Shangqin Hao

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La Jolla, CA 92093, United States

Education

- **University of California San Diego** *Sept., 2020 - Now*
  Ph.D. candidate in Geophysics, Advisor: Dr. Peter M. Shearer La Jolla, United States
- **University of Science and Technology of China** *Sept., 2017 - Jul., 2020*
  M.S. in Geophysics, Advisor: Dr. Zhongqing Wu Hefei, China
- **Nanjing University** *Sept., 2013 - Jul., 2017*
  B.S. in Geology, Advisor: Dr. Zhongqing Wu, Dr. Tao Wang Nanjing, China

Research Interests

- Imaging fine-scale structure using dense arrays and DAS
- Multiscale imaging of global deep-Earth structure
- Observation and interpretation of seismic discontinuities, anisotropy, and other seismic observables
- Multidisciplinary investigation of the deep Earth integrating seismic observations, mineral physics, geochemistry, and geodynamic modeling

Selected Projects

- **Substantial global radial variations of basalt content near the 660-km discontinuity** *May, 2023 - Oct., 2024*
  - Constrained seismic velocity, density, and basalt content at and below the 660-km discontinuity (d660) by *S660S* waveform inversions
  - Found that slabs exhibit a smaller impedance jump across the d660 but a steeper gradient below the d660 compared to other regions
  - Suggested that basalt accumulates at the d660, especially in subduction zones, but decreases significantly below it, forming a harzburgite-enriched layer

- **Upper-mantle structure beneath Alaska imaged by teleseismic S-wave reverberations** *May, 2021 - May, 2023*
  - Imaged the Moho and mantle transition zone (MTZ) discontinuities beneath Alaska by stacking long-period teleseismic *SH* reverberated waves
  - Observed crustal thickness is consistent with surface topography and gravity measurements
  - Suggested that the Pacific slab may have penetrated into the upper MTZ under central Alaska but not under the Alaska Peninsula

- **Thermoelasticity of phase D and implications for low-velocity anomalies and local discontinuities at the uppermost lower mantle** *Sept., 2019 - Sept., 2021*
  - Obtained elasticity and density of phase D under the lower-mantle conditions
  - Proved that the accumulation of phase D may account for seismic anisotropy rather than low-velocity anomalies in the uppermost lower mantle (ULM)
  - Suggested that the decomposition of phase D in the ULM causes a density jump, possibly explaining some discontinuities in subduction zones

- **Compositional and thermal state of the lower mantle from joint 3D inversion with seismic tomography and mineral elasticity** *Oct., 2018 - June, 2023*
  - Inverted for the 3D chemical composition and thermal state of the lower mantle based on seismic tomography models and mineral elasticity data
  - Found that velocity heterogeneities in the upper lower mantle mainly result from thermal anomalies, whereas those in the lowermost mantle mainly result from compositional or phase variations
  - Found that LLSVPs have ~500 K higher temperature, higher bridgmanite and iron content than the ambient mantle, supporting the origin from an ancient basal magma ocean

- **Elasticity of akimotoite under the mantle conditions: Implications for multiple discontinuities and seismic anisotropies at the depth of ∼600-750 km in subduction zones** *Oct., 2017 - Sept., 2019*
  - Calculated the elasticity of akimotoite under the mantle conditions using first-principles calculations
  - Estimated the V_P, V_S, and density contrasts caused by akimotoite-related transitions
  - Proved that the discontinuity at the depth of ∼700-750 km in cold slabs could result from the decomposition of pyrope rather than the akimotoite-bridgmanite transition

PUBLICATIONS

[1] **Hao, S.**, Wei, S. S., & Shearer, P. M. (2024). Substantial global radial variations of basalt content near the 660-km discontinuity. *AGU Advances*, 5(6), e2024AV001409. [**Featured as an Editor's Highlight on EOS**]

[2] **Hao, S.**, Yang, D., Wang, W., Zou, F., & Wu, Z. (2024). Thermoelasticity of phase D and implications for low-velocity anomalies and local discontinuities at the uppermost lower mantle. *American Mineralogist*.

[3] Deng, X., Xu, Y., **Hao, S.**, Ruan, Y., Zhao, Y., Wang, W., ... & Wu, Z. (2023). Compositional and thermal state of the lower mantle from joint 3D inversion with seismic tomography and mineral elasticity. *Proceedings of the National Academy of Sciences*, 120(26), e2220178120.

[4] **Hao, S.**, Shearer, P., & Liu, T. (2023). The upper-mantle structure beneath Alaska imaged by teleseismic S-Wave reverberations. *Journal of Geophysical Research: Solid Earth*, 128(6), e2023JB026667.

[5] Song, J., Qian, W., **Hao, S.**, Wang, W., Sun, D., & Wu, Z. (2023). Elasticity of high-pressure clinoenstatite under mantle conditions: Implications for the origin of the X-discontinuity. *Science China Earth Sciences*, 66(4), 718-729.

[6] Song, Z., Wu, Z., Wang, W., **Hao, S.**, & Sun, D. (2022). Elasticity of phase H under the mantle temperatures and pressures: Implications for discontinuities and water transport in the mid-mantle. *Journal of Geophysical Research: Solid Earth*, 127(11), e2022JB024893.

[7] Zhao, Y., Wu, Z., **Hao, S.**, Wang, W., Deng, X., & Song, J. (2022). Elastic properties of Fe-bearing Akimotoite at mantle conditions: Implications for composition and temperature in lower mantle transition zone. *Fundamental Research*, 2(4), 570-577.

[8] **Hao, S.**, Wang, W., Qian, W., & Wu, Z. (2019). Elasticity of akimotoite under the mantle conditions: Implications for multiple discontinuities and seismic anisotropies at the depth of ∼600–750 km in subduction zones. *Earth and Planetary Science Letters*, 528, 115830.

SKILLS

- **Seismic Approaches:** *SH* reverberations, *SS* precursors, Receiver functions
- **Programming Languages:** Python, Matlab, C, Fortran
- **Tools & Technologies:** GMT, First-principles calculations (Quantum Espresso & VASP), Origin, 3D printing
- **Languages:** Mandarin, English

PROFESSIONAL SERVICE

Reviewed manuscripts submitted to academic journals: Nature Communications, Communications Earth & Environment

HONORS AND AWARDS

- **Outstanding Graduate** *2020*
  University of Science and Technology of China
- **National Scholarship** *2019*
  University of Science and Technology of China
- **Outstanding Student** *2015*
  Nanjing University
- **Cyrus Tang Scholarship** *2014 - 2017*
  Cyrus Tang Foundation
- **National Scholarship for Encouragement** *2014 - 2016*
  Nanjing University