

Kirsty A. McKenzie

Postdoctoral Research Associate

University of North Carolina, Chapel Hill | Department of Earth, Marine, and Environmental Sciences

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Education

The Pennsylvania State University

PhD Geosciences

Jun 2022

Dissertation title: *Studies of Upper-Plate Deformation at Subduction Zone Plate Boundaries*

Advisor: Kevin Furlong

University of St Andrews

1st Class BSc (Honours) Geology

Jun 2016

Undergraduate dissertation title: *Modal Layering in the Carna Pluton, Connemara, Ireland*

Employment

University of North Carolina at Chapel Hill

Postdoctoral Research Associate (Supervisor: Eric Kirby)

Jul 2022-present

The Pennsylvania State University

Graduate Research/Teaching Assistant

2017-2022

Peer-Reviewed Publications

McKenzie, K.A., Kelsey, H.M., Kirby, E., Rittenour, T.M., Furlong, K.P. (2022). Differential coastal uplift quantified by luminescence dating of marine terraces, central Cascadia forearc, Oregon, *Quaternary Science Reviews*, 298

McKenzie, K.A., Furlong, K.P., Herman, M.W. (2022). Regional and local patterns of upper-plate deformation in Cascadia: the importance of the down-dip extent of locking relative to upper-plate strength contrasts, *Tectonics*, 41(1)

McKenzie, K.A., Furlong, K.P., Kirby, E. (2022). Mid-Miocene to present upper-plate deformation of the southern Cascadia forearc: Effects of the superposition of subduction and transform tectonics, *Frontiers in Earth Science*, 10

McKenzie, K.A., Furlong, K.P., (2021). Isolating Non-Subduction-Driven Tectonic Processes in Cascadia, *Geoscience Letters*, 8(10)

McKenzie, K.A., Furlong, K.P., Herman, M.W. (2020). Bidirectional Loading of the Subduction Interface: Evidence from the Kinematics of Slow Slip Events, *Geochemistry, Geophysics, Geosystems*, 21(9)

Furlong, K.P., Villaseñor, A., Benz, H.M., **McKenzie, K.A.** (Accepted). Formation and Evolution and Pacific - North America (San Andreas) Plate Boundary: Constraints from Crustal Architecture of Northern California, *Tectonics*

Funding

The Geological Society of America

AGeS2 Geochronology Research Award. Project Title: Quantifying differential uplift of the Yaquina Bay Fault, Oregon using OSL of marine terrace sands

2019

Teaching Experience

UNC Chapel Hill

TIBBS Teaching Series in STEM education Summer 2023

Participated in a 6-week training series including syllabus, course, and assessment design, implementing active learning practices, & promoting DEI in the classroom

The Pennsylvania State University

GEOSC 397/499 “Natural Hazards in a Developing Nation” Maymester
Co-leader, *including a 3-week field excursion to Thailand* 2019, 2022

GEOSC 301 “Plate Tectonics” Fall 2021

Co-Instructor, *provided lectures and designed laboratory activities*

EARTH101 “Natural Disasters: Hollywood vs. Reality” Spring 2020

Teaching Assistant, *managed active learning modules, large enrollment general education class*

GEOSC 472A&B “Field Geology I & II (Field Camp)” Summer
Teaching Assistant, *six-week field camp based in western US* 2017, 2018, 2019

GEOSC 454 “Geology of Oil and Gas” Spring 2018

Teaching Assistant, *taught laboratories, and tutorials*

GEOSC 201 “Earth Materials”, Fall 2017, 2018

Teaching Assistant, *laboratory teaching for an introductory mineralogy course*

GEOSC 465 “Structural Geology” Spring 2017

Teaching Assistant, *field, and laboratory teaching*

Short Courses - taught

“Lithospheric Geodynamics Modeling Workshop” Summer 2019

Co-Instructor, *Kasetsart University, Bangkok, Thailand*

Awards

The Geological Society of America

Geophysics and Geodynamics Division Outstanding Student Presentation Award 2021

The American Geophysical Union

Outstanding Student Presentation Award (OSPA) AGU Fall Meeting 2020

The Pennsylvania State University

Scholten-Williams-Wright Scholarship in Field Geology 2020-2021

Graduate Exhibition Poster Award for Physical Sciences & Mathematics 2018-2019

Charles E. Knopf Sr. Memorial Scholarship 2017

Paul D. Krynine Scholarship 2017-2021

The Global Undergraduate Award

Highly Commended Entrant of The Undergraduate Awards 2016

University of St Andrews

Irvine Prize for Best Field Based Research Project 2016

Irving Prize for Excellence in Field Work in Earth Sciences 2016

The Principal’s Scholarship for Academic Excellence 2016

Petroleum Exploration Society of Great Britain Mapping Award 2015

2nd and 3rd Year BP Field Mapping Prize for Excellence in Field Mapping 2014-2015

Deans’ List for Academic Excellence 2013-2016

Invited Talks

Penn State Geodynamics Colloquium

“How do we get permanent deformation during the subduction zone earthquake cycle?” 11th Nov 2021

USGS NEIC Coffee Klatch

“What does geodesy tell us about Cascadia earthquake potential?” 6th Aug 2020

Penn State Geodynamics Colloquium

“The Cascadia Story: a tale of three plates OR Investigating plate boundary tectonics using surface observations” 13th Nov 2019

Conference Abstracts

2024

McKenzie, K.A., Kirby, E. (2024). Topography provides insight into earthquake hazard along the Himalaya. 2024 North Carolina Postdoc Research Symposium

Furlong, K.P., **McKenzie, K.A.**, Herman, M.W., Benz, H.M., Villaseñor, A. (2024). Seismic Imaging of the Mendocino Triple Junction: Unraveling the Geodynamics of a Fundamental Plate Boundary Transition. Poster 162, Seismological Society of America 2024 Annual Meeting

Furlong, K.P., Herman, M.W., **McKenzie, K.A.** (2024). Big Slip on Small Faults – How Does Extreme Fault Slip Occur on Short-to-Moderate Length Faults. 2024 EGU General Assembly

2023

McKenzie, K.A., Kirby, E. (2023). Topographic Inferences of Uplift Rates along Growing Folds in the Himalayan Foreland. 2023 AGU Fall Meeting

McKenzie, K.A., Furlong, K.P., Kirby, E., Hefner, W. (2023). Mountain Building via Crustal Flow in a Subduction Forearc. 2023 AGU Fall Meeting

Hefner, W., Kirby, E., Bierman, P.R., Corbett, L.B., **McKenzie, K.A.** (2023). Climate Modulates Topography Along the Cascadia Forearc. 2023 AGU Fall Meeting

Love, J., Creveling, J.R., **McKenzie, K.A.**, Gordon, G.W. (2023). Using GPS and Well Data to Estimate Wave-cut Platform Slope and Paleo-shoreline Elevations at Newport, Oregon. 2023 AGU Fall Meeting

Furlong, K.P., **McKenzie, K.A.**, Herman, M.W. (2023). Plate Tectonics as a Learning Portal for Quantification. 2023 AGU Fall Meeting

Furlong, K.P., Herman, M.W., **McKenzie, K.A.** (2023). The Missing Mountains of the Mendocino triple junction. 2023 AGU Fall Meeting

2022

McKenzie, K.A., Furlong, K., Kirby, E., Hefner, W. (2022). Upper-plate deformation in southern Cascadia in response to the NNW-migration of non-subduction tectonic processes over the past 6 million years. 2022 AGU Fall Meeting

Furlong, K.P., **McKenzie, K.A.** (2022). Making the San Andreas Plate Boundary. 2022 AGU Fall Meeting

McKenzie, K.A., Kelsey, H.M., Kirby, E., Furlong, K.P., Rittenour, T.M. (2022). Rapid, temporally variable slip rates on an upper-plate fault above the Cascadia subduction zone. GSA Connects 2022

Love, J.S., Creveling, J.R., Gordon, G., **McKenzie, K.A.** (2022). Estimating MIS 5 marine terrace inner edge elevations at northern Newport, OR. GSA Connects 2022

Herman, M., Furlong, K.P., **McKenzie, K.A.** (2022). Upper plate faulting above a shallow subduction megathrust earthquake: Mechanics and implications of the extreme surface faulting during the 2016 Kaikoura, New Zealand, earthquake. GSA Connects 2022

Furlong, K.P., **McKenzie, K.A.**, Benz, H.M., Villaseñor, A. (2022). Role of 3-D lithosphere geometry in the development of the northern San Andreas plate boundary fault system. GSA Connects 2022

2021

- McKenzie, K.A.**, Furlong, K., Kirby, E. (2021). Mid-Miocene to Present Deformation of the Southern Cascadia Forearc: The Effects of a Migrating Triple Junction. 2021 AGU Fall Meeting, **AGU Union Session Invited Paper*
- McKenzie, K.A.**, Furlong, K., Kirby, E., Villaseñor, A., Benz, H. (2021). Lower Crustal Flow and Injection within the Southern Cascadia Forearc from ~5 Ma to Present. 2021 AGU Fall Meeting
- Furlong, K.P., **McKenzie, K.A.**, Herman, M.W. (2021). Exhuming Forearc Terranes: The Role of Subduction Earthquake Cycle Coupling. 2021 AGU Fall Meeting
- Herman, M.W., Furlong, K.P., **McKenzie, K.A.**, Govers, R. (2021). What is coupled in subduction zones? Quantitative estimates of megathrust asperity distributions from slip deficit maps. 2021 AGU Fall Meeting
- McKenzie, K.A.**, Kirby, E., Kelsey, H.M., Rittenour, T.M. (2021). Long-term Slip Across the Yaquina Bay Fault Revealed by IRSL Dating of Uplifted Marine Terraces. Abstract T11.30-4 GSA Connects 2021
- McKenzie, K.A.**, Furlong, K.P., Kirby, E. (2021). Mid-Miocene to Present Upper-Plate Deformation of the Southern Cascadia Forearc: Effects of the Superposition of Subduction and Transform Tectonics. Abstract T4. 62-1. GSA Connects 2021
- Kirby, E., **McKenzie, K.A.**, Furlong, K.P., Hefner, W. (2021). Geomorphic Fingerprints of Active Faults in the Southern Cascadia Forearc and their Geodynamic Significance. Abstract T11.30-3 GSA Connects 2021
- Furlong, K.P., **McKenzie, K.A.**, Villaseñor, A., Benz, H. (2021). Linkage Between Upper-plate Cascadia Faulting and the Evolution of the Northern San Andreas Plate Boundary Fault System. Abstract T11.36-2. GSA Connects 2021
- McKenzie, K.A.** and Furlong, K.P. (2021). Stress-cycle driven evolution of faulting in a plate boundary transition zone, EGU General Assembly 2021, online 2020
- McKenzie, K.A.**, Furlong, K.P., Herman, M.W. (2020). What is Causing (Permanent) Uplift in Southern Cascadia? Abstract T054-0019 presented at the 2020 AGU General Assembly, Online Everywhere
- Kirby, E., Furlong, K.P., Von Dassow, W., Worms, K., **McKenzie, K.A.**, Mahan, S.A. (2020). Does Topography Along the Cascadia Forearc Reflect Permanent Deformation of North America? Abstract T24.240-3, 2020 GSA Connects Online
- McKenzie, K.A.**, Furlong, K.P. (2020). Implications of an Evolving Stress Field on faulting behavior in southern Cascadia, Abstract T1.33-6, 2020 GSA Connects Online
- Furlong, K.P., **McKenzie, K.A.** (2020). Superposition of Deformation Signals in Subduction Zones: Implications for Stress Cycles, Coupling Models, and Earthquake Potential, Abstract SE13-A007, 2020 AOGS Annual Meeting
- 2019
- McKenzie, K.A.**, Furlong, K.P., Herman, M.W. (2019). Decomposing the decadal scale Cascadia GPS velocity field and associated implications for plate interface locking, Abstract T51H-0392, 2019 AGU General Assembly
- Sethanant, I., **McKenzie, K.A.**, Kirby, E., Furlong, K.P., McDonald, E., Gosse, J.C., Walker, J.D. (2019). Potential of the Ridgecrest Earthquake Sequence to Enhance Earthquake Activity along Low-Angle Detachment Faults in Panamint and Searles Valley California, Abstract S31F-0460, 2019 AGU General Assembly
- Kirby, E., Furlong, K.P., **McKenzie, K.A.**, Sethanant, I., Walker, J.D. (2019). Preliminary Assessment of State Stress Changes Along Low-Angle Detachment Faults in Panamint and Searles Valleys, Abstract AM-341021, 2019 GSA Annual Meeting
- Furlong, K.P., **McKenzie, K.A.**, Herman M.W. (2019). Strain Accumulation and Release During the Mega-thrust Earthquake Cycle: Insight from Upper Plate Behavior, Abstract SE21-A006, 2019 AOGS Annual Meeting

- Furlong, K.P., **McKenzie, K.A.**, Herman M.W. (2019). Superposition of Earthquake Cycle and Long-term Tectonic Deformation Signals in Plate Boundary Transition Zones, Abstract EGU2019-3725, 2019 EGU General Assembly
2018
- McKenzie, K.A.**, Furlong, K.P. (2018). The effects of episodic tremor and slip in the Cascadia subduction zone on upper plate deformation and stress accumulation during the earthquake cycle, Abstract T13H-0323, 2018 AGU General Assembly
2017
- McKenzie, K.A.**, Furlong, K.P. (2017). Links between Subduction Megathrust Earthquakes and Brittle Deformation in the Pacific Northwest, Abstract T175 281-11 382 2017, GSA Annual Meeting
2016
- McKenzie, K.A.**, McCarthy, W., Hunt, E. (2016). Development of modal layering in granites: a case study from the Carna Pluton, Connemara, Ireland, Abstract EPSC2016-6689, 2016 EGU General Assembly
- McKenzie, K.A.**, McCarthy, W., Hunt, E. (2016). Modal layering in granites: a new model for understanding mineralisation, North Atlantic Craton (NAC+) meeting

Service

Conference Session Convener

Co-convenor of session T4 “Feedbacks between Upper-Plate Deformation and Plate Boundary Processes in Subduction Systems”, GSA Connects 2021

The Pennsylvania State University

Geodynamics Seminar Coordinator 2017-2022

Department of Geosciences Graduate Colloquium committee member 2019-2022

Association for Women Geoscientists, Penn State Chapter, fundraising committee 2020

Manuscript Reviewer

Science Advances, Marine Geodesy

Proposal Reviewer

National Science Foundation Tectonics Program

Professional Associations

American Geophysical Union member

Geological Society of America member

Association for Women Geoscientists