

Rebecca deGraffenried (she/her)

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Education

- August 2021 PhD, Earth and Planetary Sciences
University of Hawai'i at Mānoa (UH), Department of Earth Sciences
Topic: Verification and improvement of magma ascent rate calculators
and lava flow propagation models
Advised by Dr. Thomas Shea and Dr. Julia Hammer
Cumulative GPA: 3.97
- August 2017 M.S., Geology
University of Alaska Fairbanks (UAF), Department of Geosciences
Topic: Crystals and magma degassing in rhyolites
Advised by Dr. Jessica Larsen
Cumulative GPA: 4.00
- May 2015 B.S., General Geology, *Graduated with University Honors*
University of Texas at Austin (UT), Jackson School of Geosciences
Cumulative GPA: 3.72

Professional Appointments

- January 2024 – Present Assistant Professor
University of Missouri, Columbia, MO
- June 2022 – December 2023 NSF Postdoctoral Research Fellow
Arizona State University, Tempe, AZ
Supervised by: Dr. Christy Till
- August 2021 – May 2022 Postdoctoral Researcher
Ruhr-Universität Bochum, Bochum, Germany
Supervised by: Dr. Sumit Chakraborty
- Fall 2015 – Fall 2017 Staff Member, EarthScope National Office, Fairbanks, AK

Teaching Experience

- Fall 2020, Fall 2019, Spring 2018, Fall 2017 Teaching Assistant, UH
Introduction to Geology, Igneous and Metamorphic Petrology,
Sedimentology and Stratigraphy
- Spring 2016, Fall 2015 Teaching Assistant, UAF
Petrology and Petrography, Introduction to Chemistry
- Fall 2012 – Fall 2014 Undergraduate Teaching Assistant, UT
Introductory Chemistry 1 and 2

Last Updated: 11/14/2023

Research Experience

Fall 2017 – Summer 2021	Graduate Research Assistant, UH Dr. Thomas Shea, Dr. Julia Hammer Experimental petrology, diffusion modeling, lava flow rheology, magma storage and mixing, physical volcanology
Fall 2015 – Summer 2017	Graduate Research Assistant, UAF Dr. Jessica Larsen Experimental petrology, magma degassing
Spring 2014 – Spring 2015	Undergraduate Research Assistant, UT Dr. Jaime Barnes Stable isotopes, hydrothermal fluid-rock interactions
Spring 2012 – Fall 2013	Undergraduate Research Assistant, UT Dr. James Gardner Volcanology, mineral separation, melt inclusion analysis

Current Research Projects

- **Calculating magma decompression rates from melt embayments**
 - Construction of correction factors for 3D diffusion effects in 1D diffusion models
 - Major collaborators: T. Shea (UH Mānoa), W. Nelson (UH Mānoa)
- **Examining the link between eruption initiation mechanism, ascent rate, and ultimate eruption style at arc volcanoes**
 - Studying both explosive and effusive eruptions at two different volcanoes
 - Currently funded by NSF EAR Postdoctoral Fellowship to R. deGraffenried
 - Major collaborators: C. Till (ASU), A. Kent (OSU), A. Clarke (ASU)
- **Using machine learning applied to crystal populations for diffusion modeling**
 - Rapidly obtain Fe-Mg data in olivine through machine learning for eruption crisis response
 - Currently funded by DFG (German Science Foundation) grant led by S. Chakraborty
 - Major collaborator: S. Chakraborty (RUB, Germany)
- **Constraining bubble-crystal interactions during magma degassing**
 - Using both natural samples and experiments to determine how bubbles and crystals interact with each other through the whole magma degassing process
 - Major collaborators: N. Graham (UAF), M. Colombier (LMU-Munich), F. Caceres (LMU-Munich)
- **Developing a simple experiment to teach diffusion and diffusion modeling to students**
 - Using gelatin and food coloring to show diffusion in an easy-to-visualize manner, accompanied by calculations that can be scaled to the level of the student
 - Major collaborators: T. Shea (UH Mānoa), W. Nelson (UH Mānoa), M. Dias (RUB, Germany), L. Sobolewski (RUB, Germany)

Peer-Reviewed Publications

Published:

- [7] Colombier, M., Manga, M., Wright, H., Bernard, B., **deGraffenried, R.**,... & Dingwell, D.B. (2023). Pre-Eruptive Outgassing and Pressurization, and Post-Fragmentation Bubble Nucleation, Recorded by Vesicles in Breadcrust Bombs From Vulcanian Activity at Guagua Pichincha Volcano, Ecuador. *Journal of Geophysical Research: Solid Earth*, 128, e2023JB026775
- [6] Graham, N.A., Larsen, J.F., Tasa, K.Y., **deGraffenried, R.L.**, Cashman, K.V., & McCartney, K.N. (2023). Controls of crystal shape on degassing mechanisms in crystal-rich magmas with rhyolitic groundmass melts. *Earth and Planetary Science Letters*, 601.
- [5] Saalfeld, M.A., Myers, M.L., **deGraffenried, R.**, Shea, T., & Waelkens, C. (2022). On the rise: pushing reentrant boundaries to extract magma ascent in the nested caldera system of the Bandelier Tuff. *Bulletin of Volcanology*, 84(4).
- [4] **deGraffenried, R.**, Hammer, J., Dietterich, H., Perroy, R., Patrick, M., & Shea, T. (2021). Evaluating lava flow propagation models with examples from the 2018 eruption of Kīlauea, Hawai'i. *Bulletin of Volcanology*, 83(11).
- [3] **deGraffenried, R.** & Shea, T. (2021). Using volatile diffusion profiles to estimate magma ascent rate: assumptions and inherited errors. *Geochemistry, Geophysics, Geosystems*, 22(5).
- [2] Chao, K.H., **deGraffenried, R.**, Lach, M., Nelson, W., Truax, K., & Gaidos, E. (2021). Lava Worlds: From Early Earth to Exoplanets. *Geochemistry*, 125735.
- [1] **deGraffenried, R.**, Larsen, J.F., Graham, N.A., & Cashman, K.V. (2019). The influence of phenocrysts on degassing in crystal-bearing magmas with rhyolitic groundmass melts. *Geophysical Research Letters*, 46(10), 5127-5136.

Archived Data Sets:

deGraffenried, R., & Shea, T., 2021. Supplemental numerical model data of magma decompression rate from volatile element concentration gradients in crystal-hosted melt embayments from deGraffenried and Shea (in review), Version 1.0. Interdisciplinary Earth Data Alliance (IEDA). <https://doi.org/10.26022/IEDA/111857>.

Conference Abstracts

- [20] **deGraffenried, R.**, Till, C., Wright, H., Clynne, M., & Kent, A. (2023). Integrated Views of Magma Ascent and Decompression from Coordinated Approaches: A Case Study from Mount St. Helens, WA. Abstract V23D-0216. Presented at AGU 2023 Fall Meeting. Poster.
- [19] Till, C., **deGraffenried, R.**, & Goltz, A. (2023). Life in the Fast Lane: Observations from a Compilation of Magma Flux, Ascent, and Decompression Rates. Abstract V23D-0208. Presented at AGU 2023 Fall Meeting. Poster.
- [18] **deGraffenried, R.**, Dias, M., Sobolewski, L., Tonato, A., Nelson, W., Nizam, N., & Shea, T. (2023). Gelling diffusion and the classroom: teaching diffusion chronometry with gelatin. Submitted to IAVCEI 2023 General Assembly meeting. Poster.
- [17] **deGraffenried, R.**, Leichter, A., Almeev, R., Wittich, D., Portnyagin, M., & Chakraborty, S. (2022). Combining machine learning and petrology: application to the magma plumbing structure beneath Klyuchevskoy volcano, Kamchatka, Russia. Presented at Goldschmidt 2022, Honolulu. Poster.
- [16] Shea, T., Lubbers, J., Mourey, A., Terada, M., ... **deGraffenried, R.**, & Boro, J. (2021). Crystallographic orientation of crystal clusters in 3D using laboratory diffraction contrast

- tomography: initial tests on Kīlauea olivine. Abstract V11B-08. Presented at 2021 Fall Meeting, AGU. Talk.
- [15] **deGraffenried, R.**, & Shea, T. (2020). Modeling diffusion in 1D within melt embayments: correcting for 3D geometry. Abstract U005-06. Presented at 2020 Fall Meeting, AGU, virtual. Invited e-Lightning Poster.
- [14] Halverson, B., Whittington, A., Hammer, J., **deGraffenried, R.**, Lev, E., ... & Lewellin, E. (2020). Vesicularity, crystallinity, and implications for rheology of the Kīlauea 2018 lava flows. Abstract V002-0016. Presented at 2020 Fall Meeting, AGU, virtual. Poster.
- [13] **deGraffenried, R.**, Cluzel, N., Shea, T., & Hammer, J. (2020). Experimental examination of the melt embayment method for determining magma decompression rate. Abstract V003-0004. Presented at 2020 Fall Meeting, AGU, virtual. Poster.
- [12] Halverson, B., Whittington, A., Hammer, J., **deGraffenried, R.**, Lev, E., ... & Lewellin, E. (2020). Vesicularity, crystallinity, and implications for rheology of the Kīlauea 2018 lava flows. Abstract 32-2. Presented at 2020 National Meeting, GSA. Talk.
- [11] **deGraffenried, R.**, Cluzel, N., Shea, T., & Hammer, J. (2020). Experimental examination of the melt embayment method for determining magma decompression rate. Goldschmidt, Honolulu, HI.
- [10] **deGraffenried, R.**, Houghton, B., Walker, B., Beucler, O., Cline, J., ... & Zinn, M. (2020). Products of littoral explosions and their formation conditions: A case study from episode 58 of Pu‘u ‘Ō‘ō, Kīlauea Volcano, HI. Goldschmidt, Honolulu, HI.
- [9] Halverson, B., Whittington, A., Hammer, J., **deGraffenried, R.**, Lev, E., ... & Llewellyn, E. (2020). Vesicularity and implications for rheology of the Kīlauea 2018 lava flows. Goldschmidt, Honolulu, HI.
- [8] **deGraffenried, R.**, Hammer, J., Dietterich, H., Perroy, R., Patrick, M., & Shea, T. (2019). Ground-truthing lava flow propagation models with examples from the 2018 eruption of Kīlauea Volcano, HI. AGU Virtual Poster Showcase, Fall 2019.
- [7] Andrews, B. J., Befus, K. S., Blatter, D. L., Coombs, M. L., **deGraffenried, R.**, Hammer, J. E., ... & Wright, H. M. N. (2019). Rapid experimental determination of magmatic phase equilibria: coordinating a volcanic crisis response protocol. Abstract V33A-03. Presented at 2019 Fall Meeting, AGU, San Francisco, CA (9-13 Dec.). Talk.
- [6] **deGraffenried, R.**, & Shea, T. (2019). How Robust Are Our Assumptions in Using Crystal-Hosted Melt Embayments to Estimate Magma Ascent Rate?. Abstract V13C-0168. Presented at 2019 Fall Meeting, AGU, San Francisco, CA (9-13 Dec.). Poster.
- [5] Lerner, A. H., Wallace, P. J., Mourey, A., **deGraffenried, R.**, Shea, T., Lee, R. L., ... & Clor, L. E. (2019). Sulfur concentrations and oxidation states of products from the 2018 Kīlauea fissure eruption based on melt inclusions, embayments, and matrix glasses. Abstract V43C-0210. Presented at 2019 Fall Meeting, AGU, San Francisco, CA (9-13 Dec.). Poster.
- [4] Shea, T., Lerner, A. H., Powers, N., Moore, L., Wallace, P. J., **deGraffenried, R.**, ... & Gansecki, C. A. (2019). Storage conditions and longevity of rift zone magmas at Kīlauea Volcano, Hawai‘i: melt inclusion insights from the 2018 Lower East Rift Zone eruption. Abstract V43C-0207. Presented at 2019 Fall Meeting, AGU, San Francisco, CA (9-13 Dec.). Poster.
- [3] Graham, N.A., Larsen, J.F., Cashman, K.V., **deGraffenried, R.**, (2018). Controls of crystal shape on degassing mechanisms in crystal-rich magmas with rhyolitic groundmass melts. Abstract V44A-02. Presented at 2018 Fall Meeting, AGU, Washington, D.C. (10-14 Dec.). Talk.
- [2] **deGraffenried, R.**, Larsen, J.F., Graham, N.A., (2018). The influence of crystal content and type on permeable vesicular pathways in high-silica melts. Abstract. Presented at 2018 Goldschmidt Meeting. Boston, MA. (12-17 Aug.). Poster.

[1] **deGraffenried, R.**, Larsen, J.F., Lindoo, A., (2016). The influence of phenocrysts on magma degassing in rhyolitic systems. Abstract V31A-3081. Presented at 2016 Fall Meeting. AGU, San Francisco, CA. (12-16 Dec.). Poster.

Awards/Recognitions

December 2019	Outstanding Student Presentation Award, AGU Fall Meeting 2019
December 2019	1 st Place, Graduate Showcase. AGU Virtual Poster Showcase
May 2019	AGU EOS, Editor-highlighted paper
Spring 2016	Outstanding TA Award (>4.5/5 on student evaluations), UAF
2011	National Merit Scholarship Finalist

Seminar Talks

October 2023	“What to expect when you’re expecting...a lava flow: An overview of lava flow models” Invited , SZ4Grads Skills Webinar Series
September 2023	“How much and How Fast? A Source to Surface Perspective of Magma Transport at Subduction Zones” Invited , VSC Virtual Seminar Series
August 2021	“Mitigating errors in decompression rates calculated from crystal-hosted melt embayments” Invited , International Virtual Diffusion Seminar
December 2020	“Lava Worlds: An Interdisciplinary Perspective” Department of Earth Sciences weekly seminar, UH
September 2020	“Calculating magma decompression rate with melt embayments: correcting for 3D geometry” Invited , Montana State University, Department of Earth Sciences seminar series
March 2020	“Ground-Truthing Lava Flow Propagation Models with Examples from the 2018 Kīlauea Eruption” Department of Earth Sciences weekly seminar, UH
October 2019	“Using Volatile Diffusion Profiles to Estimate Magma Ascent Rate” Department of Earth Sciences weekly seminar, UH
July 2019	“Molecules on the Move: Diffusion and Magma Ascent” Research Experience for Undergraduates Seminar Series, UH
May 2019	“Analog Models vs Reality: A Case Study of the Rheology of 2018 Kīlauea Eruption Lava Flows” Department of Earth Sciences weekly seminar, UH
June 2018	“Bubbles and Crystals and Volcanoes, Oh My!” Research Experience for Undergraduates Seminar Series, UH

Service

Convened Conference Sessions:

- McCartney, K., Sais, M., **deGraffenried, R.**, & Dechert, A. *A Jack of Small Trades: Zooming in on the Nano- and Microscale to Better Understand Magmatic Processes*. AGU Fall Meeting 2023
- Caceres, F., Shea, T., Rusiecka, M., Oeser-Rabe, M., & **deGraffenried, R. L.** *Reconstructing high-temperature processes by characterizing the kinetics of crystallization, mineral reactions and diffusion*. Goldschmidt, 2022.
- deGraffenried, R. L.**, Whittington, A., Namiki, A., Oliveira, B., Klocking, M., Antoshechkina, A. *Geochemistry, Mechanics, Rheology, and Thermodynamics of Igneous Processes*. Goldschmidt, 2020.
- Anderson, K. R., Neal, C. A., Sigmundsson, F., **deGraffenried, R. L.** *Caldera-rift systems and new insights into basaltic volcano dynamics*. AGU Fall Meeting, 2019

Service to the Geology Community

- July 2022 Peer mentor for 3 first-time attendees of Goldschmidt
- July 2022 Diffusion modeling workshop co-convenor, Goldschmidt
- July 2020 Diffusion modeling workshop assistant, Goldschmidt

Reviewer Activities

- Fall 2021 – Present Peer reviewer for *Frontiers in Earth Sciences*, *Nature Communications*, *Journal of Volcanology and Geothermal Research*, *Bulletin of Volcanology*, National Science Foundation
- Spring 2020 Graduate Student Organization Merit-Based Award Reviewer, UH
- Spring 2018 Reviewer for mini-grant awarded to K-12 educators, UH

Department-Level Activities:

- Fall 2021 – Summer 2022 Organizer for monthly career preparation seminar for early career researchers at Hannover and Bochum
- Fall 2020 – Spring 2021 Participant in student-led Justice, Equality, Diversity, and Inclusion group (Huliāmahi)
- Fall 2019 – Spring 2021 Graduate Student Representative, Department Affairs committee, UH
- Fall 2019 – Spring 2021 Coordinator for division-wide weekly reading group, UH
- Spring 2018 Member, Department Colloquium Committee, UH

Funding

- June 2022 NSF-EAR Postdoctoral Fellowship, \$174,000
- 2017 – 2021 Various awards and grants totaling \$33,000 from GSA, UH, and Graduate Women in Science

Outreach Activities

- October 2022 Explosive volcanism demo for open house, ASU
- March 2021 Zoom talk with 75 3rd graders about geology as a career
- May 2019 Library talk on 2018 eruption of Kīlauea for K-12 children
- April 2019 Electron microprobe demonstration for alumni, UH
- Fall 2018 – Fall 2019 Biannual fun run for K-5 girls, promote interest in STEM fields
- October 2017, 2019 Explosive volcanism demo for biennial K-12 open house, UH
- April 2017 Annual K-12 science outreach day, UAF
- Spring 2014 – Spring 2015 Students Raising Students mentor, UT

Field Experience

January 2020	Lava flow sampling, Big Island, HI
September 2019	Field volcanology, Cascades, CA
March 2019	Field explosive volcanism, Taupo, New Zealand
February 2019	Field explosive volcanism, Big Island, HI
August 2018	Lava flow sampling, Big Island, HI
November 2017	Lava flow rheology, Big Island, HI
July 2016	Lava dome permeability, Obsidian Dome, CA
September 2014	Hydrothermal water sampling, Yellowstone
June-July 2014	Undergraduate field camp, USA

Professional Organizations

Fall 2021 – Present	Graduate Women in Science
Fall 2017 – Present	Golden Key International Honor Society
Fall 2016 – Present	American Geophysical Union
Fall 2016 – Present	Phi Beta Chi, Professional Women's Organization
Spring 2013 – Spring 2015	Spring 2012 – Present
European Geophysical Union	Fall 2011 – Present
	Alpha Lambda Delta/Phi Eta Sigma, National Honor Society
	Geological Society of America

Instrument Experience

Cold-seal, water-medium pressure horizontal furnace; cold-seal, gas-medium pressure vertical furnace; electron microprobe (EPMA); Fourier transform infrared spectroscopy (FTIR); Raman spectroscopy; scanning electron microscopy (SEM); bench top permeameter

Software Experience

Matlab (fluent); R (proficient); Python (beginner); Fortran (beginner); NIH ImageJ; Avizo; Probe for Windows; QGIS; Adobe suite