

Curriculum Vitae (08/1/2022)

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Areas of Academic Interest and Future Goals

My major research project is to explore the seismic properties of the chemical heterogeneities (primarily oceanic ally or continentally originated eclogitic materials) in the deep Earth. Understand the evolution and behaviors of these materials under high P-T conditions can help us to identify them in the Earth's interior, explain seismic observations, and link to the geochemical observations.

Educational background

Prior Institutions and years attended:

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

Current Institution and years attended:

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

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).

Grants, Awards and Honors

1. Hui-Rong Li Scholarship for the students with excellent performances on study: School of Earth and Space Science, PKU (2014) \$797
2. Physics contest of college students of Beijing: 3rd place, PKU (2014)
3. CNPC Scholarship for the students with excellent performances on study: School of Earth and Space Science, PKU (2015) \$1,276
4. Excellent internship report award: School of Earth and Space Science, PKU (2015)
5. Final list of the Caswell Silver fellowship for entering graduate students: UNM (2017) \$2,000
6. Albuquerque Gem and Mineral Club (AGMC) award (2018) \$1,500
7. Department of Earth and Planetary Sciences Departmental Scholarship (2018) \$700; (2019) \$900; (2021) \$800
8. Vincent C. Kelley Memorial Award (The best Ph.D. award of Department of Earth and Planetary Sciences).
 - Membership of American Geophysical Union (AGU)
 - Membership of Mineralogical Society of America (MSA)

Research

Referred Publications:

1. 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.
2. Zhou, W.-Y., **Hao, M.**, Zhang, J.S. *et al.* Constraining composition and temperature variations in the mantle transition zone. *Nat Commun* **13**, 1094 (2022).
3. 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.
4. Hou, M., Zhou, W.-Y., **Hao, M.**, Hua, F. T., Kung, J., Zhang, D., Dera, P. and Zhang, J.S. (2022) Effect of structural water on the elasticity of orthopyroxene, *American Mineralogist*
5. **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.
6. 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.
7. **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.
8. 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.
9. **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.
10. 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.
11. **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.

In preparation:

1. **Hao, M.**, Zhou, W.-Y., Hrubciak, R., Kenney-Benson, C., & Zhang, J. S. The ultra-low viscosity of volatile-rich kimberlite magma.

2. **Hao, M.**, Zhou, W.-Y., & Zhang, J. The Seismic Properties of the Recycled Lower Continental Crust – Constraints from High Pressure-Temperature Single-Crystal Elastic Properties of Jadeite.

Conference Abstracts:

1. **Hao, M.**, Zhou, W.-Y., & Zhang, J. (2021, December). The Seismic Properties of the Recycled Lower Continental Crust – Constraints from High Pressure-Temperature Single-Crystal Elastic Properties of Jadeite. In *AGU Fall Meeting 2021*. AGU.
2. **Hao, M.**, Zhou, W.-Y., Hrubciak, R., & Zhang, J. (2021, December). The Viscosity of Kimberlite Melts under High Pressure-Temperature Conditions. In *AGU Fall Meeting 2021*. AGU.
3. Hou, M., **Hao, M.**, Su, X., Liu, J., Hrubciak, R., Zhou, W., & Zhang, J. (2021, December). Ultralow velocities of amorphous CaCO₃ and the origin of seismic anomalies in the Earth's upper mantle. In *AGU Fall Meeting 2021*. AGU.
4. Zhou, W.-Y., **Hao, M.**, Ohuchi, T., Chen, B., Miyagi, L. M., Schmandt, B., & Zhang, J. (2020, December). Anisotropy of the Upper Mantle Transition Zone constrained from the first experimentally determined high temperature-pressure single-crystal elasticity data of wadsleyite. In *AGU Fall Meeting Abstracts* (Vol. 2020, pp. D1030-07).
5. **Hao, M.**, Zhang, J., Zhou, W., & Pierotti, C. E. (2020). High temperature-pressure single-crystal elastic properties of omphacite. *COMPRES, 2020*
6. **Hao, M.**, Zhang, J., Zhou, W., & Pierotti, C. E. (2019). High temperature-pressure single-crystal elastic properties of omphacite. *AGUFM, 2019*, D113B-0002.
7. Zhang, J., Ren, Z., Zhou, W., **Hao, M.**, Chen, B., Dera, P., & Schmandt, B. (2019). Systematic analysis of the single-crystal elastic properties of wadsleyite in the Fe-H₂O%-Pressure 4D space. *AGUFM, 2019*, MR24A-01.
8. **Hao, M.**, Zhang, J., Zhou, W., & Pierotti, C. E. (2019). High pressure single-crystal elastic properties of jadeite. *COMPRES, 2019*
9. 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. *COMPRES, 2019*
10. **Hao, M.**, Zhang, J., Ren, Z., Zhang, D., Tkachev, S. N., Prakapenka, V. B., & Pierotti, C. E. (2018, December). Single-crystal Elasticity and Thermal Equation of State of Omphacite to 18GPa. In *AGU Fall Meeting Abstracts*.
11. **Hao, M.**, Zhang, J., & Pierotti, C. E. (2018). Elasticity of the composition dependence of diopside-jadeite system and single-crystal omphacite up to 18 GPa. *COMPRES, 2018*

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
- Nuclear resonant scattering
- Electron microprobe
- Scanning and transmission electron microscopy
- Focused ion beam
- Paris-Edinburgh cell
- Falling sphere viscosity measurements

Computational Skills:

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

Professional Training:

- Nuclear Resonant Scattering Workshop (2017): CONUSS and Synchrotron Mossbauer Data Analysis
- 22nd National School on Neutron and X-ray Scattering (2020).
- In-Situ Rock Deformation Workshop (2021).
- Advances in Synchrotron-Based Research Towards Understanding the Structure, Evolution, and Dynamics of Earth and Planetary Interiors workshop (2021).
- The Earth Educators' Rendezvous (2022).

Service

- Public Lecture to Albuquerque Gem and Mineral Club (2018).
- AGU SEDI (Study of the Earth's Deep Interior) session mentorship (2021).
- Gem and Mineral Show, Albuquerque, NM (2021).