

## Jie Deng

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### Education

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<b>Yale University</b> Ph.D. in Geophysics and Mineral Physics	New Haven, CT, USA 2014-2019
<b>China University of Geosciences</b> B.S. in Earth Science	Wuhan, China 2009-2013

### Research Appointment

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<b>Princeton University</b> Assistant Professor, Department of Geosciences	2022-Present
<b>University of California, Los Angeles</b> Postdoctoral Scholar (Supervisor: Lars Stixrude)	2019-2022
<b>Yale University</b> Research Assistant (Advisors: Kanani Lee, Bijaya Karki, Maureen Long)	2014-2019
<b>China University of Geosciences</b> Undergraduate Research Assistant (Advisor: Junfeng Zhang)	2011-2013

### Manuscripts in progress (\*Asterisk indicates my students and postdocs)

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*In review/revision*

[12] **Deng, J.**, Miyazaki, Y., Yuan, Q., Du, Z., Formation of deep mantle heterogeneities through basal exsolution contaminated magma ocean. *Under review at Nature Geoscience*, <https://doi.org/10.21203/rs.3.rs-3263305/v1>

[11] \*Peng, Yoshino, **Deng**. Grain boundary diffusion cannot explain the W isotope heterogeneities of the deep mantle, under review at *Nature communications*, <https://doi.org/10.21203/rs.3.rs-4517988/v1>.

[10] **Deng, J.** Large-scale atomistic simulations of magnesium oxide exsolution driven by machine learning potentials: Implications for the early geodynamo. *Under review at GRL*, [10.22541/essoar.171412549.91013860/v1](https://doi.org/10.22541/essoar.171412549.91013860/v1).

[9] \*Peng Y., Pierre H., Philippe C, **Deng, J.**, Grain boundary diffusion of ferropericlase: Implications for the core-mantle interaction, [10.22541/essoar.171415920.08966865/v1](https://doi.org/10.22541/essoar.171415920.08966865/v1).

[8] \*Luo, H., O'Rourke, J., **Deng, J.** Radiogenic heating sustains long-lived volcanism and magnetic dynamos in super-Earths. *Under review at Science Advances after revision*.

### Publications

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[7] Hu, Q., **Deng, J.**, Zhuang, Y., Yang, Z., Huang, R. Core-mantle boundary heterogeneities originating from the Hadean terrestrial magma ocean. *National Science Review*.

[6] \*Luo, H., Dorn, C., **Deng, J.** Majority of water hides deep in the interiors of exoplanets. *Accepted at Nature Astronomy*.

[5] \*Peng, Y., **Deng, J.**, Hydrogen diffusion in the lower mantle revealed by machine learning potentials. *JGR-solid earth*.

[4] \*Peng, Y., **Deng, J.**, Thermal conductivity of MgSiO<sub>3</sub>-H<sub>2</sub>O system determined by machine learning potentials. *Geophysical Research Letters*.

[3] San, X., Hu, J., Chen, M., Niu, H., Smeets, P., **Deng, J.**, Koo, K., Reis, R., Dravid, R., Hu X. 2023, Unlock the structural mystery of vaterite CaCO<sub>3</sub>. *Nature communications*.

[2] **Deng, J.**, Du, Z., 2023. Extracting primordial helium from the Earth's core through MgO exsolution. *Nature Geoscience*.

[1] **Deng, J.**, Niu, H., Hu, J., Chen, M., Stixrude, L., 2023. Melting of MgSiO<sub>3</sub> determined by machine learning potentials. *Physical Review B*. 107(6), Feb. 2023. (*Editor's highlight and APS Outreach-to-the-Press*)

## Prior to Princeton

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[16] Frost, D., Avery, M., Buffet, B., Chidester B., **Deng, J.**, Dorfman S., Li, Z., Liu, L., Lv, M., Martin, J., 2022. Multidisciplinary constraints on the thermal-chemical boundary between Earth's core and mantle. *Geochemistry, Geophysics, Geosystems*.

[15] **Deng, J.**, Stixrude, L., 2021. Thermal conductivity of silicate melts determined by machine learning potentials. 48, e2021GL093806. *Geophysical Research Letters*.

[14] **Deng, J.**, Stixrude, L., 2021. Deep fractionation of Hf in a solidifying magma ocean and its implications for the tungsten isotopic heterogeneities in the mantle. *Earth and Planetary Science Letters*, 562, 116873.

[13] Lutz, K., Long, M., Creasy, N., **Deng, J.**, 2020. Seismic anisotropy in the lowermost mantle beneath North America from SKS-SKKS splitting intensity discrepancies. *Physics of the Earth and Planetary Interiors*, 305, 16504.

[12] **Deng, J.**, Du, Z., Ghosh, D, Karki, B. & Lee, K.K.M., 2020. A magma ocean origin to divergent redox evolutions of rocky planetary bodies and early atmospheres. *Nature Communications*, 11(1), 2007.

[11] Du, Z., **Deng, J.**, Miyazaki, Y., Mao, H.K, Karki, B. & Lee, K.K.M., 2019. Fate of hydrous Fe-rich silicate melt in Earth's deep mantle. *Geophysical Research Letters*, 46, 1-9.

[10] **Deng, J.** & Lee, K.K.M., 2019. Melting depression due to electronic spin transition of iron. *American Mineralogist*, 104 (8): 1189-1196.

[9] Arveson, S.M., **Deng, J.**, Karki, B. & Lee, K.K.M., 2019. Evidence for Liquid Immiscibility in the Fe-Si-O System at Deep Earth. *Proceedings of the National Academy of Sciences of the United States of America*, 116, 10238-10243.

[8] **Deng, J.**, Karki, B., Ghosh, D, & Lee, K.K.M., 2019 First-principles simulations of FeO<sub>2</sub>H<sub>x</sub> solid and melt at high pressures and implications for ultra-low velocity zones. *Journal of Geophysical Research: Solid Earth*, 124.

[7] **Deng, J.**, Miyazaki, Y., Lee, K.K.M., 2019. Implications for the melting phase relations in the MgO-FeO system at core-mantle boundary conditions. *Journal of Geophysical Research: Solid Earth*, 124, 1294-1304.

[6] Arveson, S.M., Kiefer, B., **Deng, J.**, Liu, Z. & Lee, K.K.M., 2018. Thermally induced coloration of KBr at high pressures, *Phys Rev B*, 97, 094103.

[5] **Deng, J.** & Lee, K.K.M., 2017. Viscosity jump in the lower mantle inferred from melting curves of ferropicrinite, *Nature Communications*, 8, 1997.

[4] Du, Z., **Deng, J.** & Lee, K.K.M., 2017. Experimental Constraints on Ferropicrinite (Mg, Fe)O Melt Viscosity Up to 70 GPa, *Geophysical Research Letters*, 44, 12,190-112,196.

[3] Du, Z., Jackson, C., Bennett, N., Driscoll, P., **Deng, J.**, Lee, K.K.M., Greenberg, E., Prakapenka, V.B. & Fei, Y., 2017. Insufficient energy from MgO exsolution to power early geodynamo, *Geophysical Research Letters*, 11376-11381.

[2] **Deng, J.**, Long, M.D., Creasy, N., Wagner, L., Beck, S., Zandt, G., Tavera, H. & Minaya, E., 2017. Lowermost mantle anisotropy near the eastern edge of the Pacific LLSVP: constraints from SKS–SKKS splitting intensity measurements, *Geophys J Int*, 210, 774-786.

[1] **Deng, J.**, Du, Z., Benedetti, L.R. & Lee, K.K.M., 2017. The influence of wavelength-dependent absorption and temperature gradients on temperature determination in laser-heated diamond-anvil cells, *J Appl Phys*, 121, 025901.

### Grants

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PI, Water in the Earth's lower mantle, NSF Geophysics, 2023/07-2026/07, \$454,107.39

PI, Habitability of Super-Earths: Water and Magnetic Field, Dean for Research Innovation, 2023/07-2025/07, \$193,549.44

### Awards

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Philip M. Orville Prize, Yale Geology & Geophysics	2019
Graduate Research Award, American Geophysical Union	2018
Elias Loomis Prize, Yale Geology & Geophysics	2018
Hammer Prize, Yale Geology & Geophysics	2017

### Selected Talks

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**Deng, J.** Mantle heterogeneities originated from the Earth's core: A new models, U Maryland, 2024, invited.

**Deng, J.** Long-Term Core-Mantle Chemical Interactions: A New Model, Carnegie, 2024, invited.

**Deng, J.** Silicate melts in a deep magma ocean, Gordon Research Conference, 2023, invited.

**Deng, J.** Planetary interior at the atomic scale, PMI symposium, 2023, invited.

**Deng, J.** MgO exsolution from the core, China University of Geosciences, 2023, invited.

**Deng, J.** MgO exsolution: messenger from the core, CMAP weekly meeting, 2023, virtual, invited.

**Deng, J.** Water in the lower mantle, 2022. AGU Fall meeting, Chicago.

**Deng, J.** Water in the deep Earth interior, Stanford University, CA, 2022.

**Deng, J.** Water in the deep Earth interior, Goldschmidt Meeting, virtual, 33rd IUPAP Conference on Computational Physics, 2022, virtual, invited.

**Deng, J.** Thermal conductivity of MgSiO<sub>3</sub>-H<sub>2</sub>O system, Goldschmidt Meeting, 2022, virtual, invited.

**Deng, J.** The Evolution of Early Earth, Chinese University of Hong Kong, Hong Kong, 2021, virtual.

**Deng, J.** The Early Evolution of Habitable Worlds, Princeton University, NJ, 2021, virtual.

**Deng, J.**, Niu, H., Stixrude, L. Machine learning MgSiO<sub>3</sub> system at planetary settings, Lawrence Livermore National Laboratory, CA, 2020.

**Deng, J.**, Du, Z., Ghosh, D, Karki, B. & Lee, K.K.M. A magma ocean origin of the divergent redox evolutions of Earth, Mars, and Moon. Peking University, China, 2019.

**Deng, J.**, Karki, B., Ghosh, D. & Lee, K.K.M., First-principles simulations of pyrite-type FeO<sub>2</sub>H and its isochemical melts at high pressure, Goldschmidt Meeting, Boston, MA, 2018.

**Deng, J.**, Lee, K. K. M. Viscosity jump in the lower mantle inferred from melting curves of (Mg, Fe)O ferropicrclase. COMPRES Annual Meeting, Santa Ana Pueblo, NM, 2017.

**Deng, J.**, Lee, K. K. M. Absorption Spectra and their Applications in High Pressure Mineral Physics, Brookhaven National Laboratory, NY, 2016.

### Teaching Experience

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GEO421: A Practical Guide to Atomistic Modeling

GEO320: Introduction to Earth and Planetary Physics  
GEO505: Fundamentals of the Geosciences

### **Mentoring**

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#### **As Ph.D supervisor**

Yihang Peng (2022-)  
Jina Lee (2022-)  
Donghao Zheng (2023-)

#### **As undergraduate research supervisor**

Ethan Sontarp (2023)

#### **As postdoctoral supervisor**

Haiyang Luo (2023-)  
Akash Gupta (2023, summer-)

### **Scientific and University Services**

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Nov/2022- Present Outreach representative, Department of Geosciences, Princeton University  
2022- Present Graduate Work Committee member, Department of Geosciences, Princeton University  
2023 Gordon Research Seminar: Interior of the Earth, Mount Holyoke College, co-Chair  
2022, 2023,2024 AGU Fall Meeting, “Computational Simulation and Data Analytics in Planetary Materials Research”, Co-convener  
2020-Present Review Editor, Frontiers in Earth Science, Solid Earth Geophysics  
2019 AGU Fall Meeting, “Heterogeneity in the Earth: Multidisciplinary Perspectives from Imaging, Modeling, Geochemistry, and Experiments”, Co-convener  
2019 Gordon Research Seminar: Interior of the Earth, Mount Holyoke College, June 2019, Discussion Leader