

Martin A. Harris

Phd. Geological Sciences

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Research Interests

I study the physical properties of lava, focusing on how lava viscosity evolves during effusive eruptions as a function of phase proportions (crystals and bubbles), temperature, and oxygen fugacity. My approach combines laboratory experiments on remelted lavas with in situ field measurements of active flows made with custom-built field instruments.

My expertise spans physical and petrochemical volcanology, volcanic mapping, and forensic analysis of pyroclastic, phreatic, and effusive deposits. I am experienced in identifying glaciovolcanic landforms and integrating major, minor, and isotope geochemical data for petrologic sourcing. I am also experienced with applying radiometric geochronology and paleomagnetic data to constrain eruption timescales and deposit ages.

Education

- 2025 – Post-Doctoral Research Associate, Department of Earth Sciences, University at Buffalo. Advisors: Dr. Stephan Kolzenburg; Dr. Oryaelle Chevrel (Université Clermont Auvergne).
- 2022 – 2025 Ph.D. in Geological Sciences, Department of Earth Sciences, University at Buffalo.
Dissertation: The Multiphase Rheology of Natural Lava. Advisors: Dr. Stephan Kolzenburg; Dr. Oryaelle Chevrel (Université Clermont Auvergne).
- 2019 – 2021 M.Sc. in Geological Sciences, Department of Earth, Ocean, and Atmospheric Sciences, University of British Columbia.
Thesis: Physical and Chemical Evolution of Cracked Mountain Glaciovolcano, SW British Columbia. Advisor: Dr. Kelly Russell.
- 2013 – 2017 B.S. (Honors) in Geological Sciences, Department of Earth Sciences, University of Oregon.
Thesis: Late Miocene to Early Pleistocene Volcanism in the Parker Mountain Quadrangle, Southern Oregon. Advisors: Dr. Paul Wallace; Dr. Jad D’Allura (Emeritus-Southern Oregon University).

2016 Study Abroad: Geoscience in the Himalaya, Nepal (School for International Training) (Field-Camp-Equivalent).

Research Grants

2024 – 2027 NSF EAR Standard grant; Project title: “Tackling Multiphase Lava Rheology at its Origins.” (Proposal Number 2420723). Budget: \$490,302.00. Role: Co-investigator.

2023 – 2026 NSF EAR Standard grant; Project title: “Rheology for near real time forecasting of lava flows” (Award #: 2223098). Budget: \$410,626.00. Role: Co-investigator. 100% hosted at UB

2022 – 2024 NSF EAR RAPID grant; Project title: “RAPID: Deployment of a Field Rheometer Prototype” (Award #: 2241489). Budget: \$52,582.00. Role: Co-investigator. 100% hosted at UB.

Fellowships & Awards (~US \$71,000 total)

2022 – 2025 Presidential Fellowship, University at Buffalo (\$30,000)

2025 Student Academic Excellence Showcase, University at Buffalo

2024, 2025 Solène Pouget Memorial Award for Scientific Contributions to Society, Department of Earth Science, University at Buffalo (\$2,000)

2024 Jack Kleinman Memorial Grant for Volcano Research (\$5,000)

2023 Center for Geological & Climate Hazards Award (\$2,500)

2019 – 2021 Natural Resources Canada, Research Affiliate Program Bursary (\$30,000)

2016 Walter Youngquist Fellowship Award, University of Oregon (\$700)

2016 Friends of Cascade Siskiyou National Monument Grant for “Jenny Creek Summer Research” (\$800)

Appointments and Positions

2025 – Serving as Postdoctoral Research Associate, University at Buffalo, USA

2024 Invited Graduate Student Researcher, Hawaiian Volcano Observatory, USA

2024 Invited Graduate Student Researcher, Observatoire Volcanologique du Piton de la Fournaise, La Reunion

2023 – 2025 Served as Graduate Research Assistant, Department of Earth Sciences, University at Buffalo, USA

- 2023 – 2025 Served as Graduate Teaching Assistant, Department of Earth Sciences, University at Buffalo, USA
- 2019– 2021 Served as Graduate Teaching Assistant, Department of Earth, Ocean, and Atmospheric Sciences, University of British Columbia, Canada
- 2019– 2021 Served as GIS & Field Research Assistant, Natural Resources Canada, Canada
- 2019 Served as Research Assistant, Department of Earth Science, Dartmouth College, USA

Peer-Reviewed Publications

Published

- [1] **Harris, M.A.**, Chevrel, M.O., Parsons, J.T., Latchimy, T., Thordarson, T., Höskuldsson, A., Moreland, W.M., Payet–Clerc, M., & Kolzenburg, S. (2024). Real-time, in situ viscosity mapping of active lava. *Geology*, 53(2), 181–185.
<https://doi.org/10.1130/G52558.1>
- [2] ****Harris, M.A.**, Kolzenburg, S., Sonder, I., & Chevrel, M.O. (2024). A new portable penetrometer for measuring the viscosity of active lava. *Review of Scientific Instruments*.
<https://doi.org/10.1063/5.0206776>
- [3] Chevrel, M.O., Latchimy, T., Batier, L., Delpoux, R., **Harris, M.A.**, & Kolzenburg, S. (2023). A new portable field rotational viscometer for high-temperature melts. *Review of Scientific Instruments*, 94. <https://doi.org/10.1063/5.0160247>
- [4] **Harris, M.A.**, Russell, J.K., Wilson, A., & Jicha, B. (2023). A 500 ka record of volcanism and paleoenvironment in the northern Garibaldi Volcanic Belt, British Columbia. *Canadian Journal of Earth Sciences*, 60(4), 401–421.
<https://doi.org/10.1139/cjes-2022-0101>
- [5] **Harris, M.A.**, & Russell, J.K. (2022). Polymagmatic glaciovolcanism: Cracked Mountain Tuya, Canadian Cascades. *Frontiers in Earth Science*, 10.
<https://doi.org/10.3389/feart.2022.859794>
- [6] **Harris, M.A.**, Russell, J.K., Barendregt, R., Porritt, L.A., & Wilson, A. (2022). Explosive glaciovolcanism at Cracked Mountain Volcano, Garibaldi Volcanic Belt, Canada. *Journal of Volcanology and Geothermal Research*, 423.10.1016/j.jvolgeores.2022.107477

****Editor's pick in Review of Scientific Instruments**

Manuscripts Under Review

- [1] **Harris, M.A.**, Kolzenburg, S., & Chevrel, M.O. (2025). The viscosity of multiphase lava: New insights from integrating laboratory and field measurements. *Earth and Planetary Science Letters* (under review).

- [2] Saucier, É., **Harris, M.A.**, & Kolzenburg, S. (2025). Shear induced permeability heterogeneity of dome lavas: A mechanism for cyclic explosive gas venting. *Geophysical Research Letters* (under review).

Other Publications

- [1] Wilson, A.M., Russell, J.K., & Harris, M.A. (2024). Glaciovolcanism in the Garibaldi volcanic belt: Nine geological maps from southwestern British Columbia, Canada. British Columbia Ministry of Mining and Critical Minerals, *British Columbia Geological Survey Open File 2024-10*, 64 p.
- [2] Harris, M.A., Russell, J.K., Muhammad, M., & Williams-Jones, G. (2022). Mount Meager volcanic complex, Garibaldi Volcanic Belt, British Columbia: Expanded bedrock map including Cracked Mountain, north Lillooet Ridge, and west Mount Meager. *Geological Survey of Canada*, Open File 8881, 1 Sheet. <https://doi.org/10.4095/329886>
- [3] Harris, M.A., & Russell, J.K. (2021). Bedrock mapping results for the Mount Meager geothermal research initiative. *Geoscience BC*, 7–34.
- [4] Harris, M.A., Muhammad, M., Williams-Jones, G., & Russell, J.K. (2020). Bedrock mapping for Mount Meager Geothermal Research Initiative, Garibaldi Geothermal Energy Project, Mount Meager 2019 - Field Report. *Geoscience BC*, 2, 1–29.

Conference Abstracts, Posters, and Presentations

- [1] ***Harris, M.A.**, Kolzenburg, S., Chevrel, M.O. (2025). TM7: New Advancements in Techniques for Investigating Lava Rheology. Session: Techniques and Methods: Rheometry, Tribometry, Spectroscopy and Microscopy, *Society of Rheology*. *(Invited Keynote Speaker)
- [2] Kolzenburg, S., **Harris, M.A.**, Chevrel, M.O. (2025). A new generation of field rheometers and their potential for improving near real-time lava flow monitoring and hazard assessment. *Volcanology in Practice*.
- [3] Chevrel, M.O., **Harris, M.A.**, Kolzenburg, S., Cartographie in situ de la viscosité d’une coulée de lave. *Rencontre Scientifique Volcanologique 2025*; 25-27 June 2025, Le Bourget du Lac (France)
- [4] **Harris, M.A.**, Chevrel, M.O., Kolzenburg, S. (2024). In-situ parameterization of the pāhoehoe-‘ā transition of the 2023 Litli Hrófur lavas, Iceland. *AGU Fall Meeting Abstracts*, V51C-309. Poster
- [5] Saucier, E., Kolzenburg, S., **Harris, M.A.** (2024). Permeability anisotropy of dome lavas constrained by in-situ field measurements. *AGU Fall Meeting Abstracts*, V13E-3309. Poster
- [6] Kolzenburg, S., **Harris, M.A.**, Chevrel, M.O. (2024). The effect of oxygen fugacity on the rheology and texture of basaltic melts at thermal equilibrium. *AGU Fall Meeting Abstracts*, V51C-3096. Poster
- [7] Chevrel, M.O., Latchimy, T., Batier, L., Delpoux, R., Kolzenburg, S., **Harris, M.A.**, Parsons, T., Sonder, I., Berlie-Caillat, C., In-situ viscosity measurements of active lava., *Groupe Français de Rhéologie Meeting 2024*, France. Invited Talk

- [8] **Harris, M.A.**, Kolzenburg, S., Chevrel, M.O., Parsons, J.T., Sonder, I. (2023). A new portable penetrometer for measuring the viscosity of active lava. *Geological Society of America Abstracts with Programs*, Vol. 55. Talk
- [9] Chevrel O., T. Latchimy, S. Kolzenburg S, **M.A., Harris**, I. Sonder, T. Parsons, C. Berlie-Caillat, L. Batier, R. Delpoux. Measuring the viscosity of lava using a portable rotational field rheometer, *IAVCEI 2023*, Rotorua, New Zealand. Talk
- [10] **Harris, M.A.**, Russell, K., Wilson, A., Jicha, B. (2022). A 500 ka record of glaciovolcanism in the Mount Meager volcanic complex, northern Garibaldi Volcanic Belt, Canada. *AGU Fall Meeting Abstracts*, A15H-1328. Poster
- [11] **Harris, M.A.**, Russell, J.K. (2021). The magmatic origins for Cracked Mountain, SW British Columbia: Evidence for cryptic tapping of two magma chambers during a monogenetic eruption. *AGU Fall Meeting*, V31A-05. Talk
- [12] **Harris, M.A.**, Russell, J.K., Barendregt, R., Porritt, L.A., Wilson, A.M. (2021). Explosive glaciovolcanism at Cracked Mountain Volcano, Canada. *Geological Association of Canada*, Special Session 19: Volcanism. Talk
- [13] D'Allura, J., and **Harris, M.A.**, Volcanic rocks of the High and Western Cascade Volcanic Series, Southeastern portion of the Cascade-Siskiyou National Monument, Southwest Oregon: Proceedings of the *American Association for the Advancement of Science*, Pacific Division meeting, Big Island, Hawai'i, Programs with abstr. vol. 36, Part I, p.93. June 2017. Talk
- [14] **Harris, M.A.**, Late-Miocene to Early-Pleistocene Volcanism in the 7.5' Parker Mountain Quadrangle of Southern Oregon, *Oregon Academy of Science Proceedings*, Volume LXXVI, February 2017. Talk

Professional Memberships

2023	International Association of Volcanology and Chemistry of the Earth's Interior
2022	Geological Society of America
2021	American Geophysical Union
2021	Geological and Mineralogical Association of Canada; GAC/MAC
2019	Vancouver Volcanic Studies Group (2019)
2016	University of Oregon Geology Club (President)

Service

Reviews for the following scientific journals:

Nature Communications, Journal of Petrology, Chemical Geology, and Journal of Volcanology and Geothermal Research

Contributions to the Scientific Community:

I have reproduced four versions of the new Axial Viscometer for active lava, which have been donated to four global volcano research centers: the Volcanological Observatory of

Piton de la Fournaise (OVPF), Hawaiian Volcano Observatory (HVO), National Institute of Geophysics and Volcanology – Catania (INGV), and the University of Iceland (HI).

In addition to donating these instruments, I have provided in-person tutorials to researchers at OVPF and HVO, and delivered virtual training videos and instructional materials for INGV and HI. This contribution significantly increases the number of usable field viscometers available to the global volcanological research community.

Research Experience

2022 – Experimental Volcanology & Petrology Laboratory (LAVAPUB), University at Buffalo

- Designed and calibrated portable field rheometers, developed custom software and electronics
- Deployed field rheometers to active eruptions and conducted in-situ measurements of lava viscosity
- Synthesized volcanic glass in high-temperature furnaces; prepared drill cores and polished sections

2019 – 2022 Volcanology & Petrology Laboratory, University of British Columbia

- Led field campaigns, collected samples, generated regional bedrock maps, and used GIS to generate digital maps of the geology
- Prepared thin sections and prepared rocks for geochemical and geochronological analyses
- Conducted petrographic microscopy, electron microprobe work
- Synthesized data into informative graphics and authored peer-reviewed publications

2019 Radiogenic Isotope Geochemistry Lab, Dartmouth College

- Learned clean-lab procedures; prepared standards and sample blanks for Thermal Ionization Mass Spectrometry (TIMS) analysis

2016 – 2017 Geological Mapping Field Assistant and Researcher, Ashland, OR

- Assisted in field mapping of volcanic rocks in the Southern Cascades
- Collected hand samples, cut and polished rocks for thin sections
- Generated geological maps and compiled textural and geochemical data for scientific research reports

Teaching Experience

2024 University at Buffalo, Department of Earth Sciences

- Guest lectured on rheology for Earth Materials (GLY 205): Taught lectures on rheology of rocks and earth materials to undergraduates during the weekly (50 min) lecture periods.
- 2022 – 2023 University at Buffalo, Department of Earth Sciences
- Geology for Engineers (GLY 103, 2023): Designed exercises and quizzes, managed Canvas platform, graded assignments, and held office hours
 - Earth Materials (GLY 205, 2022): Conducted mineral identification labs, set up materials, graded, managed Blackboard platform, held office hours
- 2019 – 2021 University of British Columbia, Department of Earth, Ocean, and Atmospheric Sciences
- Introduction to Field Methods (EOSC 223, 2020–2021): Supervised mapping labs, managed Canvas grading and assignments
 - Structural Geology (EOSC 323, 2019–2021): Led labs on structural techniques; facilitated grading and course administration
- 2017 – 2018 Petpittayakom School (Secondary), Phetchabun, Thailand
- Taught English conversation and Earth, Environmental, Biological, and Health sciences to grades 6–12
 - Created lesson plans, weekly assignments, quizzes, exams, and graded all coursework

Field Campaigns for Research

- 2023 In-situ Permeability Measurements of Dome Lavas, Lassen National Park
Field assistant for a two-week campaign measuring dome lavas in Lassen National Park, including Lassen Peak and the Chaos Crag. Responsibilities included transportation to sites, hiking, sampling, and using a TinyPerm™ to measure in-situ permeability of exposed lava dome surfaces.
- 2023 In-situ Viscosity Measurements of Active Lava, Iceland
Co-organizer of a two-week field campaign during the 2023 Litli-Hrútur eruption. Responsible for operating newly developed field viscometers to collect real-time viscosity data along the lava transect, measuring in-situ temperatures with K-type thermocouples, and collecting molten samples for quenching. This campaign provided the primary data and samples for my doctoral dissertation.
- 2021 Cheakamus Basalt Mapping, British Columbia
Field assistant for primitive mapping in the southwest Coast Mountains of British Columbia. Duties included gear transport, wilderness camping, and lava sampling.
- 2020 Cracked Mountain Mapping, British Columbia

Co-organizer of a five-week mapping campaign of the glaciovolcanic tuya, Cracked Mountain. The project was helicopter-supported with remote camping. Tasks included mapping, sampling, and volcanic stratigraphy for my Master's thesis on glaciovolcanic deposits in the MMCV. Also assisted with paleomagnetic drilling and sample orientation for relative age determinations.

- 2019 Mount Meager Volcanic Complex Mapping, British Columbia
Co-organizer of a seven-week bedrock and volcanic mapping campaign around Mount Meager Volcano (MMVC). The work was helicopter-supported with primitive camping. Mapping supported both the Geological Survey of Canada's geothermal initiative and my Master's research on glaciovolcanic deposits in the MMCV.
- 2019 Chaos Crags, Lassen National Park
Field assistant for a research campaign focused on sampling and taking structural measurements of exposed lava domes at Chaos Crags. Duties included transport, hiking, sampling, and assisting with field structural measurements.
- 2016 Field Mapping in the Cascade-Siskiyou National Monument and Southern Oregon Cascades
Field assistant and co-mapper for the summer, identifying bedrock units and collecting samples for textural and geochemical analyses used in my undergraduate honors thesis at the University of Oregon.
- 2016 Field Mapping of the Palung Granite, Nepal
Co-organizer of an independent mapping project as part of the School for International Training's Geoscience in the Himalaya final project. Involved three weeks of mapping, sampling, petrographic analysis, and report writing.

Field Skills

- Experience working around active lava: measuring viscosity, temperature, and collecting molten samples
- Proficient with protective gear, gas sensors, and field safety protocols
- Advanced geological mapping in rugged terrain with GPS, field drills, stratigraphic profiling, and permeability measurements in situ
- Helicopter-supported wilderness campaigns: field camp setup, cooking, bear safety

Technological Development

- 2025 Design, construction, and calibration of a new, lightweight, microcontroller-based field rotational viscometer prototype with modifications made from lessons learned from field usage of existing field viscometers during the 2023 Litli-Hrútur eruption.

2022 – 2025 Design, construction, and deployment of two new high-accuracy, lightweight, microcontroller-based field rheometer prototypes (one penetrometer and one rotational rheometer). These were deployed to the 2023 Litli-Hrútur eruption in Iceland, resulting in nearly doubling the total number of viscosity measurements ever made of actively flowing lava.

Media Coverage and Outreach

2024

- Featured in American Geophysical Union magazine EOS article on field rheology titled “How Liquid Is That Lava? A new device helps scientists measure lava viscosity during active flows.” Published July 12th 2024 <https://eos.org/articles/how-liquid-is-that-lava>
- Article was chosen as Editor’s pick and highlighted on the cover page on Review of Scientific Instruments journal for article “A new portable penetrometer for measuring the viscosity of active lava” June 4th 2024.

2023

- Featured research for UBNow on current research activity on lava flows and their monitoring / modeling titled: “UB volcano expert monitors lava flow around the world.” Published July 31, 2023 <https://www.buffalo.edu/ubnow/stories/2023/07/kolzenburg-lava.html>,

Laboratory Skills

- Expertise in high-temperature melting, glass synthesis, and sample processing (cores, thin sections, polished sections)
- Electrical engineering for microcontroller sensors and single-board computers (Raspberry Pi)
- Petrographic analysis of minerals and vesicles; compositional analyses
- Proficient in GIS mapping, SEM, and electron microprobe operation

Software Skills

- ArcGIS: Geological mapping and spatial interpolation
- MATLAB: Figure creation, statistical and petrochemical modeling
- Python (including CircuitPython): Data analysis, visualization, microcontroller programming
- ImageJ: Textural and image analyses
- Microsoft Office: Word, Excel, PowerPoint for data management and presentations
- Adobe Creative Suite: Illustrator, Photoshop for figure production and visual communication