference, South Hadley, Massachusetts, June–July 2009.

N. Guttenberg, N. Goldenfeld, G. Gioia, and P. Chakraborty. 2009. Scaling and criticality in two-dimensional turbulence. Nonlinear Science Gordon Research Conference, South Hadley, Massachusetts, June–July 2009.

P. Chakraborty, G. Gioia, and S. Kieffer. 2008. Volcanic Mesocyclones. American Geophysical Union (AGU) Fall Meeting, San Francisco, California, December 2008.

J. Kolinski, P. Chakraborty, G. Gioia, and S. Kieffer. 2008 Morphological transition in rapidly expanding magmas. AGU Fall Meeting, San Francisco, California, December 2008.

- P. Chakraborty, S. Kieffer, and G. Gioia. 2008. Rayleigh-Taylor instability in rotating volcanic umbrellas. Annual Meeting APS-DFD, San Antonio, Texas, November 2008.
- T. Tran, P. Chakraborty, G. Gioia, S. Steers, and W. Goldburg. 2008 Hydraulic jump in falling soap films. Annual Meeting APS-DFD, San Antonio, Texas, November 2008.
- J. Larkin, W. Goldburg, T. Tran, P. Chakraborty, and G. Gioia. 2008 Turbulent dynamics of a hydraulic jump in two dimensions: soap film flow Annual Meeting APS-DFD, San Antonio, Texas, November 2008.
- P. Chakraborty, S. Balachandar, and R. J. Adrian. 2007. Identification of vortices in complex flows. AGU Fall Meeting, San Francisco, California, December 2007. (Invited Speaker)
- P. Chakraborty, S. Kieffer, and G. Gioia. 2007. Mount Pinatubo's starfish umbrella plume. AGU Fall Meeting, San Francisco, California, December 2007.
- T. Tran, P. Chakraborty, G. Gioia, and N. Goldenfeld. 2007 Abrupt thickening of soap films. Annual Meeting APS-DFD, Salt Lake City, Utah, November 2007.
- A. Poole, P. Chakraborty, G. Gioia, and F. A. Bombardelli. 2006. Time-dependent turbulent scouring. Annual Meeting APS-DFD, Tampa Bay, Florida, November 2006.
- J. M. Kolinski, J. M. Austin, G. Gioia, P. Chakraborty, and S. W. Kieffer. 2006. Annular waves on the surface of impact-formed tektites. Annual Meeting APS-DFD, Tampa Bay, Florida, November 2006.
- P. Chakraborty, G. Gioia, and S. Kieffer. 2006. Volcán Reventador's unusual umbrella. Cities On Volcanoes 4 Conference, Quito, Ecuador, January 2006.
- P. Chakraborty, G. Gioia, and S. Kieffer. 2005. Volcán Reventador's unusual umbrella. AGU Fall Meeting, San Francisco, California, December 2005.
- P. Chakraborty, S. Balachandar, and R. J. Adrian. 2005. Practical considerations in the identification of vortices amidst vortex interactions. Annual Meeting APS-DFD, Chicago, Illinois, November 2005.
- G. Gioia, and P. Chakraborty. 2005. Unveiling the ties between Nikuradse and Kolmogorov: How to derive the diagram from the spectrum. Annual Meeting APS-DFD, Chicago, Illinois, November 2005.
- S. Gary, R. Keane, M. Dameron, G. Gioia, and P. Chakraborty. 2005. Residence time of a buoyant ball in a hydraulic jump. Annual Meeting APS-DFD, Chicago, Illinois, November 2005.
- P. Chakraborty, S. Balachandar, and R. J. Adrian. 2004. Extracting hierarchy of vortices in multiscale flows. Annual Meeting APS-DFD, Seattle, Washington, November 2004.
- P. Chakraborty, S. Balachandar, and R. J. Adrian. 2004. Local vortex identification criteria:

formulation, inter-relationships and issues. International Union of Theoretical and Applied Mechanics (IUTAM) Symposium on Elementary Vortices and Coherent Structures: Significance in Turbulence Dynamics, Kyoto, Japan, October 2004. (paper in proceedings)

P. Chakraborty, S. Balachandar, and R. J. Adrian. 2004. On local vortex identification. 21st International Congress of Theoretical and Applied Mechanics (ICTAM), Warsaw, Poland, August 2004.

P. Chakraborty, S. Balachandar, and R. J. Adrian. 2003. Toward a unified local vortex identification criterion. Annual Meeting APS-DFD, East Rutherford, New Jersey, November 2003.

P. Chakraborty, S. Balachandar, and R. J. Adrian. 2003. Vortex Identification in Turbulent Flows: Isotropic, Sphere Wake, Channel. American Society of Mechanical Engineers (ASME) 2003 Fluids Engineering Division Summer Meeting, Honolulu, Hawaii, July 2003. (paper in proceedings)

#### INVITED TALKS

Department of Mathematics, Imperial College London, London, England, 5 May 2011.

Department of Geosciences, Princeton University, Princeton, New Jersey, 11 January 2011.

Department of Mechanical and Aerospace Engineering, Princeton University, Princeton, New Jersey, 10 January 2011.

Okinawa Institute of Science and Technology, Okinawa, Japan, 16 December 2010.

Environmental Science and Engineering Seminar, School of Engineering and Applied Sciences, Harvard University, Cambridge, Massachusetts, 8 November 2010.

Earth Surface Processes Seminar, University of Illinois at Urbana-Champaign, Urbana, Illinois, 21 October 2010.

Institute for Science and Technology Austria, Klosterneuburg, Austria, 12 April 2010.

Mathematical Institute, University of Oxford, Oxford, England, 26 March 2010.

Department of Earth Sciences, University of Oxford, Oxford, England, 25 March 2010.

Department of Mechanical Engineering, McGill University, Montreal, Quebec, Canada, 17 February 2010.

Department of Civil Engineering, University of Minnesota, Minneapolis, Minnesota, 10 February 2010.

Department of Mathematical and Statistical Sciences, University of Alberta, Edmonton, Alberta, Canada, 1 February 2010.

Department of Mechanical and Manufacturing Engineering, University of Calgary, Calgary, Alberta, Canada, 29 January 2010.

Max Planck Institute for Dynamics and Self-Organization, Göttingen, Germany, 20 January 2010.

Max Planck Research Group Symposium, Max Planck Society, Garching, Germany, 18 Jan-

uary 2010.

Department of Mechanical Engineering, University of Maryland, College Park, Maryland, 27 October 2009.

Department of Geology, University of Maryland, College Park, Maryland, 26 October 2009.

Department of Physics and Astronomy, University of Pittsburgh, Pittsburgh, Pennsylvania, 14 July 2009.

Department of Geophysical Sciences, University of Chicago, Chicago, Illinois, 22 May 2009.

Department of Mechanical Engineering, California Institute of Technology, Pasadena, California, 17 March 2009.

Institute for Computational Engineering and Sciences, University of Texas at Austin, Austin, Texas, 23 February 2009.

Department of Atmospheric Sciences, University of Illinois at Urbana-Champaign, Urbana, Illinois, 26 March 2008.

Department of Mechanical Science & Engineering, University of Illinois at Urbana-Champaign, Urbana, Illinois, 22 February 2008.

Department of Civil and Environmental Engineering, University of California at Davis, Davis, California, 12 December 2007.

Department of Geology, University of Illinois at Urbana-Champaign, Urbana, Illinois, 14 September 2007.

FUNDED  
PROPOSALS

*Title:* An experimental investigation of conditions conducive to groove and ridge formation at Double-Layer-Ejecta (DLE) craters on Mars.

*Participants:* Susan W. Kieffer (PI), Pinaki Chakraborty (co-PI), and Joanna Austin (co-PI).

*Duration:* Jan 1, 2008 – Dec 31, 2010.

*Budget:* \$ 357,854

*Sponsor:* National Aeronautics and Space Agency. (Program: Mars Fundamental Research)

PROFESSIONAL  
ACTIVITIES

Reviewer for: National Science Foundation.

Reviewer for: Physical Review Letters, Physical Review E, Physics of Fluids, Journal of Fluid Mechanics, Geophysical Research Letters, Journal of Geophysical Research, Earth and Planetary Science Letters, Journal of Fluids Engineering, American Institute of Aeronautics and Astronautics Journal, International Journal of Heat and Fluid Flow.

Co-Organizer and co-chair of session on Geological Fluid Dynamics in American Geophysical Union (AGU) Fall Meeting, San Francisco, California, December 2008.

Member of American Geophysical Union (AGU), American Physical Society (APS).