

Buchanan Kerswell, PhD

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Curriculum Vitae: Jul 22 2025

Summary

I study how Earth's mantle and tectonic plates move using fieldwork, petrography, numerical geodynamic modeling, applied statistics, and analytical techniques in laboratories. My work focuses on rock formation and deformation at a small scales, and how these processes affect larger systems. Thus, my colleagues and students typically work in remote mountains, use electron beams in labs, and run simulations on large computer clusters. I also teach, create learning materials, and explore how AI can improve geoscience.

Education

- May 2022 : Aug 2015 **PhD Geosciences** Boise State University
Supervisor: Dr. Matthew Kohn
Dissertation: Computational Approaches to Understanding Subduction Zone Geodynamics, Surface Heat Flow, and the Metamorphic Rock Record
- Jul 2015 : Aug 2011 **BSc Earth Science** Utah Valley University
Supervisor: Dr. Steven Fellows
Thesis: Geochemical Analysis Of Tourmaline as a Tool for Determining the Location and Characteristics of the Main Central Thrust, Central Nepal

Professional Appointments

- present : Nov 2024 **Postdoctoral research associate** University of Liverpool
Investigated phase transformations in mantle flow models under non-hydrostatic stress conditions
- Oct 2024 : May 2023 **Postdoctoral research associate** Géosciences Montpellier
Applied machine learning (ML) and artificial intelligence (AI) techniques to geochemical and thermodynamic datasets to increase the efficiency of predicting rock properties in numerical geodynamic simulations

- May 2023 : Aug 2022 **Visiting assistant professor** Miami University
Adapted, updated, delivered, and graded course materials, mentored independent undergraduate research on high-pressure metamorphic rocks within the AUGITE program, taught graduate/undergraduate seminars on scientific communication including technical writing workshops and student-led public presentations and discussions, completed a New Faculty Teaching Enhancement Program with Miami's Center for Teaching and Learning, participated in cross-disciplinary events across campus
- May 2019 : Jan 2019 **Instructor** Boise State University
Adapted, updated, delivered, and graded course materials, transitioned a field-based course to online-learning, produced a virtual field trip during the early COVID-19 pandemic
- Aug 2018 : Jun 2018 **Visiting student** Sorbonne Université
Supervisor: Dr. Philippe Agard
Studied rheologic theory and application, implemented metamorphic-rheologic processes into numerical geodynamic models
- Dec 2017 : Sep 2017 **Visiting student** ETH-Zürich
Supervisor: Dr. Taras Gerya
Studied computational fluid dynamic theory and application, practiced high performance computing, and developed finite-difference numerical geodynamic models of subduction
- May 2022 : Aug 2015 **Graduate research associate** Boise State University
Supervisor: Dr. Matthew Kohn
Studied petrologic theory and application, practiced chemistry- and physics-based analytical techniques, sampled various rock types and tectonic structures from exhumed HP terranes (Catalina Island, W Alps, NW India, Greece), led seminars on tectonic theory and application
- May 2021 : Aug 2015 **Graduate teaching associate** Boise State University
Adapted, updated, delivered, and graded course materials, organized, ran, and graded up to one field exercise per week, developed web pages and inclusive formats to enhance online-learning experiences
- May 2021 : Aug 2015 **Guest lecturer** Boise State University
Introduced finite-difference numerical modeling approaches, led students through live coding tutorials (a student's code featured in this peer-reviewed publication), presented selected material on subduction zone metamorphism and geodynamics

Peer-reviewed Publications

Pending Books

- [1] **B. Kerswell** (2025). *Methods in Tectonics: From Big Data to Machine Learning. Geoscience in Practice: Geological Society of London.*

Pending Journal Articles

- [1] **B. Kerswell**, M. Kohn (2025). A Comparison of Surface Heat Flow Interpolations Near Subduction Zones. *In preparation.* [online pdf repo](#)

Published Journal Articles

- [1] **B. Kerswell**, N. Cerpa, A. Tommasi, M. Godard, J. Alberto Padrón-Navarta (2024). RocMLMs: Predicting Rock Properties through Machine Learning Models. *JGR: MLC*. doi: 10.1029/2024JH000264 [online](#) [pdf](#) [repo](#) [google](#)
- [2] **B. Kerswell**, M. Kohn, T. Gerya (2023). Computing Rates and Distributions of Rock Recovery in Subduction Zones. *Geochemistry, Geophysics, Geosystems*. doi: 10.1029/2022GC010834 [online](#) [pdf](#) [repo](#) [google](#)
- [3] M. Klöcking, L. Wyborn, K. Lehnert, B. Ware, A. Prent, L. Profeta, F. Kohlmann, W. Noble, I. Bruno, S. Lambart, H. Ananuer, N. Barber, H. Becker, M. Brodbeck, H. Deng, K. Deng, K. Elger, G. de Souza Franco, Y. Gao, K. Ghasera, D. Hezel, J. Huang, **B. Kerswell**, J. Kim, H. Koch, A. Lanati, G. ter Maat, N. Martínez-Villegas, L. Nana Yobo, N. Randazzo, A. Redaa, W. Schäfer, M. R. Swing, R. Taylor, M. Traun, J. Whelan, T. Zhou (2023). Community Recommendations for Geochemical Data, Services and Analytical Capabilities in the 21st Century. *Geochimica et Cosmochimica Acta*. doi: 10.1016/j.gca.2023.04.024 [online](#) [pdf](#) [google](#)
- [4] **B. Kerswell**, M. Kohn, T. Gerya (2021). Backarc Lithospheric Thickness and Serpentine Stability Control Slab-Mantle Coupling Depths in Subduction Zones. *Geochemistry, Geophysics, Geosystems*. doi: 10.1029/2020GC009304 [online](#) [pdf](#) [repo](#) [google](#)
- [5] S. Long, M. Kohn, **B. Kerswell**, J. Starnes, K. Larson, N. Blackford, E. Soignard (2020). Thermometry and Microstructural Analysis Imply Protracted Extensional Exhumation of the Tso Moriri UHP Nappe, Northwestern Himalaya: Implications for Models of UHP Exhumation. *Tectonics*. doi: 10.1029/2020TC006482 [online](#) [pdf](#) [repo](#) [google](#)
- [6] M. Kohn, A. Castro, **B. Kerswell**, C. Ranero, F. Spear (2018). Shear Heating Reconciles Thermal Models with the Metamorphic Rock Record of Subduction. *Proceedings of the National Academy of Sciences*. doi: 10.1073/pnas.1809962115 [online](#) [pdf](#) [google](#)

Conference Proceedings

- [1] **B. Kerswell**, N. Cerpa, A. Tommasi, M. Godard, J. Alberto Padrón-Navarta (2024). RocMLMs: Predicting Rock Properties through Machine Learning Models. *American Geophysical Union 2024, Washington D.C.*. [abstract](#) [slides](#) [video](#)
- [2] **B. Kerswell**, N. Cerpa, A. Tommasi, M. Godard, J. Alberto Padrón-Navarta (2024). RocMLMs: Predicting Rock Properties through Machine Learning Models. *European Geosciences Union 2024, Vienna Austria*. doi: 10.5194/egusphere-egu24-8578 [abstract](#) [slides](#)
- [3] **B. Kerswell**, M. Kohn (2023). A Comparison of Surface Heat Flow Interpolations Near Subduction Zones. *Goldschmidt 2023, Lyon France*. [slides](#)
- [4] D. Sims, **B. Kerswell** (2023). Deformation of Dry High-Pressure Eclogites During Tectonic Slicing of Subducted Oceanic Lithosphere: a Case Study from the Monviso Ophiolite, Italy. *Geological Society of America North-Central 2023, Grand Rapids*. doi: 10.1130/abs/2023NC-386862 [abstract](#)
- [5] C. Morrison, **B. Kerswell** (2023). Comparing PT Paths of Metamorphic Rocks Determined by Quantitative and Semi-Quantitative Approaches: a Case Study from the Monviso Ophiolite, Italy. *Geological Society of America North-Central 2023, Grand Rapids*. doi: 10.1130/abs/2023NC-386686 [abstract](#)
- [6] **B. Kerswell**, M. Kohn (2022). A Comparison of Surface Heat Flow Interpolations Near Subduction Zones. *American Geophysical Union 2022, Chicago*. [abstract](#) [slides](#) [video](#)

- [7] **B. Kerswell**, M. Kohn, T. Gerya (2022). Computing Rates and Distributions of Rock Recovery in Subduction Zones. *Geological Society of America 2022, Denver*. [abstract](#) [slides](#)
- [8] **B. Kerswell**, M. Kohn, T. Gerya (2022). Computing Rates and Distributions of Rock Recovery in Subduction Zones. *Goldschmidt 2022, Honolulu USA*. [abstract](#) [slides](#) [video](#)
- [9] **B. Kerswell**, M. Kohn, T. Gerya (2018). A Physical Mechanism Explaining the Common Depth of Slab-Mantle Coupling and Formation of a Rheologic Backstop at ~80 km Depth. *Goldschmidt 2018, Boston USA*. [abstract](#)
- [10] **B. Kerswell**, M. Kohn, T. Gerya (2018). Backarc Lithospheric Thickness and Serpentine Stability Control Slab-Mantle Coupling Depths in Subduction Zones. *50 Years of Plate Tectonics: Then, Now, and Beyond, Collège de France, Paris France*.
- [11] **B. Kerswell**, S. Fellows, S. Emerman, S. Panday, S. Adhikari (2014). Geochemical Analysis Of Tourmaline as a Tool for Determining the Location and Characteristics of the Main Central Thrust, Central Nepal. *Geological Society of America 2014, Vancouver Canada*. [abstract](#) [slides](#)

Invited Talks

- [1] **B. Kerswell**, N. Cerpa, A. Tommasi, M. Godard, J. Alberto Padrón-Navarta (2024). RocMLMs: Predicting Rock Properties through Machine Learning Models. *American Geophysical Union 2024, Washington D.C.* [slides](#) [video](#)
- [2] **B. Kerswell** (2022). Evaluating Distributions of High-Pressure Rock Recovery in Subduction Zones with Large Empirical Datasets and Numerical Simulations. *University of Minnesota*. [slides](#)
- [3] **B. Kerswell** (2022). Evaluating Aspects of Geodynamic Uniformity Among Subduction Zones with Large Empirical Datasets and Numerical Simulations. *University of Southern California*. [slides](#) [video](#)

Professional Development

Workshops

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| Jun 2025 | <u>ASPECT Hackathon</u> Garden City, Utah, USA
Implemented a new material model in ASPECT that governs phase transformation kinetics via non-equilibrium thermodynamics |
| Apr 2025 | <u>Metamorphic Studies Group</u> Liverpool, United Kingdom
Presented research and engaged in networking and scientific discussions focusing on metamorphic petrology |
| Apr 2025 | <u>Imaging Planetary Solid Dynamics</u> Cambridge, United Kingdom
Presented research and engaged in networking and scientific discussions focusing on seismology and geodynamics |
| Sep 2024 | <u>Ada Lovelace</u> Sète, France
Presented research and engaged in networking and scientific discussions focusing on numerical geodynamic modeling |
| Jul 2024 | <u>ERC RhEoVOLUTION</u> Montpellier, France
Presented research and engaged in networking and scientific discussions focusing on deformation in the solid Earth |

- Jul 2024 **French Network on Subduction Zones (FrenSZ)** Barcelonnette, France
Presented research and engaged in networking and scientific discussions focusing on subduction zone dynamics
- Jan 2024 **ERC RhEoVOLUTION** Villard-de-Lans, France
Presented research and engaged in networking and scientific discussions focusing on deformation in the solid Earth
- May 2023 **Réseau Numérique en Terre Solide (NuTS)** Université Lyon 1
Presented research and engaged in networking and scientific discussions focusing on current capabilities and new directions for scientific computing in the geosciences
- Jul 2022 **Earth Science Meets Data Science** Goldschmidt Conference Honolulu
Explored scientific challenges in geochemistry, showcased examples of existing data solutions/infrastructures/services, discussed recommendations, best practices, and essential features of a globally standardised geochemical data framework
- Jul 2020 **Preparing for an academic career Earth Educators Rendezvous**
Discussed career paths, prepared and reviewed job application materials
- Feb 2019 **GeoPRISMS Synthesis & Integration TEI** Hotel Menger, San Antonio TX
Engaged in community efforts to synthesize the successful achievements of the MARGINS and GeoPRISMS programs, participated in an Early-Career Investigator symposium to identify outstanding questions in subduction zone research
- Aug 2018 **GeoPRISMS EFIRE** Boston College, MA
Engaged in community building, initiated strategic sharing and storage protocols for EFIRE samples, presented research on subduction zone mechanics, planned a field institute for 2019
- Dec 2016 **GeoPRISMS EFIRE** Marin Headlands Hostel, CA
Engaged in community building, discussed past research to identify future targets for subduction zone investigations, planned a field institute for 2017
- Feb 2016 **SIMS student workshop UCLA EPSS**
Engaged in a 5-day workshop focused on principles and practice of secondary-ion mass spectrometry (SIMS)

Scholarly Teaching

- Aug 2022 **New faculty teaching enhancement program** Miami University CTE
Engaged in numerous activities on improving scholarly teaching
- Aug 2020 **Graduate identity formation through teaching** Boise State University CTL
Planned K-12 lessons with Education majors based on next generation science standards
- Aug 2020 **Exploration in pedagogy** Boise State University CTL
Engaged in numerous activities on pedagogy and inclusive teaching

Awards & Honors

Minor Awards

- Jun 2019 **Research grant** \$3,500 GeoPRISMS: EFIRE
Sampling mafic eclogites from Monviso, Italy
- Feb 2016 **Research grant** \$1,500 Geological Society of America
Zr-in-Rutile EPMA analysis

Proposed Projects (not funded)

- Nov 2024 **Fellowship** €89,000 Humboldt Foundation
Interplay between Metamorphic Reactions and Fluid-Mediated Strain Localization: A Comparative Study of Mélange-Type and Coherent-Type Ophiolites in the Cycladic Archipelago and Western Alps
- Jun 2024 **Fellowship** €80,400 Juan de la Cierva (reserve: #6 of 154)
Investigating the interplay between fluid-mediated metamorphic reactions and strain localization during tectonic slicing of subducted oceanic lithosphere: a case study from the Monviso Ophiolite, Italy
- Feb 2024 **Fellowship** €195,915 Marie Curie Fellowship (score: 85.6/100)
Supervised Machine learning for Accurate and Rapid Thermodynamics in GEodynamic Simulation (SMARTGEOS)

Honors

- May 2021 **Outstanding graduate teaching assistant** Boise State University
Voted best Teaching Assistant by the Department of Geosciences student body
- May 2015 **Outstanding undergraduate contributions** Utah Valley University
Engaged in community building, organized field trips, and served as president of the Geology Club
- Jan 2013 **NSF undergraduate STEM fellowship** Utah Valley University
Engaged in interdisciplinary activities with faculty mentors and undergraduates from STEM fields

Professional Service

International

- Apr 2025 **Reviewer** Journal of Metamorphic Geology
- May 2024 **Reviewer** Scientific Reports
- Jan 2024 **Reviewer** iScience (Cell Press)
- Oct 2023 **Reviewer** Gondwana Research
- Dec 2022 **OSPA Judge** AGU Fall Meeting 2022 Chicago
- Nov 2022 **Reviewer** German Research Foundation (DFG)
- Oct 2022 **Reviewer** Geophysics Geochemistry Geosystems (G3)

University

- Apr 2025 **Organizing committee** MinSoc Metamorphic Studies Group
50+ participants
Co-organized and hosted meeting and workshop on behalf of the Mineralogical Society
- May 2023 **Faculty judge** Road Test Pitch Competition 2023
100+ undergraduates
Heard undergraduates pitch early-stage business ideas that they developed at Miami University's Farmers Business School
- Mar 2023 **Faculty mentor** Social Innovation Weekend 2023
100+ undergraduates
Engaged with student teams at Miami University's Farmers Business School as they proposed innovative new technologies regarding climate change and its impacts on our society

Professional Affiliations

- Jan 2024 **Member** European Geosciences Union
- Jan 2021 **Member** International Association for Mathematical Geosciences
- Jan 2012 **Member** American Geophysical Union
- Jan 2012 **Member** Geological Society of America
- Jan 2012 **Member** Mineralogical Society of America

Mentoring

year	name	role	presented	thesis
2023: 2022	C. Morrison	Undergraduate	GSA NC 2023	<u>Comparing PT paths: Monviso Ophiolite</u>
2023: 2022	D. Sims	Undergraduate	GSA NC 2023	<u>Strain localization: Monviso Ophiolite</u>

Teaching

The table below shows comparative mean scores (out of 4 = “strongly agree”) for the following prompt given to students at the end of term: “Upon reflection, this instructor is an effective teacher”.

term	course	title	format	role	students	score	department
Sp2023	GLG 556	Environmental & Economic Mineralogy	Seminar	Instructor	7	3.9	3.4
Sp2023	GLG 456	Environmental & Economic Mineralogy	Seminar	Instructor	30	3.9	3.4
Sp2023	GLG 111	Dynamic Earth	Lecture/Lab	Instructor	342	3.6	3.4
Fa2022	GLG 211	Chemistry of Earth Systems	Lecture/Lab	Instructor	27	3.4	3.4
Fa2022	GLG 121	Environmental Geology	Lecture/Lab	Instructor	196	3.7	3.5
Sp2021	GEOS 345	Igneous & Metamorphic Petrology	Lecture/Lab	TA	23	—	—
Fa2020	GEOS 471	Field Methods	Field Lab	TA	8	—	—
Fa2020	GEOS 315	Sedimentology & Stratigraphy	Lecture/Lab	TA	21	—	—
Sp2020	GOES 314	Structural Geology	Lecture/Lab	Instructor	20	—	—
Sp2019	GEOS 645	Physics & Chemistry of Mountain Building	Seminar	Guest lecturer	12	—	—
Sp2018	GEOS 597	Subduction Zone Processes	Seminar	Co-instructor	15	—	—
Sp2016	GEOS 300	Earth Materials	Lecture/Lab	TA & guest lecturer	23	—	—
Fa2015	GEOS 101	Introductory Geology	Lecture/Lab	TA	48	—	—