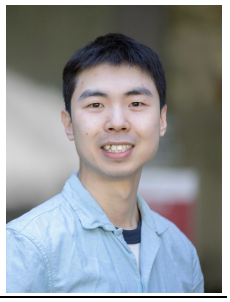
Hairuo Fu



LunaSCOPE Postdoctoral Fellow
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Education

2018-2024	Ph.D., Isotope Geochemistry, Harvard University (advisor: Stein B. Jacobsen)
2018	Visiting student at NERC Isotope Geosciences Laboratories, British Geological Survey, UK (mentor: Daniel J. Condon)
2016-18	Graduate research, Geology, China University of Geosciences, Beijing (CUGB) (advisor: Shihong Zhang)
2016	BSc Honors, Geology, China University of Geosciences, Beijing (CUGB)

Appointments

2024-Present	LunaSCOPE Postdoctoral Fellow, Brown University (mentors: James Dottin & Alex Evans)

Manuscripts in-revision & under-review

1. **Fu, H.**, Dottin III, J.W., Sulfur geochemical evidence for a high-energy impact lunar origin (*in revision*) (https://www.researchsquare.com/article/rs-6762675/v1).
2. Patil, K., Dottin III J. W., **Fu, H.**, Monteleon, B., Chatterjee, N., Hooper, N., Izon, G., Adams J. C., Irving, A., Shearer, C. K. Franz, H. B., S Ono, S., Isotopic evidence for ancient exotic sulfur delivery to the Martian mantle (*in revision*).
3. **Fu, H.**, Jacobsen, S. B., Larsen, B. T. The ^{40}K-^{40}Ca chronometer as a tracer of magma sources and crustal contamination (*under review*).

Publications

1. **Fu, H.**, Jacobsen S. B., 2025, Lunar refractory element evidence challenges the canonical giant-impact hypothesis. *Earth and Planetary Science Letters* 672, 119697. (https://doi.org/10.1016/j.epsl.2025.119697)
2. Dottin III, J.W., Simon S. B., Shearer C. K., Benson J., **Fu, H.**, Boesenberg J. S., Monteleone B., and the ANGSA Science Team, 2025, Endogenous, yet exotic, sulfur in the lunar mantle. *Journal of Geophysical Research: Planets* 130, e2024JE008834 (https://doi.org/10.1029/2024JE008834)
3. **Fu, H.**, Jacobsen S. B., 2024, Earth-Moon refractory element similarity constrains a thoroughly-mixed Moon-forming disk. *Earth and Planetary Science Letters* 646, 119008. (https://doi.org/10.1016/j.epsl.2024.119008)
4. Loeb, A., Jacobsen, S. B., Tagle, R., Adamson, T., Bergstrom S., Cloete, R., Cohen, S., Conrad, K., Domine, L., **Fu, H.** et al., 2024, Discovery of Spherules of Likely Extrasolar Composition in the Pacific Ocean Site of the CNEOS 2014-01-08 (IM1) Bolide. *Chemical Geology* (https://doi.org/10.1016/j.chemgeo.2024.122415)
5. **Fu, H.**, Jacobsen, S. B., Sedaghatpour, F., 2023, Moon's high-energy giant-impact origin and differentiation

timeline inferred from Ca and Mg stable isotopes. *Communications Earth & Environment.* 4, 307 (https://doi.org/10.1038/s43247-023-00974-4)

6. **Fu, H.**, Zhang S., Condon, D. J., Xian H., 2022, Secular change of true polar wander over the past billion years. *Science Advances* 8, eabo2753. (science.org/doi/10.1126/sciadv.abo2753)
7. **Fu, H.**, Jacobsen, S. B., Larsen, B. T., Eriksen, Z. T., 2022, Ca-isotopes as a robust tracer of magmatic differentiation. *Earth and Planetary Science Letters* 594, 117743. (doi.org/10.1016/j.epsl.2022.117743)
8. Park, Y., Swanson-Hysell, N. L., Xian, H., Zhang, S., Condon, D. J., **Fu, H.**, Macdonald, F. A., 2022, A consistently high-latitude South China from 820 to 780 Ma: Implications for exclusion from Rodinia and the feasibility of large-scale true polar wander. *Journal of Geophysical Research: Solid Earth*, 126, e2020JB021541. (doi.org/10.1029/2020JB021541)
9. Ren, Q., Zhang, S., Wu, Y., Yang, T., Gao, Y., Turbold, S., Zhao, H., Wu, H., Li H., **Fu, H.**, Xu, B., Zhang, J., Tomurtogoo, O., 2018, New late Jurassic to early Cretaceous paleomagnetic results from North China and southern Mongolia and their implications for the evolution of the Mongol-Okhotsk suture. *Journal of Geophysical Research: Solid Earth*, 123. (https://doi.org/10.1029/2018JB016703)

Conference abstracts

1. **Fu, H.**, Parmentier, E. M., Huber, C., Melt Retention and Migration in Lunar Cumulates Reconcile KREEP Composition and Crustal Chemical Heterogeneity. Abstract for AGU 2025 fall meeting (https://agu.confex.com/agu/agu25/meetingapp.cgi/Paper/1874052)
2. **Fu, H.**, Boukaré, C.-E., Nakajima, M., Advancing Giant-Impact Hypothesis Testing: Integrating Impact Simulations with Pre-Impact Body Differentiation. Abstract for AGU 2025 fall meeting (https://agu.confex.com/agu/agu25/meetingapp.cgi/Paper/1936393)
3. **Fu, H.**, Dottin III, J.W., 2025, Geochemical constraints on the origin of the Moon: Insights from sulfur concentration and isotope coevolution models. NASA Exploration Science Forum
4. **Fu, H.**, Dottin III, J.W., 2025, Post-Giant-Impact Lunar Sulfur and Sulfur Isotope Coevolution: Insights into the Moon's Origin. Lunar and Planetary Science Conference (LPI Contrib. No. 1616). (https://www.hou.usra.edu/meetings/lpsc2025/pdf/1616.pdf)
5. **Fu, H.**, Jacobsen, S. B., Larsen, B. T., 2024, The ^{40}K-^{40}Ca chronometer as a tracer of magma sources and crustal contamination. Goldschmidt 2024 (https://conf.goldschmidt.info/goldschmidt/2024/meetingapp.cgi/Paper/24343)
6. **Fu, H.**, Jacobsen, S. B., 2024, Moon's Predicted Chemical Composition under Canonical Giant-impact Models and Its Compatibility with Lunar Observations. 55th Lunar and Planetary Science Conference (LPI Contrib. No. 2054). (http://www.hou.usra.edu/meetings/lpsc2024/pdf/2054.pdf)
7. Loeb, A., Jacobsen, S. B., Adamson, T., Bergstrom, S., Cloete, R., Cohen, S., Conrad, K., Domine L., **Fu, H.**, et al., 2024, Spherules Recovered from the Pacific Ocean Site of the CNEOS 2014-01-08 (IM1) Bolide. 55th Lunar and Planetary Science Conference (LPI Contrib. No. 2130). (https://www.hou.usra.edu/meetings/lpsc2024/pdf/2130.pdf)
8. Fu, R.R., Thaler, P., Maxemin, G., Steele S.C., **Fu, H.**, Heck, P.R., 2024, A Strongly Magnetic Sub-Region of the Solar Nebula Defined by the CM, CO, and CV Chondrites. 55th Lunar and Planetary Science Conference (LPI Contrib. No. 1511) (https://www.hou.usra.edu/meetings/lpsc2024/pdf/1511.pdf)
9. Jacobsen, S. B., Parendo, C. A., Eriksen, Z. T., **Fu, H.**, Gérard, Y., 2023, The Nu Sapphire SP001 collision cell MC-ICP mass spectrometer: Application to high-precision measurements of K and Ca isotopes. Goldschmidt 2023 (conf.goldschmidt.info/goldschmidt/2023/meetingapp.cgi/Paper/20550)

10. Fu, R. R., Thaler P, Maxemin G., Steele S., **Fu, H.**, Solar nebula magnetic fields recorded in chondrules from the Murchison CM chondrite. Abstract for AGU 2023 fall meeting (https://agu.confex.com/agu/fm23/meetingapp.cgi/Paper/1392285)
11. **Fu, H.**, Jacobsen, S. B., Sedaghatpour, F., 2023, Timeline of lunar differentiation recorded in Ca and Mg stable isotopes. 54th Lunar and Planetary Science Conference (LPI Contrib. No. 2806). (http://www.hou.usra.edu/meetings/lpsc2023/pdf/2400.pdf)
12. **Fu, H.**, Jacobsen, S. B., 2023, Testing the Earth-Moon Synestia with trace elements. 54th Lunar and Planetary Science Conference (LPI Contrib. No. 2806). (https://www.hou.usra.edu/meetings/lpsc2023/pdf/2683.pdf)
13. Zhao, H., Zhang, S., **Fu, H.**, Yang, K., Li, H., Wu, H. and Yang, T., 2023, Characterizing the geomagnetic paleosecular variation at high latitudes in late Mesoproterozoic: new evidence from carbonate successions of the Jingeryu Formation in the North China craton. Abstract for AGU 2022 fall meeting (https://agu.confex.com/agu/fm22/meetingapp.cgi/Paper/1084265)
14. Chang, L., Zhang, S., Xian, H., **Fu, H.**, and Li, H., 2021, Paleomagnetic insights into the Neoproterozoic connection between South China and India, and their position in Rodinia. Abstract for AGU 2021 fall meeting (https://agu.confex.com/agu/fm21/meetingapp.cgi/Paper/994801)
15. **Fu, H.**, Jacobsen, S. B., Larsen, B. T., Eriksen, Z. T., 2022, Ca-isotopes as a robust tracer of magmatic differentiation. Goldschmidt 2022 (https://conf.goldschmidt.info/goldschmidt/2022/meetingapp.cgi/Paper/12513)
16. Ren, Q., Zhang, S., Zhao, H., Ding, J., Turbold, S., Gao, Y., Xu, B., Wu, Y., **Fu, H.**, 2017, New late Jurassic to early Cretaceous paleomagnetic results from North China and southern Mongolia and their implications for the evolution of the Mongol-Okhotsk suture. Abstract for AGU 2017 fall meeting (https://agu.confex.com/agu/fm17/meetingapp.cgi/Paper/220039)
17. Xian, H., Zhang, S., Xiao, Q., Li, H., Chang, L., **Fu, H.**, Liu, R., 2017, Tonian paleomagnetism of the red beds of Madiyi Formation, lower Banxi Group in South China: implications for pre-Sturtian climate, Rodinia reconstruction and true polar wander. Abstract for AGU 2017 fall meeting.

Fellowships & Awards

- Research fund awarded by LunaSCOPE (5,000$ annually, 2024-Present)
- LunaSCOPE Postdoctoral Fellowship, Brown University (2024-Present)
- Fellow of Origins of Life Initiative (2020-2024)
- Department Fellowship, Harvard University (2018)
- CUGB Innovation Fund for overseas research (15,000$, 2017-2018)
- CUGB Professional Scholarship (2012–2016)
- Fellow of the 1st Innovation Class of CUGB (2013-2016)
- CUGB LongRun Scholarship (2013)

Teaching

- ESE6–Introduction to Environmental Science and Engineering, Harvard University (TF, undergrad level, Profs. Steven Wofsy and Elsie Sunderland, 2020 Spring)
- GENED 1018: How to Build a Habitable Planet, Harvard University (TF, general education for undergrad, Prof. Charles Langmuir, 2020 Fall)
- EPS240–Isotope and Trace Element Geochemistry and Geochronology, Harvard University (TF, grad level, Prof. Stein Jacobsen, 2022 Spring)
- EPS141–Geochemical and Cosmochemical Thermodynamics, Harvard University (TF, grad level, Prof.

Stein Jacobsen, 2023 Spring)
- EPS110–Introduction to Planetary Materials and Earth Resources (TF, undergrad level, Prof. Stein Jacobsen, 2023 Fall)

Talks

- Melt migration in early lunar mantle and its influences on lunar chemical differentiation (Geochemistry, Magma, and Petrology research seminar, Brown University, Oct. 31, 2025)
- Paleomagnetic perspectives on the coupling of true polar wander and mantle thermal evolution (Geophysics research seminar, Brown University, Sep. 30, 2025)
- Sulfur geochemical evidence for a high-energy impact lunar origin (LunaSCOPE Annual Meeting, Brown University, Aug. 6, 2025)
- From magma chambers to magma oceans: novel geochemical insights into planetary differentiation and Earth-Moon formation (invited research seminar talk, The University of Hong Kong, Apr. 7, 2025)
- "Non-traditional" stable isotopes and their applications in high-temperature geochemistry (invited guest lecture at Environmental Stable Isotopes, Brown University, Apr. 1, 2025)
- Lunar origin and chronology inferred from Ca, Mg, and S isotopes (Geochemistry, Magma & Petrology research seminar, Brown University, Mar. 8, 2025)
- Moon's predicted chemical composition under canonical giant-impact models and its compatibility with lunar observations (Brown Postdoctoral Research Symposium, Mar. 27, 2025)
- A new approach to determine lunar refractory element compositions: implications for Moon formation (Geochemistry, Magma & Petrology research seminar, Brown University, Nov. 15, 2024)
- Geochemical evidence for the giant-impact formation of the Earth-Moon system (invited guest lecture at Evolution of the Moon seminar, Brown University, Sep. 11, 2024)
- Testing Moon-forming giant-impact models with lunar chemical and isotopic compositions (invited, LunaSCOPE Annual Meeting, Brown University, Aug. 6, 2024)
- Making the Earth-Moon system with a canonical or high-energy giant impact? A geochemical perspective (Graduate Student and PostDoc seminar, Harvard University, Oct. 31, 2023)
- Planetary reorientation (true polar wander) and new interpretations of its evolution on Earth (Graduate Student and PostDoc seminar, Harvard University, Nov. 1, 2022)
- Probing Solar nebula magnetic fields: paleomagnetic studies on the Murchison meteorite (First-year symposium, Harvard University, Sep. 3, 2019)

Academic and professional service

- *Peer reviewer for*:
  - Geochimica et Cosmochimica Acta
  - Geophysical Research Letters
  - Earth and Planetary Science Letters
  - Chemical Geology
  - Journal of Geophysical Research: Solid Earth
  - Geochemistry, Geophysics, Geosystems
  - Lithos
  - Space: Science & Technology
  - SCIENCE CHINA Earth Sciences
- AGU 2025 session convener (Planetary Impacts as a Fundamental Geophysical Process: Multidisciplinary Perspectives)

- AGU 2025 session chair (Planetary Impacts as a Fundamental Geophysical Process: Multidisciplinary Perspectives)
- AGU 2025 session chair (To the Moon: A New Era of Lunar Science III: Geology and Geophysics V Oral)
- External reviewer for the NASA Emerging Worlds proposal
- Panelist on *How to Land a Postdoc in STEM* (Harvard University, Sep. 18, 2024)

Outreach

- International Observe the Moon Night: Museum of Natural History and Planetarium x LunaSCOPE (scientist participant, Roger Williams Park, Providence, Oct. 4 to 5, 2025)
- International Observe the Moon Night: Museum of Natural History and Planetarium x LunaSCOPE (scientist participant, Roger Williams Park, Providence, Spt. 14, 2024)
- Introducing Earth and planetary sciences to high-school students in remote areas of China (online seminar series, Jun. 26, 2024)
- Did 'alien' debris hit Earth? Startling claim sparks row at scientific meeting (talk featured by *Nature Magazine*, Mar. 13, 2024)
- Planet+AI program (member of AI Experiences with Planetary Data Summer Course, 2024)
- Invited talk for high-school students: Lunar Narrative Through Apollo Petrographic Thin Sections (Planet+AI Webinar Series, Jan. 26, 2024)
- Judge of the 2024 National Collegiate Research Conference (Jan. 20–21, 2024)