

CURRICULUM VITAE — JAMES M. WATKINS

Professor
Department of Earth and Planetary Sciences
University of California-Davis,
Davis, CA 95616, USA

Education

PhD, UC-Berkeley, 2010: *Elemental and isotopic separation by diffusion in geological liquids*
PhD Advisors: Donald J. DePaolo, Michael Manga, and Frederick J. Ryerson
B.S., Geology with minor in Mathematics, University of Wisconsin-Eau Claire, 2005

Appointments

Professor, University of California-Davis, 2025-present
Professor, University of Oregon, 2024-2025
Associate Professor, University of Oregon, 2018-2024
Assistant Professor, University of Oregon, 2013-2018
Post doctoral researcher, UC-Berkeley, 2010-2012
Graduate Student Researcher, Center for Isotope Geochemistry, 2005-2010
Graduate Student Researcher, Experimental Petrology Lab, LLNL, 2006-2010

Teaching

UC-Davis, GEL 1: *The Earth*, 2026
UC-Davis, GEL 298: *Geochemical Modeling*, 2026
University of Oregon, EARTH 101: *Exploring Planet Earth*, 2018, 2020, 2022, 2024
University of Oregon, EARTH 201: *Dynamic Planet Earth*, 2021, 2023, 2025
University of Oregon, EARTH 311: *Earth Materials*, 2015, 2016, 2018, 2021
University of Oregon, EARTH 353: *Geological Hazards*, 2013, 2014, 2018
University of Oregon, EARTH 406: *Field Camp*, 2013, 2014, 2015, 2020
University of Oregon, EARTH 410/510: *Geochemical Modeling*, 2014, 2016, 2020, 2024
University of Oregon, EARTH 510: *Low-temperature geochemistry*, 2017
University of Oregon, EARTH 510: *Non-traditional stable isotope geochemistry*, 2015
University of Oregon, EARTH 199 (FIG): *Volcanoes in Your Backyard*, 2014

Honors and Awards

Guest Professor, ETH-Zurich, 2022
Faculty Excellence Award, University of Oregon, 2020
Hisashi Kuno Early Career Award, American Geophysical Union, 2017
Lawrence Scholarship, Lawrence Livermore National Laboratory, 2009-2010
Louderback Award for Excellence in Graduate Studies, UC-Berkeley, 2008
Charles Meyer Fellowship for Outstanding Research, UC-Berkeley, 2008
Outstanding Graduate Student Instructor Award, UC-Berkeley, 2007

Service

Organizing committee for ExPet26 Workshop (2025)
Steering committee for 2019 International Clumped Isotope Workshop (2018-2019)

Co-editor for Reviews in Mineralogy and Geochemistry (RiMG) volume: Measurement, theories and applications of non-traditional stable isotopes (2015-2016)
Lead organizer for RiMG workshop held in Berkeley, CA (2017)
Session chair at Goldschmidt (2013, 2014, 2016, 2024)
Session chair at AGU (2012, 2013, 2016, 2017, 2021)
NSF Review Panel – Petrology and geochemistry (2015)
Reviewer for: *National Science Foundation, Department of Energy, Nature Communications, Geology, Quaternary Science Reviews, American Journal of Science, Geochimica et Cosmochimica Acta, Chemical Geology, Computers & Geosciences, Earth and Planetary Science Letters, American Mineralogist, Bulletin of Volcanology, Journal of Volcanology and Geothermal Research, European Mineralogical Union, Environmental Science and Technology, PNAS, Minerals*

University service

Geology Club advisor (2025)
Personnel Committee (2024)
Search Committee, Career Instructor (2024)
Admissions and Awards Committee (2018-2024)
Panel reviewer for Incubating Interdisciplinary Initiatives (I3) award program (2019)
Lab tours for UO Take Our Children to Work Day (2018-Present)
Faculty Advisory Committee for TSA (2017-2018)
Faculty Advisory Committee for CAMCOR (2016-2018)
Search Committee, Volcanology (2015)
Curriculum Committee (2014-2015)
Barry M. Goldwater Scholarship Committee (2014-2016)
UO College Scholars Program (2014-2017)

Students advised

Primary advisor

Dr. Laurent Devriendt, Postdoc, 2019-2022
Dr. Elias Bloch, Postdoc, 2014-2015
Umme Fatema, PhD student, 2023-Present
Qicui Jia, visiting PhD student from Tsinghua University, 2023
Ellen Olsen, PhD, 2017-2023: Stable isotope systematics of calcite
Marisa Acosta, PhD, 2014-2020: Titanium in quartz during growth and deformation under hydrothermal-magmatic conditions
Erin Hoxsie, MSc, 2018: Ash sintering in the presence of a CO₂-H₂O vapor: Experiments and comparison to natural samples
Madison Ball, MSc, 2015-2017: Timing vapor-melt equilibration in silicic magmas
Evan Baker, MSc, 2013-2015: Carbon and oxygen isotope fractionation in laboratory precipitated, inorganic calcite

Committee member

Degrees completed:

Monse Casconte (PhD, 2018-2025)
Annika Dechert (PhD, 2020-2025)
Lissie Connors (PhD, 2019-2025)
Behnaz Hosseini (PhD., 2019-2024, Montana State University)
Jacob McKenzie (PhD, 2018-2024, Chem)
Fatai Balogun (PhD, 2018-2022)
Josh Wiejaczka (PhD, 2017-2023)

Michelle Muth (PhD, 2016-2021)
Mike Hudak (PhD, 2016-2021)
Amy Ryan (PhD, 2016-2020, University of British Columbia)
Jessica Stone (PhD, 2014-2020, Anthropology)
Angelica Kneisly (MSc, 2018-2020, Interdisciplinary Studies)
Brandon Crockett (PhD, 2014-2019, Chemistry)
Brantley Fulton (PhD, 2014-2019, Chemistry)
Anne Fulton (MSc, 2016-2019)
Madison Myers (PhD, 2012-2017)
Benjamin Shapiro (MSc, 2011-2017)
Nicolas Famoso (PhD, 2012-2017)
Brennan O'Connell (MSc, 2014-2016)
Angela Seligman (PhD, 2011-2016)
Scott Maguffin (PhD, 2010-2016)
Ellen Aster (MSc, 2014-2016)
Nicolas Weldon (MSc, 2013-2016, UC-Davis)
Kenneth Befus (PhD, 2009-2014, UT-Austin)
Dana Drew (MSc, 2012-2013)
Felix von Aulock (PhD, 2009-2013, University of Canterbury)
Robin Tuohy (MSc, 2010-2013)

PhD candidates:

Kseniya Vialichka 2022-
August Harrell 2022-
Anika Tullos 2023-

MSc candidates

Margery Price 2023-

Funded Proposals

- *NSF-FRES: Collaborative Research: Does rapid mineralization and cohesion control the dynamics of slow slip events?* (2316819), 20234 \$1,772,446. 10/1/2024-9/30/2027. Co-PI w/A. Thomas (UO)
 - *NSF-EAR: Ca and K isotopic study of igneous and metamorphic transport processes.* **NSF: Petrology and Geochemistry** (EAR-2023513), \$25,000. 7/1/2021-6/30/2022. Subaward from PI DePaolo (UCB).
 - *NSF-EAR: Pumice: a post-fragmentation product?* **NSF: Petrology and Geochemistry** (EAR-2024510), \$355,315. 7/1/2020-6/30/2023. Co-PI w/T. Giachetti (UO).
 - *NSF CAREER: Toward an inorganic reference frame for interpreting the stable isotope composition of biogenic carbonates,* **NSF: Geobiology and Low-Temperature Geochemistry** (EAR-1749183), \$600,644. 9/1/2018-8/31/2024. Sole-PI.
 - *NSF-EAR: Collaborative research: What do obsidian pyroclasts tell us: Constraints from textures, volatiles, and experiments,* **NSF: Petrology and Geochemistry** (EAR-1725207), \$247,971 (UO portion), 7/1/2017-9/30/2021. Co-PI w/J. Gardner (UT) and T. Giachetti (UO).
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- *NSF-EAR: Formation of magmatic-hydrothermal veins: Interpreting quartz textures and vein mineral assemblages in the Butte, Montana porphyry copper system, NSF: Petrology and Geochemistry* (EAR-1524665), \$379,932. 6/15/2015-5/31/2020. Co-PI w/M. Reed (UO).
- *NSF-EAR: Ca-Mg isotopic probe of transport processes in high temperature geochemical systems, NSF: Petrology and Geochemistry* (EAR-1080000), \$98,415. 1/1/2014-12/31/2014. Subaward from PI DePaolo (UCB).
- *NSF-EAR: Chemical and isotopic gradients around bubbles in volcanic feeder systems”, NSF: Petrology and Geochemistry* (EAR-1249404), \$188,694. 12/1/2013-1/31/2017. Sole-PI

Invited talks

Berkeley (2025) - “Stable isotopes in carbonates: A climate archive built upon disequilibrium”

UC-Davis (2024) – “Stable isotopes in carbonates: A climate archive built upon disequilibrium”

AGU (2024) – “Biomineralization model for kinetic clumped isotope effects in the CaCO₃-DIC-H₂O system”

University of Oregon (2024) – “Stable isotopes in carbonates: A climate archive built upon disequilibrium”

SwissSIMS (2022) – “Using SIMS to investigate anomalous ages of eucrite meteorites”

UNIL (2022) – “The importance of sintering in volcanic eruptions”

Syros Workshop (2022) – “The thermodynamics and kinetics of quartz veins”

ETH paleoclimate group (2022) – “The unusual nature of carbonate formations in high-pH waters”

ETH IGP seminar (2022) – “Syncing TitaniQ: Reconciling some issues surrounding the Ti-in-quartz thermobarometer”

USGS Denver (2018) – “Oxygen isotope fractionation in the CaCO₃-DIC-H₂O system”

Caltech (2017) – “Oxygen isotope fractionation in the CaCO₃-DIC-H₂O system”

Brown University (2017) – “Magma degassing and regassing”

Brown University (2017) – “How, exactly, do minerals record paleo-environment?”

Goldschmidt keynote (declined; 2017) – Diffusion and transport processes in geomaterials

AGU invited (2016): “Where do obsidian pyroclasts come from and what can they tell us?”

Rice University (2016): “How, exactly, do minerals record paleo-environment?”

UC-Berkeley (2016): “How, exactly, do minerals record paleo-environment?”

Wayne State University (2016): “Crystal growth experiments and models”

Portland State University (2015): “Investigating paleoproxies using experiments and crystal growth models”

University of Washington (2014): “How, when, and why does paleothermometry work?”

AGU invited (2013): “Isotope fractionation by multicomponent diffusion”

Oregon State University (2013): “How, when, and why does paleothermometry work?”

University of Oregon (2013): “Low-T molecular isotope geochemistry”

UW-Eau Claire (2012): “Chemical gradients around bubbles: A new kind of geobarometer”

USGS-Menlo Park (2012): “Using isotopes to probe chemical speciation and diffusion mechanisms in molten silicates”

University of Oregon (2011): “Magmatic processes and properties inferred from non-equilibrium geochemistry”

Manuscripts in review or revision

Zhang, S., Jia, Q., Watkins, J. and Huang, Y., 202x, Ocean acidification hinders proton pumping by foraminifera, Submitted.

Publications

49. Acosta, M., **Watkins, J.**, Fougereuse, D., Foley, M., Plumper, O., Saxey, D., Reddy, S., and Reed, M., 2026, Impurity poisoning as a mechanism for the formation of zircon oscillatory growth zones, *Contributions to Mineralogy and Petrology*, in press.
 48. Thomas, A., **Watkins, J.**, Beeler, N., French, M., Behr, W., and Reed, M., 2025, Rapid fault healing from cementation in the source region of deep slow slip and tremor, *Science Advances*, v. 11, no. 47.
 47. Lucarelli, J., Purgstaller, B., Parvez, Z., **Watkins, J.**, Eagle, R., Dietzel, M., and Tripathi, A., 2025, Dual clumped isotope (Δ_{47} , Δ_{48}) values for calcite grown at varying pH and carbonic anhydrase concentrations constrain equilibrium and kinetic isotope effects, *Geochemistry, Geophysics, Geosystems*, in press.
 46. **Watkins, J.**, Jia, Q., Zhang, S., Devriendt, L., and Chen, S., 2025, Dual-clumped model of coral aragonite isotopic composition constrains the conditions of biomineralization, *Geochemistry, Geophysics, Geosystems*, v. 26, no. 9, e2025GC012263.
 45. Chen, S., and **Watkins, J.**, 2025, Oxygen and carbon isotopes in marine carbonates: A biogenic climate archive built upon disequilibria, *Elements*, v. 21, p. 112-117.
 44. Jia, Q., Zhang, S., **Watkins, J.**, Devriendt, L., Huang, Y., and Wang, G., 2024, Modeled foraminiferal calcification and strontium partitioning in benthic foraminifera helps reconstruct calcifying fluid composition, *Nature Communications: Earth and Environment*, v. 5, no. 1, p. 36
 43. Aubin, W., Gardner, J., **Watkins, J.**, and Lloyd, M., 2023, Construction of obsidian during explosive-effusive eruptions: Insights from microlite crystals in obsidian pyroclasts, *Frontiers in Earth Science*.
 42. Parvez, Z., Matamoros, I., Rubi, J., Miguel, K., Elliot, B., Flores, R., Lucarelli, J., Ulrich, R., Eagle, R., **Watkins, J.**, Christensen, J., and Tripathi, A., 2023, Paired Δ_{47} - Δ_{48} constrains kinetic effects and timescales in peridotite-associated springs, *Geochimica et Cosmochimica Acta*, v. 358, p. 77-92.
 41. Hosseini, B., Myers, M., **Watkins, J.**, and Harris, M., 2023, Are we recording? Putting embayment speedometry to the test using high pressure-temperature decompression experiments, *Geochemistry, Geophysics, Geosystems*, 18 p.
 40. Hudak, M., Bindeman, I., **Watkins, J.**, and Lowenstern, J., 2022, Hydrogen isotope fractionation between volcanic glass and water vapor between 175 and 375°C, *Geochimica et Cosmochimica Acta*, v. 337, p. 33-48.
 39. Acosta, M., Reed, M., and **Watkins, J.**, 2022, Quartz vein formation and deformation during porphyry Cu deposit formation: A microstructural and geochemical analysis of the Butte, Montana ore deposit, *Lithosphere*, 19 pages.
 38. **Watkins, J.**, and Devriendt, L., 2022, A combined model for kinetic clumped isotope effects in the CaCO_3 -DIC- H_2O system, *Geochemistry, Geophysics, Geosystems*, 34 pages.
 37. Olsen, E. **Watkins, J.**, and Devriendt, L., 2022, Oxygen isotopes of calcite precipitated at high ionic strength: CaCO_3 -DIC fractionation and carbonic anhydrase inhibition. *Geochimica et Cosmochimica Acta*, v. 325, p. 170-186.
 36. **Watkins, J.**, Christensen, J., Ryerson, F., and DePaolo, D., 2022, Ca and K isotope fractionation by diffusion in molten silicates: Large concentration gradients are not required to induce large diffusive isotope effects, *Isotopic Constraints on Earth System Processes, Geophysical Monograph*, 273.
 35. **Watkins, J.**, and Antonelli, M., 2022, Beyond equilibrium: Kinetic isotope effects in high-temperature systems, *Elements*, v. 17, p. 383-388.
 34. Devriendt, L., Metzger, E., Olsen, E., **Watkins, J.**, Kaczmarek, K., Nehrke, G., de Nooijer, L., and Reichart, G.-J., 2021, Sodium incorporation into inorganic CaCO_3 and implications for biogenic carbonates as a salinity proxy, *Geochimica et Cosmochimica Acta*, v. 314, p. 294-312.
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33. Giachetti, T., Trafton, K., Wiejaczka, J., Gardner, J., **Watkins, J.**, Shea, T., Wright, H., 2021, The products of primary magma fragmentation finally revealed by pumice agglomerates, *Geology*, v. 49. p. <https://doi.org/10.1130/G48902.1>.
 32. Christensen, J., **Watkins, J.**, Devriendt, L., DePaolo, D., Conrad, M., Voltolini, M., Yang, W., and Dong, W., 2021, Isotopic fractionation accompanying CO₂ hydroxylation and carbonate precipitation from high pH waters at The Cedars, California, USA, *Geochimica et Cosmochimica Acta*, v. 301, p. 91-115.
 31. Acosta, M., **Watkins, J.**, Reed, M., Donovan, J., and DePaolo, D., 2020, Ti-in-quartz: Evaluating the role of kinetics in high temperature crystal growth experiments, *Geochimica et Cosmochimica Acta*, v. 281, p. 149-167.
 30. Antonelli, M., Mittal, T., McCarthy, A., Tripoli, B., **Watkins, J.**, and DePaolo, D., 2019, Ca isotopes indicated rapid disequilibrium crystal growth in volcanic and subvolcanic systems, *Proceedings of the National Academy of Sciences*, v. 116.
 29. Gardner, J., Wadsworth, F., Llewellyn, E., **Watkins, J.**, and Coumans, J., 2019, Experimental constraints on the textures and origin of obsidian pyroclasts, *Bulletin of Volcanology*, 81:22.
 28. Burgener, L., Huntington, K., Sletten, R., **Watkins, J.**, Quade, J., and Hallet, B., 2018, Clumped isotope constraints on equilibrium formation and kinetic isotope effects in soil carbonates from cold environments, *Geochimica et Cosmochimica Acta*, v. 235, p. 402-430.
 27. Myers, M., Wallace, P., Wilson, C., **Watkins, J.M.** and Liu, Y., 2018, Ascent rates of rhyolitic magma at the onset of three caldera forming eruptions, *American Mineralogist*, v. 103, p. 952-965.
 26. Gardner, J., Wadsworth, F., Llewellyn, E., **Watkins, J.M.** and Coumans, J., 2018, Experimental sintering of ash at conduit conditions and implications for the longevity of tuffisites, *Bulletin of Volcanology*, 80:23.
 25. Bloch, E., **Watkins, J.**, and Ganguly, J., 2018, Comment on "Reconciliation of the excess ¹⁷⁶Hf conundrum in meteorites: Recent disturbances of the Lu-Hf and Sm-Nd isotope systematics," *Geochimica et Cosmochimica Acta*, v. 230, p. 190-192.
 24. Devriendt, L.S., **Watkins, J.**, and McGregor, H.V., 2017, Oxygen isotope fractionation in the CaCO₃-DIC-H₂O system, *Geochimica et Cosmochimica Acta*, v. 214, p. 115-142.
 23. Saenger, C., Gabitov, R., Farmer, J., **Watkins, J.**, and Stone, R., 2017, Linear correlations in bamboo coral δ¹³C and δ¹⁸O sampled by SIMS and micromill: Evaluating paleoceanographic potential and biomineralization mechanisms using δ¹¹B and Δ₄₇ variability, *Chemical Geology*, v. 454, p. 1-14.
 22. Bloch, E., **Watkins, J.**, and Ganguly, J., 2017, Diffusion kinetics of lutetium in diopside and the effect of thermal metamorphism on Lu-Hf systematics in clinopyroxene, *Geochimica et Cosmochimica Acta*, v. 204, p. 32-51.
 21. Gardner, J.E., Llewellyn, E.W., **Watkins, J.**, and Befus, K.S., 2017, Formation of obsidian pyroclasts by sintering of ash particles in the volcanic conduit, *Earth and Planetary Science Letters*, v. 459, p. 252-263.
 20. **Watkins, J.**, Gardner, J.E., and Befus, K.S., 2017, Nonequilibrium degassing, regassing, and vapor fluxing in magmatic feeder systems, *Geology*, v. 45, no. 2, p. 183-186.
 19. Teng, F., Dauphas, N., and **Watkins, J.**, 2017, Non-traditional stable isotopes: Retrospective and prospective, *Reviews in Mineralogy and Geochemistry*, v. 82, p. 1-26.
 18. **Watkins, J.**, DePaolo, D., and Watson, E.B., 2017, Kinetic fractionation of non-traditional stable isotopes by diffusion and crystal growth reactions, *Reviews in Mineralogy and Geochemistry*, v. 82, p. 85-125.
 17. Seligman, A., Bindeman, I., **Watkins, J.**, and Ross, A., 2016, Water in volcanic glass: From volcanic degassing to secondary hydration, *Geochimica et Cosmochimica Acta*, v. 191, p. 216-238.
 16. Saenger, C., and **Watkins, J.**, 2016, A refined method for calculating paleotemperatures from linear correlations in bamboo coral carbon and oxygen isotopes, *Paleoceanography*, v. 31, p. 789-799.
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15. Gardner, J., Befus, K., **Watkins, J.**, and Clow, T., 2016, Nucleation rates of spherulites in natural rhyolitic lava, *American Mineralogist*, v. 101, p. 2367-2376.
 14. Aster, A., Wallace, P., Moore, L., **Watkins, J.**, Gazel, E., and Bodnar, R., 2016, Reconstructing CO₂ concentrations in basaltic melt inclusions from mafic cinder cones using Raman analysis of vapor bubbles, *Journal of Volcanology and Geothermal Research*, v. 323, p. 148-162.
 13. **Watkins, J.**, and Hunt, J., 2015, A process-based model for non-equilibrium clumped isotope effects in carbonates, *Earth and Planetary Science Letters*, v. 432, p. 152-165.
 12. Befus, K.S., **Watkins, J.**, Gardner, J., Richard, D., Befus, K. M., and Miller, N., 2015, Spherulites as in-situ recorders of thermal history in lava flows, *Geology*, v. 43, no. 7, p. 647-650.
 11. von Aulock, F., Kennedy, B., Schipper, I., Castro, J., Martin, D., Oze, C., Nichols, A., **Watkins, J.**, Wallace, P., Puskar, L., Bégué, F., Tuffen, H., 2015, Advances in Fourier transform infrared spectroscopy of natural glasses: From sample preparation to data analysis, *Lithos*, v. 206-207, p. 52-64.
 10. **Watkins, J.**, Hunt, J., Ryerson, F., and DePaolo, D., 2014, The influence of temperature, pH, and growth rate on the $\delta^{18}\text{O}$ composition of inorganically precipitated calcite, *Earth and Planetary Science Letters*, v. 404, p. 332-343.
 9. **Watkins, J.**, Liang, Y., Ryerson, F., Richter, F., and DePaolo, D., 2014, Diffusion of multi-isotopic chemical species in molten silicates, *Geochimica et Cosmochimica Acta*, v. 139, p. 313-326.
 8. **Watkins, J.**, Nielsen, L., Ryerson, F., and DePaolo, D., 2013, The influence of kinetics on the oxygen isotope composition of calcium carbonate, *Earth and Planetary Science Letters*, v. 375, p. 349-360.
 7. Gardner, J., Befus, K., **Watkins, J.**, Hesse, M., and Miller, N., 2012, Compositional gradients surrounding spherulites in obsidian and their relationship to spherulite growth and cooling, *Bulletin of Volcanology*, v. 74, no. 8., p. 1865-1879.
 6. **Watkins, J.**, Manga, M., and DePaolo, D., 2012, Bubble geobarometry: A record of pressure changes, degassing, and regassing at Mono Craters, California, *Geology*, doi:10.1130/G33027.1
 5. **Watkins, J.**, DePaolo, D.J., Ryerson, F., and Peterson, B., 2011, Influence of liquid structure on diffusive isotope separation in molten silicates and aqueous solutions, *Geochimica et Cosmochimica Acta*, v. 75. p. 3103-3118.
 4. **Watkins, J.**, DePaolo, D.J., Huber, C., and Ryerson, F., 2009, Liquid composition-dependence of calcium isotope fractionation during diffusion in molten silicates, *Geochimica et Cosmochimica Acta*, v. 73, p. 7341-7359.
 3. Richter, F.M, Watson, E.B., Mendybaev, R., Dauphas, N., Georg, B., **Watkins, J.**, and Valley, J., 2009, Isotopic fractionation of the major elements of molten basalt by chemical and thermal diffusion, *Geochimica et Cosmochimica Acta*, v. 73, p. 4250-4263.
 2. **Watkins, J.**, Manga, M., Huber, C., and Martin, M., 2008, Diffusion controlled spherulite growth inferred from H₂O concentration profiles in obsidian, *Contributions to Mineralogy and Petrology*, v. 157, p. 163-172.
 1. Huber, C., **Watkins, J.**, and Manga, M., 2008, Steady shape of a miscible bubble rising below an inclined wall at low Reynolds numbers, *European Journal of Fluid Mechanics B/Fluids*, v. 28, p. 405-410.
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