James Atterholt

Mendenhall Postdoctoral Fellow

1711 Illinois Street
Golden, CO 80401
Email: jatterholt@usgs.gov
Website: atterholt.github.io

Education

2019-2024	**PhD**, Geophysics California Institute of Technology (Caltech) Advised by Zhongwen Zhan & Zachary E. Ross Thesis: Fault Zone Structure and Rupture Behavior with Fiber-Optic Sensing and Second Moments
2015-2019	**Bachelor of Science**, Mathematics & Geological Sciences Indiana University (IU) Advised by Gary L. Pavlis Thesis: Measurements of P-wave anisotropy in the Homestake Mine

Appointments

2024-present	**Mendenhall Postdoctoral Fellow**, U.S. Geological Survey (USGS)
2024-present	**Visiting Faculty**, Colorado School of Mines
2019-2024	**Graduate Student Researcher**, Caltech Seismological Laboratory
2019	**NAGT Summer Intern**, USGS
2015-2019	**STARS Research Assistant**, IU Geophysics Laboratory
2017	**IRIS Intern**, Los Alamos National Laboratory

Awards

2024	**GPS Award for Academic Excellence in Research**, Caltech
2024	**AGU Annual Meeting Outstanding Student Presentation Award**
2023	**SSA Annual Meeting Student Presentation Award**

2019	**Faculty Senior Award**, IU Geological Sciences
2019	**Cora B. Hennel Memorial Scholarship**, IU Mathematics
2019	**Margaret Russell Edmondson Award**, IU Phi Beta Kappa Chapter
2017	**Undergraduate Prize**, Mineralogical Society of America

Grants and Fellowships

2024	**Mendenhall Postdoctoral Fellowship**, USGS
	$193,000 in salary over 2 years and $32,500 in research funds
2020	**NSF Graduate Research Fellowship**
	$138,000 in support over 3 years

Journal Publications

[21] **Atterholt, J.**, McGuire, J.J., Barbour, A.J., Moschetti, M.P. (*in review*). Investigating Wavefield Complexity at the Basin Edge with Distributed Acoustic Sensing.

[20] Kehoe, H.L., Boyd, O.S., **Atterholt, J.**, Moschetti, M.P., Bozdağ, E., Caylor, E.A. (*in review)*. Geologic controls on seismic hazard across the continental United States using horizontal-to-vertical spectral ratios.

[19] **Atterholt, J.**, McGuire, J.J., Barbour, A.J., Moschetti, M.P. (*in review*). Sharp Structural Variability of the Gorda Slab Imaged by a Fiber Array.

[18] Bird, E., **Atterholt, J.**, Biondi, E., Yang, Y., Zhan, Z. (*in review*). Imaging the North Bishop Block with Converted Phases Observed through Fiber-Optic Seismology.

[17] McGuire, J.J., Barbour, A.J., Spica, Z.J., Rodríguez Tribaldos, V., Zhan, Z., Lipovsky, B.P., Mellors, R.J., Biondi, E., Yoon, C., Karrenbach, M., Ringler, A.T., **Atterholt, J.**, Nayak, A., Sawi, T., Viens, L., Martin, E.R., Husker, A.L., Bodin, P., Moschetti, M.P., Shi, Q., Miller, N.C., Puri, P. (*in press*). Fiber Optic Sensing for Earthquake Hazards Research, Monitoring and Early Warning.

[16] Skoumal, R.J., **Atterholt, J.**, Barbour, A.J., Hardebeck, J.L. (*in press*). S/P Amplitude Ratios with Distributed Acoustic Sensing and Application to Earthquake Focal Mechanisms.

[15] Goldberg, D.E., Yeck, W.L., Hanagan, C., **Atterholt, J.**, Kehoe, H.L., Reitman, N.G., Barnhardt, W.D., Shelly, D.R., Hatem, A.E., Wald, D., Earle, P.S. (*in press*) Ultralong, Supershear Rupture of the 2025 Myanmar Earthquake Reveals Unaccounted Hazard. *Science*.

[14] **Atterholt, J.**, McGuire, J.J., Barbour, A.J., Stewart, C., Moschetti, M. M. (2025). Fiber-Imaged Supershear Dynamics in the 2024 Mw7 Mendocino Fault Earthquake. *Science*, doi: 10.1126/science.adx6858

[13] Zhai, Q., Yin, J., Yang, Y., **Atterholt, J.**, Li, J., Husker, A., Zhan, Z. (2025). Comprehensive Evaluation of DAS Amplitude and Its Implications for Earthquake Early Warning and Ambient Noise Interferometry. *Journal of Geophysical Research: Solid Earth*, doi: 10.1029/2024JB030288

[12] Bird, E.J., **Atterholt, J.**, Li, J., Biondi, E., Zhai, Q., Yang, Y., Fang, J., Wei, X., Hjörleifsdóttir, V., Klesh, A., Kamalov, V., Gunnarsson, T., Zhan, Z. (2025). Constraining Dike Opening Models with Seismic Velocity Changes Associated with the 2023-2024 Eruption Sequence on the Reykjanes Peninsula. *AGU Advances*. doi: 10.1029/2024AV001516

[11] **Atterholt, J.**, Wilding, J.D., Ross, Z.E. (2025). The Evolution of Fault Orientation in the 2019 Ridgecrest Earthquake Sequence with a New Long-Term Catalog of Seismicity and Moment Tensors. *Geophysical Journal International,* doi: 10.1093/gji/ggaf001

[10] **Atterholt, J.**, Zhan, Z. (2024). Fine Scale Southern California Moho Structure Uncovered with Distributed Acoustic Sensing. *Science Advances*, doi: 10.1126/sciadv.adr3327

[9] **Atterholt, J.**, Zhan, Z., Yang, Y., Zhu, W. (2024). Imaging the Garlock Fault Zone with a Fiber: A Missing Damage Zone and Hidden Bimaterial Contrast. *Journal of Geophysical Research: Solid Earth*, doi: 10.1029/2024JB028900

[8] Guo, H., **Atterholt, J.**, McGuire, J.J., Thurber, C. (2024). Evidence for low effective stress within the crust of the subducted Gorda plate from the 2022 December M_w 6.4 Ferndale Earthquake Sequence. *Seismological Research Letters*, doi: 10.1785/0220240078

[7] **Atterholt, J.**, Ross, Z.E. (2023). Finite Source Properties of Large Strike-Slip Earthquakes. *Geophysical Journal International,* doi: 10.1093/gji/ggad459

[6] **Atterholt, J.**, Zhan, Z., Yang, Y. (2022). Fault zone imaging with distributed acoustic sensing: body-to-surface wave scattering. *Journal of Geophysical Research: Solid Earth*, doi: 10.1029/2022JB025052

[5] Yang, Y., Zhan, Z., Shen, Z., **Atterholt, J.** (2022). Fault zone imaging with distributed acoustic sensing: surface-to-surface wave scattering. *Journal of Geophysical Research: Solid Earth*, doi: 10.1029/2022JB024329.

[4] **Atterholt, J.**, Ross, Z. E. (2022) Bayesian framework for inversion of second-order stress glut moments: application to the 2019 Ridgecrest sequence mainshock. *Journal of Geophysical Research: Solid Earth*, doi: 10.1029/2021JB023780

[3] **Atterholt, J.**, Zhan, Z., Shen, Z., Li, Z. (2021) A unified wavefield partitioning approach for distributed acoustic sensing. *Geophysical Journal International*, doi: 10.1093/gji/ggab407

[2] Yang Y., **Atterholt, J.**, Shen, Z., Muir, J.B., Williams, W.F., Zhan, Z. (2021) Sub-kilometer correlation between near-surface structure and ground motion measured with distributed acoustic sensing. *Geophysical Research Letters*, doi: 10.1029/2021GL096503

[1] **Atterholt, J.**, Brownlee, S.J., Pavlis, G.L. (2021). Direct P-wave anisotropy measurements at Homestake Mine: implications for wave propagation in the continental crust. *Geophysical Journal International*, doi: 10.1093/gji/ggaa416

Teaching Experience

2022-2023	**Caltech EQ Fellows Program**, Instructor/Mentor
2023	**Plate Tectonics**, Teaching Assistant, Caltech
2022	**Geophysical Data Analysis**, Teaching Assistant, Caltech
2021	**Seismology**, Teaching Assistant, Caltech

Service

2025-present	**Representative**, Subduction Zone Science Working Group, USGS
2022-present	**Manuscript Reviewer**, *Seismological Research Letters, Journal of Geophysical Research – Solid Earth, Communications Earth & Environment, Scientific Reports, Seismica, Bulletin of the Seismological Society of America, Tectonophysics, Nature Geoscience, Geophysical Research Letters*
2023-2024	**Project Mentor**, High School Student Researchers, Caltech
2022-2023	**Curriculum Developer / Instructor**, Caltech EQ Fellows Program
2021-2022	**Organizer**, Caltech Seismological Laboratory Seminar
2016-2019	**Editorial Board Member**, *IU Journal of Undergraduate Research*

Invited Seminars

[11] **Advanced National Seismic System (ANSS) Seminar**, 2025, upcoming
Title: Fiber arrays for rapid and precise rupture imaging: a case study on the 2024 M7 Mendocino Fault Earthquake

[10] **University of Hawaiʻi at Mānoa**, Special Seminar, 2025
Title: Imaging Big Things at Fine Scales with Fiber-Measured Earthquake Wavefields

[9] **Rutgers University, New Brunswick**, Special Seminar, 2025
Title: Imaging Big Things at Fine Scales with Fiber-Measured Earthquake Wavefields

[8] **University of Colorado, Boulder, Geological Sciences**, Weekly Seminar, 2025
Title: Imaging Big Things at Fine Scales with Fiber-Measured Earthquake Wavefields

[7] **Earthquake Science Center (USGS)**, Weekly Seminar, 2025
Title: Imaging Big Things at Fine Scales with Fiber-Measured Earthquake Wavefields

[6]   **Berkeley Seismology Laboratory**, Department Seminar, 2025
Title: Exploring Tectonic Processes at Fine Scales with Fiber-Measured Earthquake Wavefields

[5]   **Geologic Hazards Science Center (USGS)**, Weekly Seminar, 2024
Title: The Top-to-Bottom Structure of the Garlock Fault with Fiber Seismology

[4]   **Indiana University Department of Earth and Atmospheric Sciences**, Invited Talk, 2024
Title: Investigating Fault Structure and Moho Topography with a Fiber Array

[3]   **John Wesley Powell Center for Analysis and Synthesis**, Invited Talk, 2024
Title: Fault Zone Imaging with DAS: A Case Study at the Garlock Fault

[2]   **California Institute of Technology**, Brown Bag Seminar, 2024
Title: Exploring Fine-Scale Crustal Structure with Fiber Optic Seismology

[1]   **Lawrence Livermore National Laboratory**, GMP Guest Seminar, 2023
Title: Illuminating the Multiscale Structure of the Garlock Fault Zone with Distributed Acoustic Sensing

Select Oral Presentations

[9]   **Atterholt, J.**, McGuire, J.J., Barbour, A.J., Stewart, C., Moschetti, M.M. (2025, upcoming) Fiber-Imaged Supershear Dynamics in the 2024 Mw7 Mendocino Fault Earthquake. AGU Fall Meeting, New Orleans. **Invited**.

[8]   **Atterholt, J.**, McGuire, J.J., Barbour, A.J., Moschetti, M.M. (2025, upcoming) Sharp Structural Variability of the Gorda Slab Imaged by a Fiber Array. AGU Fall Meeting, New Orleans

[7]   **Atterholt, J.**, Zhan, Z. (2024) Fine Scale Southern California Moho Structure Uncovered with Distributed Acoustic Sensing. AGU Fall Meeting, Washington DC.

[6]   **Atterholt, J.**, Wilding, J.D., Ross, Z.E. (2024). The Evolution of Fault Orientation in the 2019 Ridgecrest Earthquake Sequence with a New Long-Term Catalog of Seismicity and Moment Tensors. AGU Fall Meeting, Washington DC.

[5]   **Atterholt, J.**, Zhan, Z. (2023) Illuminating Moho Variability Across the Garlock Fault with Distributed Acoustic Sensing. AGU Fall Meeting, San Francisco.

[4]   **Atterholt, J.**, Zhan, Z., Yang, Y., Zhu, W. (2023) The Top-to-Bottom Structure of the Garlock Fault Zone Uncovered with Fiber Sensing. AGU Fall Meeting, San Francisco.

[3]   **Atterholt, J.**, Zhan, Z., Yang, Y., Zhu, W. (2023) High-Resolution Fault Zone Imaging with Distributed Acoustic Sensing. SSA Annual Meeting, Puerto Rico. **Invited**.

[2]   **Atterholt, J.**, Zhan, Z., Yang, Y., Zhu, W. (2022) Imaging the Garlock Fault Zone using distributed acoustic sensing. AGU Fall Meeting, Chicago.

[1]   **Atterholt, J.**, Ross, Z.E. (2022). Global evaluation of large strike-slip ruptures using a Bayesian estimation of stress glut second moments. AGU Fall Meeting, Chicago.

Software Libraries

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[2] **Strain to Particle Motion Conversion Library** – Collection of functions for a regularized conversion from strain (measured by a dense array) to ground motion.
Accompanying paper: Zhai et al (2025) – Journal publication [13] (above)
Accompanying link: https://github.com/atterholt/DAS-unit-conversion

[1] **Curvelet Denoising Library** – Collection of functions for and an example of the wavefield partitioning and denoising framework for distributed acoustic sensing. This library has been ported into Python for inclusion in the DASPy Toolbox.
Accompanying paper: Atterholt et al. (2021) – Journal publication [3] (above)
Accompanying link: https://github.com/atterholt/curvelet-denoising

Select Datasets

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[2] **Atterholt, J.**, Wilding, J. D., Ross, Z. E. (2025). 2019 Ridgecrest Earthquake Sequence Long-Term Hypocenter and Moment Tensor Catalog (Version 2) [Data set]. CaltechDATA. doi: 10.22002/5af05-cah73

[1] **Atterholt, J.**, Zhan, Z. (2024). Catalog of Events with PmP Phase [Data set]. CaltechDATA. doi: 10.22002/hhg7x-hgm42

Field Experience

2025	**Field data collection of ongoing mass-wasting event**, Lead, USGS	
2025	**Fiber deployment in southern Cascadia**, Contributor, USGS	
2023	**Nodal deployment in Los Angeles County**, Contributor, Caltech	
2022	**Seismic survey across Garlock Fault**, Lead, Caltech	
2019	**Seismic survey across Seattle Fault**, Contributor, USGS	
2019	**Seismic survey in Wabash Valley Fault Zone**, Contributor, USGS	
2018	**Field mapping in the Tobacco Root Mountains**, Student, IU	

Media

- "Lasers, fiber optics and tiny vibrations tease a way to warn about earthquakes." NBC News. September 2025. Link
- "Calif. could detect massive earthquakes with internet cables. Here's how." SFGate. September 2025. Link

- "Fiber Optic Cables Could Revolutionize Earthquake Detection and Monitoring." KQED (NPR). September 2025. Link
- "How buried cables are revealing Earth's interior in incredible detail." New Scientist. May 2025. Link
- "New Technique to Look Deep Within Tectonic Plates." Caltech News. November 2024. Link