Buchanan Kerswell, PhD

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Curriculum Vitae: Apr 23 2025

Summary

I study how Earth's mantle and tectonic plates move. I focus on rock formation at a small scale and how this affects larger systems. I use fieldwork, petrography, and lab techniques like EPMA, LAICPMS, and Raman microscopy. My colleagues and students work in remote mountains, use electron beams in labs, and run simulations on computers. 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 Centeral Thurst, Central Nepal

Professional Appointments

present : Nov 2024 **Postdoc** **University of Liverpool**
Investigated phase transformations in mantle flow models under non-hydrostatic stress conditions

Oct 2024 : May 2023 **Postdoc** **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 asst. prof.** **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 performace computing, and developed finite-difference numerical geodynamic models of subduction

May 2022 : Aug 2015 **Graduate RA** 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 TA** 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

[1] **B. Kerswell**, M. Kohn (2024). A Comparison of Surface Heat Flow Interpolations Near Subduction Zones. *In preparation.* online pdf repo

Published

[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 Morari 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 Centeral Thurst, 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

Apr 2025 **Metamorphic Studies Group** Liverpool, United Kingdom
Presented research and engaged in networking and scientific discussions focusing on metamorphic petrology

Apr 2025 **Imaging Planetary Solid Dynamics** Cambridge, United Kingdom
Presented research and engaged in networking and scientific discussions focusing on seismology and geodynamics

Sep 2024 **Ada Lovelace** Séte, France
Presented research and engaged in networking and scientific discussions focusing on numerical geodynamic modeling

Jul 2024 **ERC RhEoVOLUTION** Montpellier, France
Presented research and engaged in networking and scientific discussions focusing on deformation in the solid Earth

Jan 2024 **ERC RhEoVOLUTION** Villard-de-Lans, 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

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 Geol

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)

May 2024 **Reviewer** Scientific Reports

University

Apr 2025 **Co-organizer** Annual MinSoc Metamorphic Studies Group meeting
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	Comparing PT paths: Monviso Ophiolite
2023: 2022	D. Sims	Undergraduate	GSA NC 2023	Strain localization: Monviso Ophiolite

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	—	—