

Curriculum Vitae (09/01/2023)

Hao, Ming, MH

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Areas of Academic Interest

I am a mineral physicist with a primary research focus on delving into the intricate compositions and structures of both Earth and other planets. My work revolves around high pressure and temperature techniques, enabling the precise measurement of essential geophysical properties like elasticity and electrical conductivity of materials on Earth and other planets. By synergistically merging field geophysical observations with experimental measurements, I can reveal the complexities that underlie the dynamic processes shaping Earth and other planets.

Educational background

Prior Institutions and years attended:

Peking University, August 2013- July 2017, B.S. in Geology

University of New Mexico, August 2017- August 2022, Ph.D. in Earth and Planetary Sciences

Current Institution and years attended:

Earth and Planets Laboratory, Carnegie Institution for Science, August 2022-Present, Postdoctoral Fellow

Employment Experience

Teaching Assistance at Department of Earth and Planetary Sciences, University of New Mexico (2018 spring, 2019 spring, 2020 spring, 2020 fall, and 2022 spring).

Research Assistance at Department of Earth and Planetary Sciences, University of New Mexico (2017 fall, 2018 fall, 2019 fall, 2021 spring, and 2021 fall).

Postdoctoral Fellow at Earth and Planets Laboratory, Carnegie Institution for Science (August 2022-present).

Grants, Awards and Honors

1. AGU Mineral and Rock Physics Graduate Research Award (2022).
2. Vincent C. Kelley Memorial Award (The best Ph.D. award of Department of Earth and Planetary Sciences).
3. Department of Earth and Planetary Sciences Departmental Scholarship (2018) \$700; (2019) \$900; (2021) \$800
4. Final list of the Caswell Silver fellowship for entering graduate students: UNM (2017) \$2,000
5. Excellent internship report award: School of Earth and Space Science, PKU (2015)
6. Albuquerque Gem and Mineral Club (AGMC) award (2018) \$1,500

7. CNPC Scholarship for the students with excellent performances on study: School of Earth and Space Science, PKU (2015) \$1,276
 8. Hui-Rong Li Scholarship for the students with excellent performances on study: School of Earth and Space Science, PKU (2014) \$797
 9. Physics contest of college students of Beijing: 3rd place, PKU (2014)
- Membership of American Geophysical Union (AGU)
 - Membership of Mineralogical Society of America (MSA)

Publications:

1. **Hao, M.**, Zhou, W. Y., Hrubciak, R., Kenney-Benson, C., Kavanagh, J., & Zhang, J. S. (2023). The ultra-low viscosity of volatile-rich kimberlite magma. (in preparation)
2. **Hao, M.**, Codillo, E. A., Walter, M. J., Hrubciak, R., Cross A. J., Wagner, L., Thomson, A. R., & Pommier, A. Electrical Conductivity and Sound Velocities of Talc under High Pressure and High Temperature Conditions and Application to the Subducting Cocos Plate. (in preparation)
3. **Hao, M.**, Zhou, W. Y., Dera, P., Zhang, D., Schmandt, B., & Zhang, J. S. (2023). Fast Seismic Anomalies under Continents Explained by the Delaminated Lower Continental Crust - Implications from High Pressure-Temperature Elasticity of Jadeite. *Geophysical Research Letters* (under revision).
4. Nellessen, M.A., Gasda, P., Crossey, L., Peterson, E., Ali, A., Zhang, J., Zhou, W., **Hao, M.**, Spilde, M., Newsom, H. and Lanza, N., (2023). Boron adsorption in clay minerals: Implications for martian groundwater chemistry and boron on Mars. *Icarus*, p.115599.
5. Zhou, W. Y., Olson, P. L., Shearer, C. K., Agee, C. B., Townsend, J. P., **Hao, M.**, ... & Zhang, J. S. (2022). High pressure-temperature phase equilibrium studies on Martian basalts: Implications for the failure of plate tectonics on Mars. *Earth and Planetary Science Letters*, 594, 117751.
6. Zhou, W. Y., **Hao, M.**, Zhang, J. S., Chen, B., Wang, R., & Schmandt, B. (2022). Constraining composition and temperature variations in the mantle transition zone. *Nature Communications*, 13(1), 1094.
7. Zhang, J. S., Irifune, T., **Hao, M.**, Zhang, D., Hu, Y., Tkachev, S., ... & Prakapenka, V. (2021). Grain size dependent high-pressure elastic properties of ultrafine micro/nanocrystalline grossular. *Scientific reports*, 11(1), 1-11.
8. Hou, M., Zhou, W. Y., **Hao, M.**, Hua, F. T. S., Kung, J., Zhang, D., ... & Zhang, J. S. (2022). Effect of structural water on the elasticity of orthopyroxene. *American Mineralogist: Journal of Earth and Planetary Materials*, 107(4), 703-708.
9. **Hao, M.**, Zhang, J. S., Zhou, W.-Y., & Wang, Q. (2021). Seismic visibility of eclogite in the Earth's upper mantle – implications from high pressure-temperature single-crystal elastic properties of omphacite. *Journal of Geophysical Research: Solid Earth*, 126(5), e2021JB021683.
10. Zhou, W. Y., Ren, Z., Zhang, J. S., Chen, B., **Hao, M.**, Ohuchi, T., ... & Schmandt, B. (2021). The Water-Fe-Pressure dependent single-crystal elastic properties of wadsleyite: Implications for the seismic anisotropy in the upper Mantle Transition Zone. *Earth and Planetary Science Letters*, 565, 116955.
11. **Hao, M.**, Zhang, J. S., Pierotti, C. E., Zhou, W. Y., Zhang, D., & Dera, P. (2020). The seismically fastest chemical heterogeneity in the Earth's deep upper mantle—

implications from the single-crystal thermoelastic properties of jadeite. *Earth and Planetary Science Letters*, 543, 116345.

12. Mans, W., Zhang, J. S., **Hao, M.**, Smyth, J. R., Zhang, D., Finkelstein, G. J., & Dera, P. (2019). Hydrogen Effect on the Sound Velocities of Upper Mantle Omphacite. *Minerals*, 9(11), 690.
13. **Hao, M.**, Pierotti, C. E., Tkachev, S., Prakapenka, V., & Zhang, J. S. (2019). The single-crystal elastic properties of the jadeite-diopside solid solution and their implications for the composition-dependent seismic properties of eclogite. *American Mineralogist*, 104(7), 1016-1021.
14. Zhang, J. S., **Hao, M.**, Ren, Z., & Chen, B. (2019). The extreme acoustic anisotropy and fast sound velocities of cubic high-pressure ice polymorphs at Mbar pressure. *Applied Physics Letters*, 114(19), 191903.
15. **Hao, M.**, Zhang, J. S., Pierotti, C. E., Ren, Z., & Zhang, D. (2019). High-pressure single-crystal elasticity and thermal equation of state of omphacite and their implications for the seismic properties of eclogite in the Earth's interior. *Journal of Geophysical Research: Solid Earth*, 124(3), 2368-2377.

Relevant technical skills

Technical and analytical skills:

- Diamond anvil cell
- Multi-anvil press
- CO₂ laser heating
- X-ray diffraction: single-crystal and powder diffraction
- Brillouin spectroscopy
- Raman spectroscopy
- Fourier-transform infrared spectroscopy
- Electron microprobe
- Scanning and transmission electron microscopy
- Focused ion beam
- Paris-Edinburgh cell
- Falling sphere viscosity measurements
- Electrical conductivity measurements

Computational Skills:

- Programming skills: Matlab; Python
- Software data analysis tools: Eosfit; Crystallmaker; ImageJ; WIN1024; Cij_Works; Gsas; Diopbase; GSE_ADA; RSV; Z_view

Professional Training:

- The Earth Educators' Rendezvous (2022).

- Advances in Synchrotron-Based Research Towards Understanding the Structure, Evolution, and Dynamics of Earth and Planetary Interiors workshop (2021).
- In-Situ Rock Deformation Workshop (2021).
- 22nd National School on Neutron and X-ray Scattering (2020).
- Nuclear Resonant Scattering Workshop (2017): CONUSS and Synchrotron Mossbauer Data Analysis

Service

- Review papers for different journals (e.g., Science Advances, Journal of Geophysical Research, and American Mineralogist etc.).
- Gem and Mineral Show, Albuquerque, NM (2021).
- AGU SEDI (Study of the Earth's Deep Interior) session mentorship (2021).
- Public Lecture to Albuquerque Gem and Mineral Club (2018).