Updated: October 1, 2025

2016

2016

Xiyuan Bao

xiyuanbao@fas.harvard.edu Personal Website

Department of Earth and Planetary Sciences, Harvard University

EDUCATION	Ph.D. in Geophysics, University of California, Los Angeles	2018-Mar 2024	
	M.S. in Geophysics, University of California, Los Angeles	2018-2020	
	B.S. of Geophysics with Honors, University of Science and Technology of China	2014-2018	
	Minor in Computer Science , University of Science and Technology of China	2014-2018	
Experience	Reginald A. Daly Postdoctoral fellow, Harvard University	Oct 2024-	
	Postdoctoral Scholar, University of California, Los Angeles	Mar 2024-Sep 2024	
	Graduate Research Assistant, University of California, Los Angeles	Sep 2018-Mar 2024	
	Hotspots from Top to Bottom (Advisor: Carolina Lithgow-Bertelloni)		
	Undergraduate Research Assistant, University of Science and Technology of Chi		
	Benchmark on CitcomToEllipsis: Spontaneous subduction towards free surface (Adv		
	Visiting Undergraduate, University of Illinois, Urbana-Champaign	Jun-Aug 2017	
	Constraining the Nature of the LLSVPs Using Geoid and Dynamic Topography (Advisor: Lijun Liu)		
Honors &	Reginald A. Daly Postdoctoral Research Fellowship, Harvard University	2024	
AWARDS	• Study of the Earth's Deep Interior Section Award for Graduate Research, AGU	2023	
	 Computers and Geosciences Research Scholarship, IAMG 	2022	
	 Jiuzhang Zhao Talent Program in Earth and Space Sciences, USTC 	2015-2018	
	 Award from National Undergraduate Innovation Training Program, USTC 	2017-2018	
	 Earth Science Climbing Scholarship, USTC 	2015, 2017	

• First Prize of Physics Innovation Research Experiment Thesis Competition, USTC

Silver Scholarship for Outstanding Students, USTC

PUBLICATIONS

- [6] **Bao, X.** & Lithgow-Bertelloni, C. R. Self-correction of the optical distortion effect of thermal plumes in particle image velocimetry. *Physics of Fluids*. https://doi.org/10.1063/5.0233759 (2024).
- [5] **Bao, X.** Giant impact and Earth's mysterious blobs: An interdisciplinary revelation. *Science Bulletin* **69**, 293–294 (2024).
- [4] **Bao, X.,** Mittal, T. & Lithgow-Bertelloni, C. R. Determining Mid-Ocean Ridge Geography from Upper Mantle Temperature. *Earth and Planetary Science Letters* **641**, 118823 (2024).
- [3] Zhang, X., Brown, E. L., Zhang, J., Lin, J., **Bao, X.** & Sager, W. W. Magmatism of Shatsky Rise controlled by plume-ridge interactions. *Nature Geoscience*. https://www.nature.com/articles/s41561-023-01286-0 (2023).
- [2] Li, S., Li, J., Ferrand, T. P., Zhou, T., Lv, M., Xi, Z., Maguire, R., Han, G., Li, J., **Bao, X.**, *et al.* Deep geophysical anomalies beneath the Changbaishan Volcano. *Journal of Geophysical Research: Solid Earth*, e2022JB025671. https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2022JB025671 (2023).
- [1] **Bao, X.,** Lithgow-Bertelloni, C. R., Jackson, M. G. & Romanowicz, B. On the relative temperatures of Earth's volcanic hotspots and mid-ocean ridges. *Science* **375,** 57–61. ISSN: 0036-8075. https://www.science.org/doi/10.1126/science.abj8944 (2022).

MANUSCRIPTS SUBMITTED

- [5] Lucas, E., Richards, F., Cederberg, G., Bao, X., Hoggard, M. J., Tsuji, S. R. J., Latychev, K., Tsuji, L. J. S. & Mitrovica, J. Emergence of Antarctic mineral resources in a warming world. Revision Under review in Nature Climate Change.
- [4] Cai, R., Bao, X., Foley, S. F., Giuliani, A., Jiang, S., Pearson, D. G. & Liu, J. Evidence for a highly fusible fundamental constituent in the convective mantle. submitted.
- [3] **Bao, X.,** Wamba, M. D. & Stracke, A. A deep-mantle geochemical zoning map beneath East Africa and Indian Ocean. Under review in Science.
- [2] Bao, X. & Lithgow-Bertelloni, C. R. End-to-End workflow for 4-dimensional flow measurements and analysis in viscous Rayleigh-Bénard Convection submitted.
- [1] Bao, X. & Lithgow-Bertelloni, C. R. Interaction and evolutionary pathways of laminar thermal plumes revealed by 4-dimensional velocity measurements and analysis: Application to mantle *plumes* submitted.

MANUSCRIPTS IN PREP

- [4] Coulson, S., Lloyd, A., Bao, X., Mitrovica, J. X., Dangendorf, S., Pan, L., Valencic, N., Tamisea, M. E., Al-Attar, D. & Heathcotte, D. Inverting Sea Surface Height Data for Greenland Ice Mass Changes (1993-2019): A Proof of Concept
- [3] Bao, X., Coulson, S., Valencic, N., Mitrovica, J., Dangendorf, S., Mousavi, M. & Lloyd, A. Inverting Sea Level Fingerprints for Ice Mass Changes Using Neural Operators: How Much Can We Recover and How Unique Is It?
- [2] Bao, X., Cao, Z., Gourley, K. C., Gutierrez, S., Liang, Y., Zhou, D., Buffett, B. A., Mittal, T., Li, J., Pierrehumbert, R., Schaefer, L., Orman, J. V. & Foley, B. J. Coupled Evolution of Earth's Hydrogen Distribution and Thermal History.
- [1] Wang, W., Zhang, X., Lin, J., Cheng, Z., Bao, X., Zhang, F., Kelley, K. A., Chen, L. & Chu, F. Ultra-depleted mantle supporting the Marion Rise: implications for ocean rise dynamics

ORAL

- PRESENTATIONS [16] Invited: Deep Provenance of East African and Indian Ocean Hotspots through Tomography, Graph Theory, and Geochemical Cross-validation Brownbag Seminar (Princeton University, Princeton, NJ, Nov. 2025).
 - [15] Invited: Deep Provenance of East African and Indian Ocean Hotspots through Tomography, Graph Theory, and Geochemical Cross-validation Geophysics Hour (Arizona State University, Tempe, AZ, Nov. 2025).
 - [14] Invited: Plumes over LLSVPs: Supercharging multi-scale flow resolution with hybrid experimentaladjoint digital twins Geophysics Seminar (Brown University, RI, US).
 - [13] Plumes over LLSVPs: Supercharging multi-scale flow resolution with hybrid experimental-adjoint digital twins BiSEPPS Seminar (Harvard University, MA, US, Nov. 2024).
 - [12] Invited: A Song of Ice and Fire: Operator Learning for Viscous Flow from Mantle Convection to Ice Dynamics Daly Special Seminar (Harvard University, MA, US, Feb. 2024).
 - [11] Invited: Hotspots from Top to Bottom Geophysics Seminar (University of Science and Technology of China, Anhui, China, Jan. 2024).

- [10] *Invited: Illuminating Mantle Convection: Unraveling Plume Dynamics over LLSVPs in the Laboratory* AGU Fall Meeting 2023 (San Francisco, CA, US, Dec. 2023).
- [9] *Invited:* Hotspots from Top to Bottom Earth Sciences Seminar (Unversity of Southern California, CA, US, Oct. 2023).
- [8] *The plume zoo of thermal LLSVPs* AGU Fall Meeting 2022 (Chicago, IL, US, Dec. 2022), V26A–02.
- [7] Coupled Evolution of Earth's Hydrogen Distribution and Thermal History AGU Fall Meeting 2022 (Chicago, IL, US, Dec. 2022), MR33A–06.
- [6] *Invited:* Hotspots from Top to Bottom Seismo Lab Seminar (California Institue of Technology, CA, US, Nov. 2022).
- [5] *Invited:* Are hotspots hotter than ridges? IGCP 648 Virtual Seminar Series (Curtin University, Australia, Nov. 2022), Series 5, Seminar 5. https://www.youtube.com/watch?v=30B21c7NGIY.
- [4] Experimental Investigation of Purely Thermal LLSVPs UCLA EPSS Seismology and Tectonics Seminar (UCLA, CA, US, May 2022).
- [3] Accurate Prediction of Ocean Basins Using Upper Mantle Potential Temperatures AGU Fall Meeting 2021 (New Orleans, LA, US, Dec. 2021), DI34A–05.
- [2] Accurate Prediction of Ocean Basins Using Upper Mantle Potential Temperatures UCLA EPSS Geology/Geophysics Seminar (UCLA, CA, US, Oct. 2021).
- [1] Correlation of geochemical signals with MORB and OIB temperatures UCLA EPSS Geocheminar (UCLA, CA, US, Oct. 2019).

POSTER

- PRESENTATIONS [12] **Bao, X.,** Coulson, S., Valencic, N., Mitrovica, J., Dangendorf, S., Mousavi, M. & Lloyd, A. *Inverting Sea Level Fingerprints for Ice Mass Changes Using Neural Operators: How Much Can We Recover and How Unique Is It?* in. 2025 Gordon Research Seminar: Interior of the Earth (Mount Holyoke College, MA, US, June 2025).
 - [11] Bao, X. & Lithgow-Bertelloni, C. R. in. AGU Fall Meeting 2024 (Washington DC, US, Dec. 2024).
 - [10] **Bao, X.** & Lithgow-Bertelloni, C. R. in. 2024 Ada Lovelace Workshop on Modelling Mantle and Lithosphere Dynamics (University of California, Berkeley, CA, US, Sept. 2024).
 - [9] **Bao, X.** in. AGU Fall Meeting 2023 (San Francisco, CA, US, Dec. 2023).
 - [8] **Bao, X.** & Lithgow-Bertelloni, C. R. in. 2023 Gordon Research Seminar: Interior of the Earth (Mount Holyoke College, MA, US, June 2023).
 - [7] **Bao, X.** & Lithgow-Bertelloni, C. R. in. Seismo Lab Centenial (California Institue of Technology, US, Nov. 2022).
 - [6] **Bao, X.** & Lithgow-Bertelloni, C. R. in. 2022 Ada Lovelace Workshop on Numerical Modelling of Mantle and Lithosphere Dynamics (Hévíz, Hungary, Aug. 2022).
 - [5] **Bao, X.** & Lithgow-Bertelloni, C. R. in. CIDER2022 (University of California, Berkeley, CA, US, July 2022).
 - [4] **Bao, X.,** Lithgow-Bertelloni, C. R. & Jackson, M. G. in. AGU Fall Meeting 2020 (San Francisco, CA, US, Dec. 2020), DI007–0006.

- [3] Wang, Y., Liu, L. & Bao, X. in. AGU Fall Meeting 2020 (San Francisco, CA, US, Dec. 2020), DI005-0005.
- [2] Bao, X., Lithgow-Bertelloni, C. R. & Jackson, M. G. in. AGU Fall Meeting 2019 (San Francisco, CA, US, Dec. 2019), DI41D-0028.
- [1] Bao, X. & Lithgow-Bertelloni, C. R. in. 2019 Gordon Research Seminar: Interior of the Earth (Mount Holyoke College, MA, US, June 2019).

PROFESSIONAL SERVICE

- Guest Editor, PNAS Nexus, 2025 Call for Papers in Machine Learning and Geosciences
- Primary Session Convener and Chair, Advances in Machine Learning for Solid Earth Geoscience, AGU Fall Meeting 2025
- Primary Session Convener and Chair, Advances in Deep Earth–Surface Interactions, AGU Fall Meeting 2024
- Discussion Leader, The Structure and Composition of the Lower Mantle, Gordon Research Seminar
- Primary Session Convener and Chair, Advances in Mantle Convection and Planetary Evolution, AGU Fall Meeting 2022
- Reviewer, Nature Geoscience; Journal of Geophysical Research: Solid Earth; Geophysical Journal International; Planetary Science Journal; Physics of Fluids; Earth and Planetary Physics; Frontiers in Earth Science
- Reviewer, National Science Foundation, Geophysics Program

OTHER SERVICE • Committee Member of UCLA EPSS Family Mentorship Program (EFMP)

OUTREACH

- Rheology, Plate Tectonics with Food Saturday Science Academy, UCLA/Charles R. Drew University Mar 2023
- Why Hawaii is a volcano? How do Alaskan volcanos differ? EYU, UCLA Nov 2022
- Media Interview about our cold hotspots, e.g. ScienceNews, New Scientist^{1,2} Popular Science, and **Deutschlandfunk** Jan 2022
- Invited Outreach Article Rocks beneath volcanic hotspots can be surprisingly cool Jan 2022
- The sweet smell of Earth's mantle: Why is Hawaii a volcano? EYU, UCLA Nov 2020, 2021
- Lab visit from Tokyo Tech. UCLA

Feb 2020

• Why is Hawaii a volcano? Explore Your Universe, UCLA

Nov 2019

TEACHING **EXPERIENCE**

• Blue Planet: Introduction to Oceanography, Teaching Assistant, UCLA

Spring 2020

• Earthquakes, Teaching Assistant, UCLA

Spring 2019, Fall 2021

MENTORING **EXPERIENCE**

- Jade Wight, undergrad, Modeling Mantle Plumes and Their Effect on Dynamic Topography, won 2020 Deane Oberste-Lehn Scholarship, UCLA Oct 2019 - Jun 2021
- Wan Ki (Arthur) Lo, undergrad, Dynamics of Adjacent Mantle Plumes through Physical and Computer Simulations, won 2021 Harold and Mayla Sullwold Scholarship, UCLA Jan 2020 - Jun 2022
- Kavya Agarwal, undergrad, Compositional and thermodynamical effect on mantle plumes; Critical plume merge distance with shadowgraph, IIT Sep 2021 - Aug 2022

REFEREES

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 20 Oxford St, Cambridge MA 02138
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