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, ERTH 101: *Exploring Planet Earth*, 2018, 2020, 2022, 2024
University of Oregon, ERTH 201: *Dynamic Planet Earth*, 2021, 2023, 2025
University of Oregon, ERTH 311: *Earth Materials*, 2015, 2016, 2018, 2021
University of Oregon, ERTH 353: *Geological Hazards*, 2013, 2014, 2018
University of Oregon, ERTH 406: *Field Camp*, 2013, 2014, 2015, 2020
University of Oregon, ERTH 410/510: *Geochemical Modeling*, 2014, 2016, 2020, 2024
University of Oregon, ERTH 510: *Low-temperature geochemistry*, 2017
University of Oregon, ERTH 510: *Non-traditional stable isotope geochemistry*, 2015
University of Oregon, ERTH 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 CO_2-H_2O 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).

- *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 $CaCO_3$-DIC-H_2O 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 $CaCO_3$-DIC-H_2O system"

Caltech (2017) – "Oxygen isotope fractionation in the $CaCO_3$-DIC-H_2O 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.

Publications

49. Acosta, M., **Watkins, J.,** Fougerouse, 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*, v. 181, no. 2.
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 Tripati, A., 2025, Dual clumped isotope (Δ47, Δ48) 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 Tripati, 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.

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 CO_2 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., Llewellin, 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., Llewellin, 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 ^{176}Hf 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 $CaCO_3$-DIC-H_2O 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 $\delta^{13}C$ and $\delta^{18}O$ sampled by SIMS and micromill: Evaluating paleoceanographic potential and biomineralization mechanisms using $\delta^{11}B$ and Δ_{47} 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., Llewellin, 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.

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 CO_2 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 $\delta^{18}O$ 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 H_2O 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.