Brenton W. Hirao

Ph.D Candidate / Geophysics / University of Oregon: Eugene, Oregon, USA
Email: bhirao@uoregon.edu

Summary

I am an observational seismologist. I specialize in large-scale earthquake detection and high-resolution earthquake catalog construction. I design efficient, modular workflows to analyze seismic waveform data at the multi-terabyte scale to understand the mechanics of magmatic and faulting systems and their hazard potential.

Education

Ph.D: Earth Sciences (defending Dec. 2025) **2021—2025**
University of Oregon Eugene, Oregon, USA
Advisor: Amanda M. Thomas
Thesis: Multidecadal enhanced earthquake catalogs at multiple spatial scales: Insights into volcanic and tectonic environments in the Pacific Northwest, USA

B.S.: Earth Sciences with Honors **2018—2021**
University of California, Santa Cruz Santa Cruz, California, USA
Advisors: Emily E. Brodsky, Heather M. Savage
Thesis: Communication Between the Northern and Southern Central San Andreas Fault via Dynamically Triggered Creep

Journal Publications

1) **Hirao, B**., A.M. Thomas, D. R. Shelly, W. A. Thelen, and C. Journeau (2025) Magmatic volatile flux drives non-eruptive volcano-tectonic seismicity at Mount St. Helens, USA from 2008-2024. Accepted in JGR-Solid Earth.

2) **Hirao, B.**, Savage, H., & Brodsky, E. E. (2021). Communication between the northern and southern central San Andreas Fault via dynamically triggered creep. *Geophysical Research Letters*, 48, e2021GL092530. https://doi.org/10.1029/2021GL092530

3) Journeau, C. R., A. M. Thomas, R. E. Abercrombie, **B. Hirao**, M. Liu, and V. Kuna (202X) OBS Data Mining Reveals Seismic Structure and Dynamics of the Blanco Transform Fault, offshore Oregon. In revision in JGR-Solid Earth.

4) Melgar, D., Thomas, A. M., Sahakian, V., **et al.** (including **B. Hirao**) (202X). *The Cascadia Region Earthquake Science Center (CRESCENT): Advancing understanding of Cascadia's earthquake hazards.* Manuscript submitted to *Seismological Research Letters*.

Manuscripts in Preparation

1) **Hirao, B**., A.M. Thomas, D. R. Shelly, and W. A. Thelen (202X) Seismotectonics of the Mount St. Helens region revealed through a high-precision seismicity catalog and focal mechanisms. (in preparation)

2) **Hirao, B**., A.M. Thomas, Y. Ni, M. Denolle, L. Bachelot, and D. Trugman (202X) Development of an Enhanced Seismicity Catalog for the Pacific Northwest, USA: the CRESCENT Seismicity Catalog Version 0. (in preparation)

Research and Professional Experience

Graduate Student Researcher **2021—2025**
University of Oregon Eugene, Oregon, USA
University of California, Davis (visitor) Davis, California, USA
Advisor: Amanda M. Thomas
- Create high resolution earthquake catalogs to understand the driving forces behind volcanic and tectonic earthquakes at Mount St. Helens, WA
- Leverage artificial intelligence to create dataset of newly discovered earthquakes across the Pacific Northwest, USA to aid in understanding tectonic processes and seismic hazard

Pathways Intern **2023**
United States Geological Survey (USGS) Golden, Colorado, USA
National Earthquake Information Center

Advisor: David R. Shelly
- Develop workflow to perform high-precision relocation with cross-correlation and double-difference methods for earthquakes at Mount St. Helens, WA

Undergraduate Researcher & SOURCES Intern **2019—2021**
University of California, Santa Cruz Santa Cruz, California, USA
UCSC Seismology Laboratory
Southern California Earthquake Center
Advisors: Emily E. Brodsky, Heather M. Savage
- Analyze near-fault creepmeter data to understand shallow aseismic slip recorded along the northern Central San Andreas Fault
- Construct strainmeter apparatus to apply towards granular flow shear experiments

CARS Intern **2017**
California State Polytechnic University, Pomona Pomona, California, USA
Advisor: Jascha Polet
- Performed GPS monument surveying and installation for a crustal deformation study of the San Jose Fault.

Select Conference Presentations

May 2026; Chiba, Japan: AGU-JpGU Joint Meeting
Non-eruptive volcano tectonic seismicity at Mount St. Helens from 2008 to 2023 [Invited Talk].

Jan. 2025; Seattle, WA, USA: CRESCENT Meeting at USGS Subduction Zone Science Workshop
Non-eruptive volcano tectonic seismicity at Mount St. Helens from 2008 to 2023 [Poster]. (view)

April 2024; Anchorage, AK, USA: Seismological Society of America Annual Meeting,
Sixteen years of post-eruptive microseismicity at Mount St. Helens, USA from 2008 to 2023 [Poster].

April 2023; San Juan, Puerto Rico: Seismological Society of America Annual Meeting
Two Decades of Seismicity at Mount St. Helens, USA [Poster].

April 2021; Online: Seismological Society of America Annual Meeting
Coupling Between the Northern and Southern Central San Andreas Fault via Triggered Creep [Invited Talk].

Aug. 2020; Online: Southern California Earthquake Center Annual Meeting
Regional earthquakes that trigger creep on the northern central San Andreas fault [Poster] (view)

Workshop Presentations

May 2022; Syros, Greece: Subduction Interface Processes in the Source Region of Slow Slip and Tremor
Deep-learning detection of Low Frequency Earthquakes [Invited Talk]

Fieldwork Experience

Nodal seismometer deployment/retrieval **2022—2025**
University of Oregon, USGS Mt. Rainier, USA
PI(s): Amanda M. Thomas, Avery Conner, Weston Thelen, Alex Iezzi Mt. Saint Helens, USA
- Install and retrieve temporary seismometer devices in harsh environments for volcanic debris flow detection study

Fluid pressure sensor deployment/retrieval **2019**
University of California, Santa Cruz Winnemucca, Nevada, USA
PI(s): Huiyun Guo, Emily E. Brodsky
- Install and retrieve fluid pressure sensors in geothermal extraction wells for fault permeability study (view)

Campaign GNSS deployment **2017**
California State Polytechnic University, Pomona Pomona, California, USA
PI: Jascha Polet
- Design experimental setup, install GNSS measurement stations, and measure positions with a GNSS tripod rig for near-fault crustal deformation study

Public Datasets

Hirao, B., Thomas, A., Shelly, D., Thelen, W., & Journeau, C. (2025). Dataset for: Magmatic volatile flux drives non-eruptive volcano-tectonic seismicity at Mount St. Helens, USA from 2008-2024 [Data set]. In Journal of Geophysical Research: Solid Earth. Zenodo. https://doi.org/10.5281/zenodo.17089016

Relevant Skills

Programming: Python, Matlab, Shell scripting
Seismology: Digital signal processing; earthquake catalog construction with template matching, machine learning, high-precision event location, and source mechanism inversion; finite fault source modelling with MudPy, high-rate GNSS, and strong-motion data
Crustal deformation: Use of data from creepmeters, GNSS, tiltmeters, and borehole strainmeters; Modelling deformation with the Disloc3dpm software
High-performance computing: Slurm, parallel/distributed processing of multi-terabyte seismic datasets
Field: Geologic mapping, temporary seismometer deployment/retrieval,

Teaching

University of Oregon
ERTH 102: Exploring Earth's Environment
ERTH 308: Geology of Oregon and the Pacific Northwest
ERTH 310: Earth Resources and Environment
ERTH 316: Computational Tools for Earth Sciences

University of California, Santa Cruz
EART 10: Earthquakes