

JOSH CROZIER, Ph.D.

NSF Postdoctoral Fellow

Stanford University Department of Geophysics, 397 Panama Mall, Stanford, CA 94305

jcrozier@stanford.edu | 832-716-4001

orcid.org/0000-0001-8996-3441 | linkedin.com/in/josh-crozier-a21a3571 | crozierjosh.weebly.com

EDUCATION

Ph.D. in Earth Science at the University of Oregon

2021

Thesis: Using Spectral Analysis and Fluid Dynamics to Understand Supraglacial Stream Networks on the Greenland Ice Sheet and Seismicity at Kīlauea Volcano.

B.S. in Earth Science at Rice University

2016

RESEARCH EXPERIENCE

NSF postdoctoral fellowship

2024 – present

Stanford University – advisor Paul Segall

- Combining seismic, geodetic, petrologic, and video data with earthquake cycle simulations to understand volcanic caldera collapse.
- Advising an undergraduate student on a computer vision geodesy project.

Mendenhall Postdoctoral Fellowship

2021 – 2024

U.S. Geological Survey California Volcano Observatory - advisor Kyle Anderson

- Developed coupled fluid-solid numerical models of earthquake cycles during volcanic caldera collapse.
- Combined finite source seismic source inversions and 3D transient numerical models of eruptive plumes to understand collapse-induced explosive eruptions at Kīlauea volcano.

Graduate Research at University of Oregon - advisor Leif Karlstrom

2016 - 2021

- Developed method for cataloging long-period seismicity with wavelets.
- Inferred evolving magma system at Kīlauea volcano by developing coupled fluid-elastic magma resonance numerical models then inverting for seismic and geodetic data.
- Predicted changes in meltwater routing on the Greenland Ice Sheet by combining numerical models of ice flow, water flow routing algorithms, and multiple types of geospatial data.

Participant at CIDER (Cooperative Institute for Dynamic Earth Research)

Summer 2019

- Demonstrated that magmatic fractures allow effusive silicic volcanic eruptions by developing numerical models of multi-phase magma ascent constrained by video analysis of eruptive plumes.

Undergraduate Research at Rice University - advisor Helge Gonnermann

2014

- Quantified evolution of magma permeability by developing numerical models of gas flow through bubble networks and measuring porosity and permeability in tephra samples.

PUBLICATIONS

Nature Geoscience

2024

Crozier, J., Dufek, J., Karlstrom, L., Cahalan, R., Anderson, K., Thelen, W., Liang, C, Benage, M.
Explosive 2018 eruptions at Kīlauea driven by a collapse-induced stomp-rocket mechanism

Journal of Geophysical Research: Solid Earth

2024

Crozier, J., Anderson, K.

Earthquake Cycle Mechanics during Caldera Collapse: Simulating the 2018 Kīlauea Eruption

Bulletin of Volcanology

2023

Crozier, J., Karlstrom, L., Montgomery-Brown, E., Angarita, M., Cayol, V., Bato, MG., Wang, T., Grapenthin, R., Shreve, T., Anderson, K., Astort, A., Bodard, O., Cannavo, F., Currenti, G., et al.

Understanding the drivers of volcano deformation through geodetic model verification and validation

Eos

2023

Karlstrom, L., Holtzman, B., Barth, A., **Crozier, J.**, & Pate, A.

Earth is noisy. Why should its data be silent?

- Journal of Volcanology and Geothermal Research 2022
Crozier, J., Tramontano, S., Forte, P., Oliva, S., Gonnermann, H., Lev, E., Manga, M., Myers, M., Rader, E., Ruprecht, P., Tuffen, H., Paisley, R., Houghton, B., Shea, T., Schipper, C., & Castro, J.
Outgassing through magmatic fractures enables effusive eruption of silicic magma.
- Science Advances 2022
Crozier, J., & Karlstrom, L.
Evolving magma temperature and volatile contents over the 2008-2018 eruption of Kīlauea Volcano.
- Journal of Geophysical Research: Solid Earth 2021
Crozier, J., & Karlstrom, L.
Wavelet-based characterization of very-long-period seismicity reveals temporal evolution of shallow magma system over the 2008–2018 eruption of Kīlauea Volcano.
- Journal of Geophysical Research: Solid Earth 2019
 Liang, C., **Crozier, J.**, Karlstrom, L., & Dunham, E.
Magma oscillations in a conduit-reservoir system, application to very long period (VLP) seismicity at basaltic volcanoes–Part II: Data inversion and interpretation at Kīlauea Volcano.
- The Cryosphere 2018
Crozier, J., Karlstrom, L., & Yang, K.
Basal control of supraglacial meltwater catchments on the Greenland Ice Sheet.
- Journal of Geophysical Research: Solid Earth 2017
 Gonnermann, H., Giachetti, T., Fliedner, C., Nguyen, C., Houghton, B., **Crozier, J.**, & Carey, R.
Permeability during magma expansion and compaction.

AWARDS

- NSF 22-625 Earth Sciences Postdoctoral Fellowships 2023
- \$180000. Award 2305163: Understanding the Mechanics of Caldera Collapse Eruptions.
- Mendenhall Research Fellowship from the U.S. Geological Survey 2020
- Three years of salary and a research budget of \$29,500.
- Research Excellence Award from the University of Oregon Department of Earth Science 2020
- \$1000 awarded to one graduate student per year.

TEACHING EXPERIENCE

Graduate Teaching Assistant at University of Oregon

- Data Analysis (graduate/undergraduate) 2020
- Taught laboratory sections, held office hours, and graded assignments.
- Seismology (graduate/undergraduate) 2020
- Held office hours and graded assignments.
- Remote Sensing (graduate/undergraduate) 2020
- Taught laboratory sections, held office hours, and graded assignments.
- Earth Processes (undergraduate) 2019
- Taught laboratory sections, held office hours, and graded assignments.
- Fluid Dynamics (graduate/undergraduate) 2019
- Held office hours and graded assignments.
- Earth History (graduate/undergraduate) 2017
- Taught laboratory sections, held office hours, and graded assignments.

SERVICE AND OUTREACH

- Advisor for an undergraduate project on using computer vision to resolve caldera collapse ground deformation 2024
- Proposed a project for the Stanford Sustainability Undergraduate Research in Geoscience and Engineering program.
 - Recruited and mentored Colorado student Anna Melega.

- Leading the CONVERSE/IAVCEI Drivers of Volcano Deformation project 2022-2023
- Collaboration with Emily Montgomery-Brown, Leif Karlstrom, Valerie Cayol, Mary Grace Bato, Ronni Grapenthin
 - Organizing community validation and verification exercises for geodetic modeling and inversions involving dozens of international researchers.
- Kīlauea visualization and sonification project 2021-present
- Collaboration with Ben Holtzman, Leif Karlstrom, Anna Barth, and Arthur Pate
 - Article and videos for Eos
- Session convener 2021-present
- SSA 2024 – Seismoacoustic, Geodetic, and Other Geophysical Investigations of Active Volcanoes
 - AGU 2023 - Data Driven Science Applied to Magmatic and Volcanic Systems
 - AGU 2022 - Volcano Seismology and Acoustics: Recent Advances in Understanding Volcanic Processes
 - AGU 2022 - Lessons Learned from Eruption Scenarios and Hypothetical Exercises
 - AGU 2021 - Understanding Shallow Volcanic Unrest Using Physics-Based Modeling Constrained by Geophysical Datasets
- Peer Reviewer 2020-present
- Earth and Planetary Science Letters - two articles
 - Earth, Planets, and Space - one article
 - Journal of Geophysical Research: Solid Earth - two articles
 - Geophysical Journal International - two articles
 - Geology - one article
 - Journal of Volcanology and Geothermal Research - one article
 - Nature Communications - one article
 - NSF - one proposal
- Wrote Volcano Watch news article for Hawaiian Volcano Observatory 2022
- Title: Magma chamber music can tell a revealing tale
- Judge for AGU Outstanding Student Presentation Award 2020-2021
- ADDITIONAL EXPERIENCE**
-
- Co-writing modeling report for CONVERSE (converging on eruption science with equity) 2023
- Nodal seismic deployment at Kīlauea Volcano 2023
- Large active source project led by Roger Denlinger.
- Geology field work at Yellowstone Volcano 2023
- With Lauren Harrison, Shaul Hurwitz, Blaine McCleskey.
 - Sampling for luminescence and cosmogenic exposure dating, cataloging magmatic breccia, water sampling.
- Volcano Monitoring with the U.S. Geological Survey California Volcano Observatory 2021-present
- Rotating shifts interpreting activity at California volcanoes from seismic and other data.
- Geophysical deployments for debris flow detection at Mt. Shasta 2021-present
- With Phil Dawson, Wes Thelen, and others.
 - Deploy nodal seismometers, telemetered short-period seismometers, video, and infrasound.
- Geology field work at Yellowstone Volcano 2022
- With Lauren Harrison, Cathy Whitlock, and Shaul Hurwitz.
 - Coring lake sediments, sampling for cosmogenic exposure dating, cataloging magmatic breccia.
- Magnetotelluric and seismic survey at Kīlauea Volcano 2022
- With Paul Bedrosian, Dana Peterson, Helen Janiszewski, Ninfa Bennington, and others.
- Participated in GeoPRISMS Volatiles from Source to Surface Workshop 2022

Nodal seismic deployments for debris flow detection at Mt. Rainier	2017 - 2020
<ul style="list-style-type: none"> With Amanda Thomas, Wes Thelen, Avery Conner, and others. 	
Nodal seismic deployments for imaging Mt. St. Helens	2018
<ul style="list-style-type: none"> With Brandon Schmandt, Margaret Glasgow, and others. 	
Field work interpreting and sampling glacial deposits in the Puget Sound	2015
<ul style="list-style-type: none"> With Brian Demet, Jeff Nittrouer, and John Anderson. 	
Geology Field Camp at South Dakota School of Mines and Technology	2015
Geology field course at the University of Otago, New Zealand	2015
Participated in iMUSH (imaging magma under St. Helens) nodal seismic deployment	2014
Co-Founded ParkIt technology company with four other Rice University students	2013
<ul style="list-style-type: none"> Participated in Rice University OwlSpark startup accelerator and won business competitions. Developed machine learning and video analysis methods for tracking vehicles. 	

SKILLS

Programming languages and software: MATLAB, Python, COMSOL, Mathematica, QGIS

Subjects: fluid and solid mechanics, numerical methods, signal processing, inverse methods, machine learning, computer vision, seismology, geodesy, volcanology, fault mechanics, glaciology

PRESENTATIONS

Talk at SSA 2024 Meeting	2024
Interseismic slip in caldera collapse earthquake sequences	
Talk at American Geophysical Union 2023 Fall Meeting	2023
Mechanics of caldera collapse earthquake sequences informed by the 2018 eruption of Kīlauea Volcano.	
Seminar at Berkeley Seismological Laboratory	2023
Earthquakes and magma resonance reveal the dynamics of a decade long eruption at Kīlauea Volcano.	
Seminar at Stanford Department of Geophysics	2023
Earthquakes and magma resonance reveal the dynamics of a decade long eruption at Kīlauea Volcano.	
Talk at IAVCEI Scientific Assembly	2023
Outgassing through magmatic fractures enables effusive eruption of silicic magma.	
Talk at IAVCEI Scientific Assembly	2023
Modeling episodic caldera collapse with earthquake rupture and magma dynamics.	
Poster at NASA Science + Technology Colloquium	2022
Evolving magma temperature and volatile contents over the 2008-2018 summit eruption of Kīlauea Volcano.	
Seminar at U.S. Geological Survey Natural Hazards Mission Area	2022
Modeling episodic volcanic caldera collapse	
Seminar at U.S. Geological Survey Earthquake Science Center	2022
Very-long-period seismic events reveal evolving magma temperature and volatile contents over the 2008-2018 eruption of Kīlauea Volcano.	
Poster at GeoPRISMS Volatiles from Source to Surface Workshop	2022
Evolving magma temperature and volatile contents over the 2008-2018 summit eruption of Kīlauea Volcano.	

- Talk at American Geophysical Union 2021 Fall Meeting 2021
Synthesizing seismic and atmospheric data with 3D conduit-plume models reveals early-stage explosion dynamics in the 2018 Kīlauea eruption.
- Poster at American Geophysical Union 2020 Fall Meeting 2020
Joint modeling and seismic inversions for very-long-period magma resonant modes at Kīlauea Volcano from 2008-2018.
- Poster at American Geophysical Union 2019 Fall Meeting 2019
Modeling and inverting very-long-period seismicity to constrain magma system properties and volatile contents.
- Seminar at U.S. Geological Survey California Volcano Observatory 2019
Hindcasting May 2018 Kīlauea Summit Explosions.
- Poster at Cooperative Institute for Dynamic Earth Research Volcanology Workshop 2019
Modeling and inverting very-long-period seismicity to constrain magma system properties and volatile contents.
- Talk at Seismological Society of America 2019 Meeting 2019
Hindcasting May 2018 Kīlauea Summit Explosions with Atmospheric Remote Sensing, Geophysical Monitoring and 3D Eruptive Plume Simulations.
- Poster at American Geophysical Union 2018 Fall Meeting 2018
Hindcasting May 2018 Kīlauea Summit Explosions with Remote Sensing, Geophysical Monitoring, and Eruption Simulations. Part 1: Seismic Source Inversions and Self-consistent Initial Conditions for Plume Models.
- Poster at American Geophysical Union 2017 Fall Meeting 2017
Significance of Thermal Fluvial Incision and Bedrock Transfer due to Ice Advection on Greenland Ice Sheet Topography.