

Hilary Chang

Personal Info	Address: 550 Memorial Dr, Apt. 23D3, Cambridge, MA, 02139, USA Phone: (857) 285-0911 Email: hilarych@mit.edu ORCID: 0000-0002-9402-6089 U.S. Immigration Status: I am eligible for F-1 Optional Practical Training (OPT).	
Education	Massachusetts Institute of Technology (MIT)	Cambridge, MA, USA
	Ph.D in Geophysics and Seismology.	<i>Expected, June 2025</i>
	<ul style="list-style-type: none">Provisional thesis title: Investigating earthquake source parameter variability and subsurface structure using dense array and optical fiber. Advisors: Nori Nakata, Rachel E. Abercrombie.	
	Memorial University of Newfoundland (MUN)	St. John's, NL, Canada
	B.S in Earth Sciences - Applied Geophysics (Honours). GPA 4.0/4.0	<i>June 2019</i>
	<ul style="list-style-type: none">Thesis title: Automatic microearthquake locating using characteristic functions in a source scanning method. Advisor: Alison Malcolm.Minor in Physics and Mathematics.	
	National Taiwan University (NTU)	Taipei City, Taiwan
	BBA in Finance.	<i>June 2009</i>
Research Experience	Lawrence Berkeley National Laboratory (LBNL)	Berkeley, CA, USA
	Research Affiliate	<i>Oct 2023 to Present</i>
	<ul style="list-style-type: none">Analyzed borehole DAS data to understand slow slips and microearthquakes during stimulation at Utah Forge and at Mont Terri, Switzerland. Advisor: Nori Nakata.	
	Memorial University of Newfoundland (MUN)	St. John's, NL, Canada
	Research Assistant in geophysics	<i>2018 to 2019</i>
	<ul style="list-style-type: none">Developed an algorithm for locating microearthquakes in the geothermal field at the Reykjavik Peninsula, Iceland. Advisor: Alison Malcolm.	
	Research Assistant in biogeochemistry	<i>Summer 2018</i>
	<ul style="list-style-type: none">Investigated CO2 emissions along aquatic and terrestrial interfaces in the boreal environments. Advisor: Sue Ziegler.	
	Research Assistant in geochemistry	<i>Summer 2017</i>
	<ul style="list-style-type: none">Analyzed the thermal history of hydrocarbon reservoirs using fluid inclusions. Advisor: Karem Azmy.	
	Research Assistant in a medical lab	<i>Summer 2016</i>
	<ul style="list-style-type: none">Quantified images and practiced lab experiments. Advisor: Noriko Daneshtalab.	
Research Interests	My broad research interests are: <ul style="list-style-type: none">Source characterization for small to moderate earthquakes.Near-surface structure.Ambient noise seismology.Fiber-optic seismology.	

- Applications in reservoir and fault monitoring, geothermal exploration, and carbon storage.

Awards Highlights

- 2024 The MathWorks Science Fellowship.
- 2022 AGU Outstanding Student Presentation Award.
- 2019 The Captain Robert A. Bartlett Science Award.
- 2019 The H.R. (Pete) Peters Award for Best B.Sc. (Honours) Thesis in Earth Sciences.
- 2019 The Professional Engineers and Geologists in Newfoundland and Labrador Award for Excellence in Geoscience.
- 2019 The University Medal for Academic Excellence in Earth Sciences.
- 2019 Best Student Presentation at the Geological Association of Canada. Newfoundland and Labrador Annual Technical Meeting.

Teaching Experience

Undergraduate Introduction to Geophysics and Planetary Science at MIT

Teaching Assistant

Spring 2023

- Teaching assistant for the undergraduate introductory class in the Department of Earth, Atmospheric, and Planetary Sciences at MIT. Topics included plate tectonics, earthquakes, seismic waves, rheology, impact cratering, gravity and magnetic fields, heat flux, thermal structure, mantle convection, deep interiors, planetary magnetism, and core dynamics.
- Led discussion groups in the class. Hosted weekly office hours for students. Prepared for laboratory experiments. Graded assignments and exams.

Graduate Mechanics of Earth at MIT

Teaching Assistant

Spring 2022

- Teaching assistant for the graduate geophysics mechanics class. Topics included anelasticity, granular mechanics, poroelasticity, rate-and-state friction, transport properties of Earth materials, brittle-ductile transitions, creep of polycrystalline materials, stored energy and dissipation, and convection.
- Facilitated discussions in the class. Hosted weekly office hour for students. Prepared for laboratory experiments. Graded assignments.

Industry Experience

ExxonMobil

Spring, TX

Geoscience Intern

Summer 2023

- Optimized injection plans for mitigating the risk of induced seismicity.
- Used pumping data to analyze subsurface permeability.

Publications (Accepted)

Chang, H., & Nakata, N. (2024). Urban site characterization using DAS dark fibers on the MIT campus in Cambridge, Massachusetts. [Accepted in the special issue of *The Leading Edge on Optical Fiber*].

Chang, H., Abercrombie, R. E., Nakata, N., Pennington, C. N., Kemna, K. B., Cochran, E. S., & Harrington, R. M. (2023). Quantifying site effects and their influence on earthquake source parameter estimations using a dense array in Oklahoma. *Journal of Geophysical Research: Solid Earth*, 128(9), e2023JB027144.

O’Ghaffari, H., Peč, M., Mittal, T., Mok, U., Chang, H., & Evans, B. (2023). Microscopic defect dynamics during a brittle-to-ductile transition. *Proceedings of the National Academy of Sciences*, 120(42), e2305667120.

White, M. C., Zhang, Z., Bai, T., Qiu, H., Chang, H., & Nakata, N. (2023). HDF5eis: A storage and input/output solution for big multidimensional time series data from environmental sensors. *Geophysics*, 88(3), F29-F38.

Chang, H., & Nakata, N. (2022). Investigation of time-lapse changes with DAS borehole data at the Brady Geothermal Field using deconvolution interferometry. *Remote Sensing*, 14(1), 185.

Pennington, C. N., Chang, H., Rubinstein, J. L., Abercrombie, R. E., Nakata, N., Uchide, T., & Cochran, E. S. (2022). Quantifying the sensitivity of microearthquake slip inversions to station distribution using a dense nodal array. *Bulletin of the Seismological Society of America*, 112(3), 1252-1270.

Randell, A., Chokshi, K., Kane, B., Chang, H., Naiel, S., Dickhout, J. G., & Daneshtalab, N. (2016). Alterations to the middle cerebral artery of the hypertensive-arthritic rat model potentiates intracerebral hemorrhage. *PeerJ*, 4, e2608.

(In Review)

Chang, H., Qiu, H., Zhang, Z., Nakata, N., & Abercrombie, R. E. (2024). Investigation of site amplifications using ambient-noise-derived shallow velocity structures under a dense array in Oklahoma. [Manuscript submitted in April 2024].

Chang, H., Abercrombie, R. E., & Nakata, N. (2024). Importance of considering site effects in earthquake source parameter estimates: Insights from shallow attenuation at a dense array in Oklahoma. [Manuscript submitted in June 2024].

Invited Talks

Chang, H., Abercrombie, R., Nakata, N., Qiu, H., Zhang, Z., Pennington, C., Kemna, K., Cochran, E., & Harrington, R. (2024, May). Understanding the contribution of site effects to variability in microearthquake source parameter measurements using a large, dense array in Oklahoma. Invited oral presentation at the *SSA Annual Meeting*, Anchorage, AK, USA.

Chang, H. (2024, May). How do site effects influence source parameter measurements? Insights from microearthquakes recorded by a dense array in Oklahoma. Invited seminar speaker at the Lawrence Livermore National Laboratory, Livermore, CA, USA.

Chang, H., & Nakata, N. (2024, May). Urban site characterization for seismic hazard assessment using DAS dark fiber on the MIT campus. Invited oral presentation at the *MIT ERL Annual Meeting*, Cambridge, MA, USA.

Chang, H., & Nakata, N. (2022, May). The DAS experiment using MIT telecommunication dark fibers. Invited oral presentation at the *MIT ERL Annual Meeting*, Cambridge, MA, USA. [10.22541/essoar.170689040.06555486/v1](https://doi.org/10.22541/essoar.170689040.06555486/v1)

Chang, H., Malcolm, A., Massin, F., and Grigoli, F. (2019, May). Automatic earthquake locating by stacking characteristic functions in a source scanning method. Invited poster presentation at the *JpGU Annual Meeting*, Chiba, Japan.

**Conferences
(Lead Author)**

Chang, H., Nakata, N., Abercrombie, R.E., Dadi, S. and Titov, T. (2024, Dec). Toward reliable estimation of source parameters using Distributed Acoustic Sensing for microearthquakes in the Cape Modern geothermal field, Utah. Poster presentation at the *AGU Fall Annual Meeting*, Washington, DC, USA.

Chang, H., Abercrombie, R. E., & Nakata, N. (2024, Dec). Importance of considering site effects for estimating source parameters: Insights from shallow attenuations at the Large-n Seismic Survey in Oklahoma. Poster presentation at the *AGU Fall Annual Meeting*, Washington, DC, USA.

Chang, H., & Nakata, N. (2024, Dec). Urban site characterization using ambient noises captured by dark fibers in the telecommunication cables on the MIT campus. Poster presentation at the *AGU Fall Annual Meeting*, Washington, DC, USA.

Chang, H., & Nakata, N. (2024, Oct). Characterizing near-surface velocity structure and site responses at the MIT campus using telecommunication dark fibers with DAS. Poster presentation at the *SSA Photonic Seismology*, Vancouver, BC, Canada.

Chang, H., Abercrombie, R., Nakata, N., Qiu, H., Zhang, Z., Pennington, C., Kemna, K., Cochran, E., & Harrington, R. (2023, Dec). Quantifying the structural and site effects on microearthquake source parameter variability in a sedimentary basin across a dense array in Oklahoma. Poster presentation at the *AGU Fall Annual Meeting*, San Francisco, CA, USA. [10.22541/essoar.170224442.21795734/v2](https://doi.org/10.22541/essoar.170224442.21795734/v2).

Chang, H., Qiu, H., Zhang, Z., Nakata, N., & Abercrombie, R. E. (2022, Dec) Determining shallow structure beneath the dense LASSO array to improve ground motion prediction and source-parameter estimation. Oral presentation at the *AGU Fall Annual Meeting*, Chicago, IL, USA.

Chang, H., Ghaffari, H., Mok, U., Evans, J. B., & Pec, M. (2021, Dec). Acoustic constraints on semi-brittle deformation of Carrara marble. Poster presentation at the *AGU Fall Annual Meeting*, New Orleans, LA, USA.

Chang, H., Abercrombie, R. E., Nakata, N., Pennington, C. N., Kemna, K. B., Cochran, E. S., & Harrington, R. M. (2021, Aug). Quantifying earthquake source parameter uncertainties associated with local site effects using a dense array in Oklahoma. Poster presentation at the *SCEC Annual Meeting*. Online.

Chang, H., Abercrombie, R. E., Nakata, N., Pennington, C. N., Kemna, K. B., Cochran, E. S., & Harrington, R. M. (2021, Apr). Investigating the influence of site effects and spatial stacking on source parameter estimation for induced earthquakes using a large-N Array. Oral presentation at the *SSA Annual Meeting*. Online.

Chang, H., & Nakata, N. (2020). Investigation of the time-lapse changes with the DAS borehole data at the Brady geothermal field using deconvolution interferometry. In *SEG Technical Program Expanded Abstracts 2020* (pp. 3417-3421). Society of Exploration Geophysicists.

Chang, H., Malcolm, A., Massin, F., and Grigoli, F. (2019, Feb/Apr). Automatic earthquake locating using characteristic functions in a source scanning method. Oral presentation at the *GACNL Annual Technical Meeting*, St John's, NL, Canada (February); poster presentation at the *EGU General Assembly*, Vienna, Austria (April).

(Contributing Author)

Mittal, T, O'Ghaffari, H., Chang, H., & Pec, M. (2024. Dec). Using active acoustic sources to constrain the rheology across the Brittle-Ductile transition in Carrara marble. Poster presentation at the *AGU Fall Annual Meeting*, Washington, DC, USA.

Pec, M., O'Ghaffari, H., Mok, U., Chang, H., Evans, B., Bernabe, Y., Mittal, T & Cross, A. (2024, June). Microscopic defect dynamics during a brittle-to-ductile transition. In *ARMA US Rock Mechanics/Geomechanics Symposium*, Golden, Colorado, USA. p. D031S036R003. ARMA.

Harrington, R. M., Liu, Y., Yu, H., Verdecchia, A., Kemna, K. B., Bocchini, G. M., Dielforder, A., Roth, M. P., Kirkpatrick, J., Cochran, E. S., Chang, H., & Abercrombie, R. E. (2023, May). Deciphering earthquake source observations to motivate questions for physics-based models of earthquake simulation. In *EGU General Assembly*, Vienna, Austria. pp. EGU-7207.

Pennington, C., Chang, H., Rubinstein, J., Abercrombie, R., Nakata, N., Uchide, T., & Cochran, E. (2021, December). Quantifying the sensitivity of microearthquake slip inversions to station distribution using the LASSO nodal array in Oklahoma. In *AGU Fall Annual Meeting*, New Orleans, LA, USA. Vol. 2021, pp. S44C-06.

Skills

Language: Fluent in English and Mandarin

Computer: Python, MATLAB, LaTeX, Linux, SLURM, Adobe Illustrator