

JIHUA HAO

jihuahao.com

Laboratoire de Géologie de Lyon, Université Claude Bernard Lyon1 & École normale supérieure de Lyon

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Education

- **Ph.D. in Geochemistry** May 2017
Johns Hopkins University, Baltimore, USA
Advisor: Prof. Dimitri A. Sverjensky
Dissertation: Geochemical signatures of weathering and surface water chemistry in the late Archean
- **M.A. in Geochemistry** Mar. 2014
Johns Hopkins University, Baltimore, USA
- **B.Eng. in Environmental Science** July 2012
University of Science and Technology of China, Hefei, China

Employment

- **Postdoctoral Fellow** Dec. 2016 – Present
Institut des Origines de Lyon, Université de Lyon, France
- **Research & Teaching Assistant** 2012 – 2016
Department of Earth and Planetary Sciences, Johns Hopkins University, USA
- **Research Assistant** 2009 – 2012
Department of Geochemistry and Environmental Sciences, USTC, China.

Research Interests

- Early Earth surface environments
- Origin of life on Earth and habitability of life in other planets
- High temperature and pressure aqueous geochemistry
- Interfacial geochemistry and mineral-water surface processes
- Thermodynamic theories with applications to geochemistry and environmental science
- Big data analysis of the co-evolution of the geo- and biospheres

Teaching Activities

- **Guest Lecturer**, Tsinghua University, China
Planets and Life (Prof. F. Tian), 1 lecture entitled “Evolution of the Earth: a brief introduction”, 2017 Fall.
- **Teaching Assistant**, Johns Hopkins University, USA
Introduction to Sustainability (Prof. C. Parker), 2015 Spring.
Guided Tour: The Planets, (Prof. B. Marsh; Prof. D. Strobel), 2014 Spring.
Conversations with the Earth, (Prof. B. Marsh; Prof. D. Strobel), 2013 Fall.
- **Mentor**
Elena Giovenco (2017; undergraduate intern in ENS-Lyon); Marwane Mokhtari (2018; undergraduate intern in ENS-Lyon); Valentine Magevand (2019; undergraduate intern in ENS-Lyon)

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Publications

- 2019, **Hao, J.**, Sverjensky, D.A., and Hazen, R.M. Redox states of Archean surficial environments: the importance of H_{2,g} instead of O_{2,g} for weathering reactions. *Chemical Geology* (**accepted**)
- 2019, **Hao, J.**, Mokhtari, M., Pedreira-Segade, U., Michot, L.M., and Daniel, I. Transition metals enhance the adsorption of nucleotides onto clay: implications for the origin of life. *ACS Earth and Space Chemistry*, 3(1), 109-119.
- 2018, Pedreira-Segade, U., **Hao, J.**, Razafitianamaharavo, A., Pelletier, M., Marry, V., Le Crom, S., Michot, L., Daniel, I. How do nucleotides adsorb onto clays? *Life*, 8(4), 59.
- 2018, **Hao, J.**, Giovenco, E., Pedreira-Segade, U., Montagnac, G., Daniel, I. Compatibility of amino acids in ice Ih: implications for the origin of life. *Astrobiology*, 18, 381-392. **Featured and cover article**
- 2018, Moore, E.K., **Hao, J.**, Prabhu, A., Zhong, H., Jelen, B.I., Meyer, M., Hazen, R.M., Falkowski, P.G. Geological and chemical factors that impacted the biological utilization of cobalt in the Archean era. *Journal of Geophysical Research: Biogeosciences*, 123, 743-759.
- 2017, **Hao, J.**, Sverjensky, D.A., and Hazen, R.M. Mobility of nutrients and trace elements during weathering on the Archean. *Earth and Planetary Science Letters*, 478, 148-159.
- 2017, Estrada, C.F., Mamajov, I., **Hao, J.**, Sverjensky, D.A., Cody, G.D., Hazen, R.M. Aspartate transformation at 200 °C with brucite [Mg(OH)₂], NH₃, and H₂: implications for prebiotic molecules in hydrothermal systems. *Chemical Geology*, 457, 162-172. **Invited research article**
- 2017, **Hao, J.**, Sverjensky, D.A. and Hazen, R.M. A model for late Archean chemical weathering and world average river water. *Earth and Planetary Science Letters*, 457, 191-203.

Manuscripts submitted

- Pedreira-Segade, U., **Hao, J.**, Montagnac, G., Cardon, H., Daniel, I. Spontaneous polymerization of glycine under hydrothermal conditions. (**under revision**)
- Moore*, E.K., **Hao***, J., Spielman, S.J., Yee, N. The Evolving Redox Chemistry and Bioavailability of Vanadium in Deep Time (*contribute equally) (**under review**)

Manuscripts in preparation

- **Hao, J.**, Rocher, P., Reynard-Feytis, Q., Cardon, H., Montagnac, G., Daniel, I. Compatibility of amino acids in ice VI and VII.
- **Hao, J.**, Huang, J., Cao, X., Huang, F., Sverjensky, D.A., and Hazen, R.M. Chromium redox equilibria in fluids and water-rock interactions during metamorphism.

Honors and Awards

- International Union of Crystallography Travel Award, International Union of Crystallography, USA, 2018
- Postdoctoral Fellowship, Institut des Origines de Lyon, Université de Lyon, France, 2016 - 2017
- Early Career Science Ambassador travel grant, European Association of Geochemistry, 2017
- Pre-doctoral Associate, Geophysical Laboratory, Carnegie Institution of Washington, USA, 2013 - 2016
- Elliott Field Fund for field research expenses, Johns Hopkins University, 2016
- US Student NASA Funding-Goldschmidt 2016, NASA, 2016

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- DCO travel grant, Deep Carbon Observatory, 2014
- Ph.D. Fellowship, Johns Hopkins University, USA, 2012
- Zhao JIUSZHANG Scholarship, Chinese Academy of Sciences, China, 2011
- National Scholarship, Ministry of Education, China, 2010

Invited Seminars and Colloquia

- 2018, Geochemistry of nutrients and transition metals on the early Earth: implications for the evolution of habitability, Sun Yat-Sen University, Shenzhen, China
- 2018, Geochemistry of trace elements: co-evolution of geosphere and biosphere, China University of Geosciences, Wuhan, China
- 2018, Mineral, water, and biomolecules: how to make life? University of Science and Technology of China, Hefei, China
- 2018, Effects of trace elements on the surface adsorption of nucleotides onto clay minerals, Université Claude Bernard Lyon1, Lyon, France.
- 2017, Geochemical environments of the Earth and other habitable planets: implications for the origin of life, Louisiana State University (Bao's group), Baton Rouge, USA.
- 2017, Geochemical environments of the early Earth: implications for the origin and evolution of life, Peking University, China.
- 2015, Earth prebiotic environment & the origin of life, Department of Geochemistry and Environmental Sciences, University of Science and Technology, Hefei, China, China.
- 2014, Basaltic and granitic weathering during the Archean: including thermodynamic properties of ferrous-clay minerals, Deep Carbon Observatory Forum, Geophysical Laboratory, Carnegie Institution of Washington, USA.

Conference Presentations (First Authors)

- 2018, Transition metals enhance the adsorption of nucleotides onto clays: implications for the origin of life, *Goldschmidt Conference*, Boston, USA.
- 2018, Late Archean weathering of phosphorus: implications for Earth's early P cycle, *4-D workshop*, Washington DC, USA.
- 2017, Compatibility of amino acids in ice Ih and high-pressure phases: implications for the origin of life, *AGU Fall Conference*, New Orleans, USA.
- 2017, Compatibility of amino acids in ice Ih: implications for the origin of life, *Goldschmidt Conference*, Paris, France.
- 2016, Importance of atmospheric H₂ in surficial environments of the Archean, *Second DCO Yellowstone Summer School*, USA.
- 2016, Weathering and late Archean riverine transport, *Australasian Astrobiology Meeting*, Perth, Australia.
- 2016, Weathering and late Archean world average river water, *Goldschmidt Conference*, Yokohama, Japan.
- 2015, Chromium redox equilibria in fluids and minerals under hydrothermal and subduction-zone conditions, *AGU Fall Conference*, San Francisco, USA.
- 2015, Equilibrium chromium isotopic fractionation as functions of redox and pH on the early Earth, *Goldschmidt Conference*, Prague, Czech Republic.
- 2014, Limits on the partial pressure of H₂ in the Archean atmosphere during weathering of basaltic minerals, *Goldschmidt Conference*, Sacramento, California, USA.

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Current and Recent Research Projects

- Role of Clay minerals and trace elements on the condensation and polymerization of DNA-RNA oligomers and their building blocks in primitive Earth. CNRS Défi Origines : AAP 2018, France, 2018-2019.
- Primitive Earth Biomolecules Interacting with Hydrothermal Oceanic Minerals, Agence Nationale de la Recherche, France, 2016-Present.
- The Co-Evolution of the Geo- and Biospheres: An Integrated Program for Data-Driven, Abductive Discovery in the Earth Sciences, Keck Foundation, USA, 2015-Present

Laboratory Skills

- **Analytical techniques:**
Ion Chromatography with Dionex ICS-5000 DP dual pump system; UV-spectroscopy; Raman Spectroscopy; Scanning Electron Microscope (SEM); X-ray Diffraction (XRD)
- **Interfacial geochemistry:**
Batch adsorption techniques under ambient *T-P*; high *T-P* adsorption facility
- **High *T-P* experiments on hydrothermal systems:**
PUK 3S Plus Professional Precision Welder; Gold tubes/gold bag hydrothermal techniques; Teflon autoclave reactors; Diamond anvil cell facilities

Modeling Skills

- **Aqueous speciation & water-rock interaction modeling under crustal and upper mantle conditions:**
SUPCRT92b, EQ3/6 codes, EQPT, Deep Earth Water Model
- **Surface chemistry modelling:** Geosurf.

Service

- Reviewer
Nature Communications, Geochimica et Cosmochimica Acta, Chemical Geology, Frontiers in Earth Sciences, European Journal of Mineralogy, Journal of Visualized Experiments, AIMS Geosciences
- Session convener
“B6: The roles of clay minerals in the origin of life”, 2019 International Conference on Clay Science and Technology, Paris, France.
“07h: Planetary habitability and the origin of life: from solar system to exoplanets”, 2019 Goldschmidt Conference, Barcelona, Spain.

Languages

- Mandarin Chinese (native), English (professional), French (beginner)

Outreach

- 2018, Diamond – a window to the interiors of the Earth and other planets, invited event speaker at Espace-Ulys, University of Lyon, Lyon, France.