

# Xiyuan Bao

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Department of Earth and Planetary Sciences, Harvard University

EDUCATION	<b>Ph.D. in Geophysics</b> , University of California, Los Angeles	2018-Mar 2024
	<b>M.S. in Geophysics</b> , University of California, Los Angeles	2018-2020
	<b>B.S. of Geophysics with Honors</b> , University of Science and Technology of China	2014-2018
	<b>Minor in Computer Science</b> , University of Science and Technology of China	2014-2018

EXPERIENCE	<b>Reginald A. Daly Postdoctoral fellow</b> , Harvard University	Oct 2024-
	<b>Postdoctoral Scholar</b> , University of California, Los Angeles	Mar 2024-Sep 2024
	<b>Graduate Research Assistant</b> , University of California, Los Angeles	Sep 2018-Mar 2024
	<i>Hotspots from Top to Bottom</i> (Advisor: Carolina Lithgow-Bertelloni)	
	<b>Undergraduate Research Assistant</b> , University of Science and Technology of China	Sep-May 2018
	<i>Benchmark on CitcomToEllipsis: Spontaneous subduction towards free surface</i> (Advisor: Wei Leng)	
	<b>Visiting Undergraduate</b> , University of Illinois, Urbana-Champaign	Jun-Aug 2017
	<i>Constraining the Nature of the LLSVPs Using Geoid and Dynamic Topography</i> (Advisor: Lijun Liu)	

HONORS & AWARDS	• Reginald A. Daly Postdoctoral Research Fellowship, Harvard University	2024
	• 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
	• Silver Scholarship for Outstanding Students, USTC	2016
	• First Prize of Physics Innovation Research Experiment Thesis Competition, USTC	2016

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

- [4] 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*.
- [3] 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.
- [2] **Bao, X.**, Wamba, M. D. & Stracke, A. *A deep-mantle geochemical zoning map beneath East Africa and Indian Ocean*. Under review in *Science*.
- [1] **Bao, X.** & Lithgow-Bertelloni, C. R. *End-to-End workflow for 4-dimensional flow measurements and analysis in viscous Rayleigh-Bénard Convection* submitted.

MANUSCRIPTS  
IN PREP

- [5] 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*
- [4] **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?*
- [3] **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*.
- [2] 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*
- [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*

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 experimental-adjoint 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 (University 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 Institute 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 Centennial (California Institute 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	<ul style="list-style-type: none"> <li>• <b>Guest Editor</b>, <i>PNAS Nexus</i>, 2025 Call for Papers in <i>Machine Learning and Geosciences</i></li> <li>• <b>Primary Session Convener and Chair</b>, <i>Advances in Machine Learning for Solid Earth Geoscience</i>, AGU Fall Meeting 2025</li> <li>• <b>Primary Session Convener and Chair</b>, <i>Advances in Deep Earth–Surface Interactions</i>, AGU Fall Meeting 2024</li> <li>• <b>Discussion Leader</b>, <i>The Structure and Composition of the Lower Mantle</i>, Gordon Research Seminar 2023</li> <li>• <b>Primary Session Convener and Chair</b>, <i>Advances in Mantle Convection and Planetary Evolution</i>, AGU Fall Meeting 2022</li> <li>• <b>Reviewer</b>, <i>Nature Geoscience</i>; <i>Journal of Geophysical Research: Solid Earth</i>; <i>Geophysical Journal International</i>; <i>Planetary Science Journal</i>; <i>Physics of Fluids</i>; <i>Earth and Planetary Physics</i>; <i>Frontiers in Earth Science</i></li> <li>• <b>Reviewer</b>, National Science Foundation, Geophysics Program</li> </ul>
OTHER SERVICE	<ul style="list-style-type: none"> <li>• Committee Member of UCLA EPSS Family Mentorship Program (EFMP)</li> </ul>
OUTREACH	<ul style="list-style-type: none"> <li>• <i>Rheology, Plate Tectonics with Food</i> Saturday Science Academy, UCLA/Charles R. Drew University Mar 2023</li> <li>• <i>Why Hawaii is a volcano? How do Alaskan volcanos differ?</i> EYU, UCLA Nov 2022</li> <li>• <b>Media Interview</b> about our <i>cold hotspots</i>, e.g. <i>ScienceNews</i>, <i>New Scientist</i><sup>1,2</sup> <i>Popular Science</i>, and <i>Deutschlandfunk</i> Jan 2022</li> <li>• <b>Invited Outreach Article</b> <i>Rocks beneath volcanic hotspots can be surprisingly cool</i> Jan 2022</li> <li>• <i>The sweet smell of Earth's mantle: Why is Hawaii a volcano?</i> EYU, UCLA Nov 2020, 2021</li> <li>• Lab visit from Tokyo Tech. UCLA Feb 2020</li> <li>• <i>Why is Hawaii a volcano?</i> Explore Your Universe, UCLA Nov 2019</li> </ul>
TEACHING EXPERIENCE	<ul style="list-style-type: none"> <li>• <i>Blue Planet: Introduction to Oceanography</i>, Teaching Assistant, UCLA Spring 2020</li> <li>• <i>Earthquakes</i>, Teaching Assistant, UCLA Spring 2019, Fall 2021</li> </ul>
MENTORING EXPERIENCE	<ul style="list-style-type: none"> <li>• Jade Wight, undergrad, <i>Modeling Mantle Plumes and Their Effect on Dynamic Topography</i>, won 2020 Deane Oberste-Lehn Scholarship, UCLA Oct 2019 - Jun 2021</li> <li>• Wan Ki (Arthur) Lo, undergrad, <i>Dynamics of Adjacent Mantle Plumes through Physical and Computer Simulations</i>, won 2021 Harold and Mayla Sullwold Scholarship, UCLA Jan 2020 - Jun 2022</li> <li>• Kavya Agarwal, undergrad, <i>Compositional and thermodynamical effect on mantle plumes; Critical plume merge distance with shadowgraph</i>, IIT Sep 2021 - Aug 2022</li> </ul>
REFEREES	<ul style="list-style-type: none"> <li>• Carolina Lithgow-Bertelloni (clb@epss.ucla.edu) Office Phone: 310-267-4719 Department of Earth, Planetary, and Space Sciences, University of California, Los Angeles 595 Charles E Young Dr E, Geology 1810, Los Angeles, CA 90095</li> </ul>

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