

PRANABENDU MOITRA

Postdoctoral Research Associate
Lunar and Planetary Laboratory
Department of Planetary Sciences
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Research interests: I am interested in investigating the physico-chemical processes associated with magma generation, migration and effusive-explosive emplacement on the surface of the Earth, and of other planetary bodies such as the Moon and Mars. My research is broadly aimed at understanding the evolution of planetary interiors, constraining magma emplacement rates and explosivity, hence is also important for mitigating volcanic hazards on Earth. I integrate field/remote observation, numerical modeling and laboratory experiments in my research.

EDUCATION

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|------------|--|-----------|
| PhD | Earth Science, Rice University, USA Thesis title: The rheology of particle-liquid suspensions, the shape and interconnectivity of vesicles in pyroclasts and implications for the Plinian eruption of basaltic magma. Advisor: Prof. Helge M Gonnermann | 2009-2015 |
| MSc | Applied Geology, Jadavpur University, India Thesis title: The mode of development of mid-ocean ridges, based on analogue and numerical experiments. Advisor: Prof. Nibir Mandal | 2006-2008 |
| BSc | Geology, Jadavpur University, India | 2003-2006 |

PROFESSIONAL APPOINTMENTS

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| Postdoctoral Research Associate Lunar and Planetary Laboratory University of Arizona, Arizona, USA. Supervisor: Prof. Jeffrey C Andrews-Hanna | Aug, 2018 – present |
| Adjunct Instructor (2 courses taught per semester) Department of Geology, University at Buffalo, New York, USA | Sep, 2017 – Aug, 2018 |
| Postdoctoral Associate Center for Geohazards Studies, University at Buffalo, New York, USA. Supervisor: Prof. Greg A Valentine | Sep, 2015 – Aug, 2017 |
| Graduate research and teaching assistant Department of Earth Science, Rice University, Texas, USA | 2009-2015 |
| Summer Fellow of Indian Academy of Sciences National Center for Experimental Mineralogy and Petrology, Allahabad, India | 2007-2008 |

PEER-REVIEWED PUBLICATIONS

Under review/In revision:

8. Horvath D G, **Moitra P**, Hamilton C W, Craddock R A, Andrews-Hanna J C, Geologically recent explosive volcanism in Elysium Planitia, Mars. *Geophysical Research Letters (in revision)*.
7. **Moitra P**, Sonder I, Valentine G A, The role of external water on rapid cooling and fragmentation of magma. *Earth and Planetary Science Letters (in revision)*.

Published articles:

6. **Moitra P**, Gonnermann M H, Houghton B F, Tiwary C S (2018), Fragmentation and Plinian eruption of crystallizing basaltic magma, *Earth and Planetary Science Letters*, 500, 97-104,

doi:10.1016/j.epsl.2018.08.003.

5. Sonder I, Harp A, Graettinger A, **Moitra P**, Valentine G A, Buttner R, Zimanowski B (2018), Meter-Scale Experiments on Magma-Water Interaction, *Journal of Geophysical Research-Solid Earth*, 123, 10597-10615, doi: 10.1029/2018JB015682.
4. **Moitra P**, Sonder I, Valentine G A (2018), Effects of size and temperature-dependent thermal conductivity on the cooling of pyroclasts in air, *Geochemistry, Geophysics, Geosystems*, 19, 3623-3636, doi:10.1029/2018GC007510.
3. **Moitra P**, Gonnermann M H (2015), Effects of crystal shape- and size-modality on magma rheology. *Geochemistry, Geophysics, Geosystems*, 16, 1-26, doi:10.1002/2014GC005554.
2. Lee C T A, Morton D M, Farner M J and **Moitra P** (2015), Field and model constraints on silicic melt segregation by compaction/hindered settling: The role of water and its effect on latent heat release. *American Mineralogist*, 100, 1762-1777, doi:10.2138/am-2015-5121.
1. **Moitra P**, Gonnermann M H, Houghton F B, Giachetti T (2013), Relating vesicle shapes in pyroclasts to eruption styles. *Bulletin of Volcanology*, 75, 1-14, doi:10.1007/s00445-013-0691-8.

In Preparation:

1. **Moitra P**, Andrews-Hanna J C, Horvath D G, A Late Amazonian explosive eruption in Elysium Planitia (*to be submitted to Earth and Planetary Science Letters*).
2. **Moitra P**, Effect of non-Newtonian rheology on the Plinian eruption of basaltic magma (*to be submitted to Journal of Volcanology and Geothermal Research*).
3. **Moitra P**, Gonnermann M H, Houghton B F, Crozier J, Effect of crystals on the development of permeability during the Plinian eruption of basaltic magma (*to be submitted to Bulletin of Volcanology*).
4. **Moitra P**, Sonder I, Valentine G A, Effect of lava flow rate on its cooling and fragmentation under subaqueous eruption conditions (*to be submitted to Earth and Planetary Science Letters*).

PROFESSIONAL SERVICES

Organization of International conferences:

Primary convener of proposed session (Understanding effusive to highly explosive styles of basaltic eruptions: Insights from field, experiment and modeling) in International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI), 2021, Rotorua, New Zealand

Co-convener of proposed session (Volcanotectonic Processes and Landforms Across the Solar System) in International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI), 2021, Rotorua, New Zealand

Co-convener of session on “Magma crystallization, fragmentation, and their roles on volcanic eruption” in JpGU-AGU joint meeting, 2020, Chiba, Japan

Co-chair of Session V019 (Developments in Magma-Water Interaction: Field Work, Experiments, and Computation) in American Geophysical Union (AGU), 2018, Washington, D.C., USA

Primary convener and co-chair of Session V.4 (Just add water: hazards variation in lava flows, steam-driven and hydromagmatic explosive eruptions) in International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI), 2017, Portland, Oregon, USA

Reviewer:

Nature Communications; Geology; Earth and Planetary Science Letters; Geochemistry, Geophysics, Geosystems; Geophysical Research Letters; Solid Earth Discussions; Journal of Volcanology and Geothermal Research; Bulletin of Volcanology; Science Advances

SCIENTIFIC PRESENTATIONS

21. **Moitra P**, Horvath D G, Andrews-Hanna J C, 2019. Explosive magma-water on Mars: Insights from a young pyroclastic deposit in Elysium Planitia, Mars, American Geophysical Union, Fall Meeting.

[ORAL]

20. Sonder I, **Moitra P***, Valentine G A, 2019. Magma-to-water heat transfer rates with implications for quench-induced fragmentation, American Geophysical Union, Fall Meeting. [*Presenter; POSTER]
19. Sonder I, Harp A, Graettinger A, **Moitra P**, Valentine G A, Büttner R, Zimanowski B, 2019, Geometry and Time Dependencies of Intense Magma-Water Interaction Experiments on Decimeter and Meter Scale. American Geophysical Union, Fall Meeting. [ORAL, INVITED]
18. Horvath D G, **Moitra P**, Andrews-Hanna J C, 2019. Explosive magma-water on Mars: Insights from a young pyroclastic deposit in Elysium Planitia, Mars, Lunar and Planetary Science Conference, 2019. [ORAL]
17. **Moitra P**, Horvath D G, Andrews-Hanna J C, 2019. A Late Amazonian phreatomagmatic tephra deposit in Elysium Planitia , Lunar and Planetary Science Conference, 2019. [POSTER]
16. **Moitra P**, Sonder I, Valentine G A, 2018. Magma-to-water heat transfer rates with implications for quench-induced fragmentation, American Geophysical Union, Fall Meeting. [POSTER]
15. Sonder I, Harp A, Graettinger A, Valentine G A, **Moitra P**, Buttner R, Zimanowski B, 2018. Meter-Scale Experiments on Magma-Water Interaction, American Geophysical Union, Fall Meeting. [POSTER]
14. **Moitra P**, Sonder I, Valentine G A, 2017. Magma-to-water heat flux: Insight from pool-boiling experiments, International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI) Scientific Assembly, Portland, Oregon, USA. [POSTER]
13. Sonder I, Harp A, Graettinger A, Valentine G A, **Moitra P**, Buttner R, Zimanowski B, 2017. Explosive Magma-Water Explosive Experiments: Premix Conditions on Decimeter Scale, International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI) Scientific Assembly, Portland, Oregon, USA. [POSTER]
12. **Moitra P**, Sonder I, Valentine G A, 2016. Magma-to-water heat flux estimates from laboratory experiments, Postdoctoral symposium, University at Buffalo. [POSTER]
11. **Moitra P**, Gonnermann M H, Houghton B F, Crozier J, 2015. Combined effect of permeability and crystallization on the explosive eruption of basaltic magma, American Geophysical Union, Fall Meeting. [ORAL]
10. **Moitra P**, Gonnermann M H, Houghton B F, Crozier J, 2014. The effect of microlite and permeability on the Plinian eruption of basaltic magma, American Geophysical Union, Fall Meeting. [POSTER]
9. **Moitra P**, Gonnermann M H, 2014. The effect of crystal shape, size and bimodality on the maximum packing and the rheology of crystalline magma, European Geosciences Union, General Assembly. [ORAL]
8. **Moitra P**, Gonnermann M H, 2013. Buoyant bubble rise through concentrated particulate suspensions with potential application to crystallizing magmas, International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI) Scientific Assembly, Japan. [POSTER]
7. **Moitra P**, Gonnermann M H, Houghton F B, Giachetti T, 2013. Relating vesicle shapes in pyroclasts to eruption styles, IAVCEI Scientific Assembly, Kagoshima, Japan. [ORAL]
6. **Moitra P**, Gonnermann M H, 2013. Relating vesicle shapes in pyroclasts to eruption styles, ESCI 404, SEM: Department Research. [ORAL]
5. **Moitra P**, Gonnermann M H, 2012. Vesicle shapes, bubble overpressure and fragmentation during explosive eruptions. ESCI 404, SEM: Department Research. [ORAL]
4. **Moitra P**, Gonnermann M H, Houghton F B, 2011. Characterization of pumice textures to calculate bubble growth rate using Capillary number. American Geophysical Union, Fall Meeting. [POSTER]
3. **Moitra P**, Gonnermann M H, 2011. Fragmentation of basaltic magma in Plinian style eruption. ESCI 404, SEM: Department Research. [ORAL]
2. **Moitra P**, Gonnermann M H, Houghton F B, 2010. Rheological effect of microlites on the Plinian

eruption of basaltic magma. American Geophysical Union, Fall Meeting. [POSTER]

1. **Moitra P**, Gonnermann M H, 2010. Fragmentation of basaltic magma in Plinian style eruption. ESCI 404, SEM: Department Research. [ORAL]

HONORS AND AWARDS

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| The Torkild Rieber Award for high academic standing Earth Science, Rice University, USA | 2014 |
| Junior Research Fellowship, University Grants Commission, India | 2008 |
| Rank holder (within top 100) in Graduate Aptitude Test for Engineering (Geology and Geophysics) organized by Ministry of Human Resources and Development, India | 2007 |
| Summer Research Fellowship, Indian Academy of Sciences | 2006 |

PRACTICAL, ANALYTICAL AND OTHER SKILLS

Computer skills: Programming in MATLAB (fluent), experience in using shared computational cluster facility, image analysis using ImageJ, FFmpeg and MATLAB, familiarity with other software: ANSYS, COMSOL and Python

Lab skills: Rotational, oscillatory and extensional rheometry, High-Temperature furnace/experiments, Gas permeametry, He-pycnometry, Tap-density analysis, Particle size analyser, Secondary Electron Microscopy (SEM), Optical Microscopy

TEACHING EXPERIENCE

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| <i>Primary instructor</i> for 3-credit advanced undergraduate/graduate course on Advanced Geofluids and Geomechanics, Department of Geology, University at Buffalo, USA | Spring 2018 |
| <i>Primary instructor</i> for 4-credit undergraduate course on Petrology, Department of Geology, University at Buffalo, USA | Spring 2018 |
| <i>Primary instructor</i> for 4-credit undergraduate course on Sedimentary Geology and Paleontology, Department of Geology, University at Buffalo, USA | Fall 2017 |
| <i>Primary instructor</i> for 4-credit undergraduate course on Mineralogy, Department of Geology, University at Buffalo, USA | Fall 2017 |
| Organizer of Volcanology Seminar, University at Buffalo, USA | Spring 2016 |
| Teaching Assistant in grading/organizing ESCI 301 (Introduction to the Earth), Rice University, USA | Spring 2015 |
| Teaching Assistant in grading/organizing ESCI 101 (The Earth), Rice University, USA | Spring 2014 |
| Substitute lecturer for ESCI 429 (Volcanic and Magmatic Processes); Lecture delivered on Magma Rheology, Rice University, USA | Fall 2013 |
| Teaching Assistant in field trip to New Mexico and grading for ESCI 334 (Geological & Geophysical Techniques), Rice University, USA | Spring 2011 |
| Organizer of department seminar for ESCI 403 (Department Research Seminar), Rice University, USA | Fall 2010 |
| Private tutor for grades 6-12 and undergraduate geology majors, Kolkata, India | 2008 |

EXPERIENCE IN RESEARCH SUPERVISION

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| Pauline Devez (summer intern), University at Buffalo | Summer-Fall, 2016 |
| Joshua Crozier (undergraduate student), Rice University | Summer 2014 |
| Li Ann Chia (undergraduate student), Rice University | Spring 2014 |
| Mira Chen (undergraduate student), Rice University | Summer 2010 |

INVITED TALKS

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| Earth and Environmental Sciences, Vanderbilt University, Tennessee, USA | 2019 |
| Planetary Geosciences Group, Brown University, Rhode Island, USA | 2019 |
| Graduate School of Oceanography, University of Rhode Island, Rhode Island, USA | 2018 |
| Woods Hole Oceanographic Institute, Massachusetts, USA | 2017 |

GEOLOGY FIELD EXPERIENCE

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| Leading field trips (as the primary instructor) to Bennett Beach, Zoar Valley, Lockport and Glen Park, Buffalo, New York, as part of the Sedimentary Geology and Paleontology course, Department of Geology, University at Buffalo | 2017 |
| Field study on volcanoclastic rocks and volcanic structures at Zuni Salt Lake, Valles Caldera, Fish Canyon tuff, Summer Coon, New Mexico and Colorado, USA | 2017 |
| Field study on volcanic eruption deposits in Valles Caldera, New Mexico, USA | 2012 |
| Structural geology field trip in Albuquerque, New Mexico, USA | 2012 |
| Field study on mafic-silicic magma interactions in Bernasconi Hills, San Jacinto, California, USA | 2011 |
| Field study on volcanic eruption deposits in Big Bend, Texas, USA | 2011 |
| Field study on eruption deposits in the Cascade Range, California, USA | 2009 |
| Field study on underground and open-cast mining in Jharkhand, India | 2008 |
| Structural geology field trip in and around Ghatshila, India | 2007 |
| Field study on modern sedimentary deposits and paleontology, Chandipur, India | 2006 |
| Field study on metamorphic petrology in and around Jabalpur, India | 2005 |
| Field study on general geology of Maithon area, India | 2004 |

WORKSHOPS ATTENDED

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| Uncertainty in Geo-science: A workshop on hazard analysis, Center for Geohazards Studies, SUNY, Buffalo, New York, USA | 2016 |
| FEMA Volcano Crisis Awareness training, Center for Geohazards Studies, SUNY, Buffalo, New York, USA | 2015 |
| Fundamentals of 3D Quantitative Analysis of Geological Materials Using Computed Tomography (CT) facility, University of Texas at Austin, Texas, USA | 2014 |
| RHEA: A collaborative database for rheological magmatic properties, International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI) Scientific Assembly, Kagoshima, Japan | 2013 |

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| Melts, glasses and magmas, Ludwig Maximilian University, Munich, Germany | 2012 |
| Short Course, Porous Material Inc., Ithaca, New York, USA | 2010 |

OUTREACH/SYNERGISTIC ACTIVITIES

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| Maintaining Rice University Earth Science's EQ-1 Seismograph | 2014 |
| Volunteered as demonstrator in Rice University Earth Science Annual Girl Scout Day outreach program | 2010 |
| Elected class representative of Science Faculty Students' Union, Jadavpur University, India | 2007 |
| Geological field trip manager, Jadavpur University, India | 2006 |
| Co-convener of the annual festival SANSKRITI 2005 of Science Faculty Students' Union, Jadavpur University, India | 2005 |
| Performed in intra-university theater, Jadavpur University, India | 2004 |

MEMBERSHIP WITH PROFESSIONAL SOCIETIES

American Geophysical Union (AGU)
International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI)
Rhea (a collaborative database for rheological magmatic properties)