Hilary Chang

Personal Info

Address: 550 Memorial Dr, Apt. 23D3, Cambridge, MA, 02139, USA
Phone: (857) 285-0911
Email: hc3627@columbia.edu
Google Scholar: https://scholar.google.com/citations?user=2VgGh4gAAAAJ&hl=en
ORCID: 0000-0002-9402-6089

Education

Massachusetts Institute of Technology (MIT) Cambridge, MA, USA
Ph.D in Geophysics and Seismology. *May 2025*

- Thesis title: Characterizing microearthquakes and shallow structure with dense array and optical fibers.

Memorial University of Newfoundland (MUN) St. John's, NL, Canada
B.S in Earth Sciences - Applied Geophysics (Honours). GPA 4.0/4.0 *June 2019*

- Thesis title: Automatic microearthquake locating using characteristic functions in a source scanning method. Advisor: Alison Malcolm.
- Double-Minors in Physics and Mathematics.

National Taiwan University (NTU) Taipei City, Taiwan
BBA in Finance. *June 2009*

Research Experience

Lawrence Berkeley National Laboratory (LBNL) Berkeley, CA, USA
Research Affiliate *Oct 2023 to Present*

- 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 *2018 to 2019*

- Developed an algorithm for locating microearthquakes in the geothermal field at the Reykjavik Peninsula, Iceland. Advisor: Alison Malcolm.

Research Assistant in biogeochemistry *Summer 2018*

- Investigated CO2 emissions along aquatic and terrestrial interfaces in the boreal environments. Advisor: Sue Ziegler.

Research Assistant in geochemistry *Summer 2017*

- Analyzed the thermal history of hydrocarbon reservoirs using fluid inclusions. Advisor: Karem Azmy.

Research Assistant in a medical lab *Summer 2016*

- Quantified images and practiced lab experiments. Advisor: Noriko Daneshtalab.

Research Interests

My broad research interests are:

- 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

2025 The Lamont-Doherty Postdoctoral Research Fellowship
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 Newfoundland and Labrador Annual Technical Meeting, Geological Association of Canada

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

Chang, H., Qiu, H., Zhang, Z., Nakata, N., & Abercrombie, R. E. (2025b). Investigation of site amplifications using ambient-noise-derived shallow velocity structures under a dense array in Oklahoma. *Bulletin of the Seismological Society of America 2025*. doi: 10.1785/0120240074

Nakata, N., **Chang, H.**, Wu, S.M., Zhengfa Bi, Chen, L.W., Soom, F., Gao, H., Titov, A., & Dadi, S. (2025). Fracture characterization revealed by microseismicity at Cape Modern Geothermal Field, Utah. *Proceedings of the 50st Stanford Geothermal Workshop*.

Chang, H., Abercrombie, R. E., & Nakata, N. (2025a). Importance of considering near-surface attenuation in earthquake source parameter estimation: Insights from Kappa at a dense array in Oklahoma. *Bulletin of the Seismological Society of America 2025*; doi: 10.1785/0120240137

Chang, H., & Nakata, N. (2024). Urban site characterization using DAS dark fibers on the MIT campus in Cambridge, Massachusetts. *The Leading Edge*, 43 (11): 747–756.

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.

Invited Seminar Talks

Chang, H. (June 2025). Challenges in microearthquake source parameter modeling: Are the observations source variabilities or site effects? Invited seminar speaker at the Taoyuan County, Taiwan.

Chang, H. (June 2025). Applications of distributed acoustic sensing in urban seismic hazard assessment and reservoir monitoring. Invited seminar speaker at the Academia Sinica, Taipei City, Taiwan.

Chang, H., Nakata, N., Abercrombie, R.E, Dadi, S. and Titov, T. (May 2025). Induced earthquake characterization using distributed acoustic sensing. Invited presentation at the *MIT ERL Annual Meeting*, Cambridge, MA, USA.

Chang, H. (Mar 2025). Optical fibers as seismic dense arrays: Opportunities and limitations. Invited seminar speaker at Stanford University, Stanford, CA, USA.

Chang, H. (Feb 2025). Optical fibers as seismic dense arrays: Opportunities and limitations. Invited seminar speaker at Lamont-Doherty Earth Observatory, Palisades, NY, USA.

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

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

Conferences (Lead Author)

Chang, H., and Nakata, N. (Aug 2025). Site characterization for seismic hazard assessment using telecom cables on the MIT campus in Cambridge, Massachusetts. Invited presentation at the *SEG/AAPG International Meeting for Applied Geoscience & Energy*, Houston, TX, USA.

Chang, H., Nakata, N., Abercrombie, R.E, Dadi, S. and Titov, T. (Apr 2025). Characterizing microearthquake and shallow attenuation with downhole optical fibers in the Cape Modern geothermal field. Invited presentation at the SSA Annual Meeting, Baltimore, MD, USA.

Chang, H., Nakata, N., Abercrombie, R.E, Dadi, S. & Titov, T. (Dec 2024). 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. (Dec 2024). 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. (Dec 2024). 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. (Oct 2024). 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. (May 2024). Understanding the contribution of site effects to variability in microearthquake source parameter measurements using a large, dense array in Oklahoma. Invited presentation at the SSA Annual Meeting, Anchorage, AK, USA.

Chang, H., Abercrombie, R., Nakata, N. Qiu, H., Zhang, Z., Pennington, C., Kemna, K., Cochran, E., & Harrington, R. (Dec 2023). 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.

Chang, H., Qiu, H., Zhang, Z., Nakata, N., & Abercrombie, R. E. (Dec 2022) 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. (Dec 2021). 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. (Aug 2021). 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. (Apr 2021). 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. (Feb/Apr/May 2019). 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); invited poster presentation at the *JpGU Annual Meeting*, Chiba, Japan (May).

(Contributing Author)

Bhutwala, R., **Chang, H.**, Babu, N., Curry, B., Hussenoeder, S., & Dutta, S. (Jun 2025). Quantifying subsurface connectivity: comparative study of pressure pulse analysis for induced seismicity management. Oral presentation at the *SEG–Beneath the Surface: Innovations in Geoscience Symposium*, Hyderabad, India.

Hussenoeder, S., Curry, B., **Chang, H.**, Dutta, S., & Babu, N. (Jun 2025). Using Pressure Pulses to Understand Subsurface Connectivity: A Midland Basin Multi-Company Case Study.

Oral presentation at the *Unconventional Resources Technology Conference (URTeC)*, Houston, TX, USA.

Mittal, T, O'Ghaffari, H., **Chang, H.**, & Pec, M. (Dec 2024). 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. (Jun 2024). 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. (May 2023). 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. (Dec 2021). 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