Hee Choi

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Research Interests

Early Earth subduction ● Plate tectonics onset ● Subduction zone dynamics ● Mantle convection modeling ● Planetary evolution ● ML/AI application to geodynamic models ● Physics-informed ML ● Grain-damage rheology ● HPC geodynamics

Education

Ph.D. in Geosciences *Aug 2019 – Aug 2025*
Pennsylvania State University, University Park, PA

- ○ **Dissertation Title:** The Origin and Evolution of Subduction in Early Earth: Insights from Geodynamic Models and Machine Learning-Based Detection
- ○ **Advisor:** Bradford Foley

M.S. in Geophysics *Aug 2017 – Aug 2019*
University of Memphis, Memphis, TN

- ○ **Thesis Title:** New Numerical Mid-ocean Ridge Models for Interactions Between Plate-driving and Resistant Force
- ○ **Advisor:** Eunseo Choi

B.S. in Geophysics *Mar 2013 – Feb 2017*
Kangwon National University, Chuncheon, South Korea

Appointments

Postdoctoral Fellow *Atlanta, GA*
School of Earth and Atmospheric Sciences, Georgia Institute of Technology *June 2025 – Present*

- ○ Integrated fluid–solid compaction modeling with geodynamic simulations to study fluid migration in subduction zones in early Earth
- ○ Developed reproducible TerraFERMA/FEniCS workflows (CMake/MPI/PETSc) with Podman containers
- ○ Mentored junior researchers, accelerating their first-author progress and lab productivity

Peer-Reviewed Publications

3. **Choi, H.** & Foley, B. J. (Accepted) Establishment of subduction at early Earth continent margins by migration: Implications for interpreting geochemical observations. *Earth and Planetary Science Letters*

2. **Choi, H.** & Foley, B. J. (2026). Deep learning-based tracking of subduction zones in mantle convection models. *Journal of Geophysical Research: Solid Earth*, 131, e2025JB032355. 10.1029/2025JB032355 ↗

1. **Choi, H.** & Foley, B. J. (2024). A limited effect of continents on subduction initiation for convection with grain-damage. *Journal of Geophysical Research: Solid Earth*, 129, e2024JB029136. 10.1029/2024JB029136 ↗

Invited Talks

- *Why is Earth so special? Inside our planet* at Sagamore Hills Elementary School, Dekalb County School District, Atlanta, GA, Mar. 9, 2026
- *The Origin and Evolution of Subduction in Early Earth: Insights from Geodynamic Models and Machine Learning-Based Detection* at Solid Earth Seminar, Georgia Institute of Technology, Atlanta, GA, Aug. 29, 2025

Presentations

- *Fluid migration in Archean subduction zones: Implications for TTG genesis* by **H. Choi.**, S. Sim., and C. Wilson., AGU25, Dec. 15-19, 2025, New Orleans, LA
- *Deep learning-based tracking of subduction zones in mantle convection models* by **H. Choi.** and B. Foley., AGU24, Dec. 9-13, 2024, Washington, D.C.
- *The role of continents in determining subduction zone locations on the early Earth: Insights from numerical models* by **H. Choi.** and B. Foley., AGU Fall Meeting 2023, Dec. 11-15, 2023, San Francisco, CA
- *Dynamics of Subduction Initiation: Where Subduction Initiates with Respect to Continents* by **H. Choi.** and B. Foley., AGU Fall Meeting 2022, Dec. 12-16, 2022, Chicago, IL
- *Dynamics of subduction initiation with respect to continents* by **H. Choi.** and B. Foley., 2022 Ada Lovelace Workshop, Aug. 28 - Sep. 2, 2022, Hévíz, Hungary
- *A limited effect of continents on subduction initiation and lithospheric stress* by **H. Choi.** and B. Foley., AGU Fall Meeting 2020 , Dec. 13-17, 2021, New Orleans, LA
- *The role of continental lithosphere in subduction initiation* by **H. Choi.** and B. Foley., AGU Fall Meeting 2020 DI020-0010, Dec. 1-17, 2020, San Francisco, CA
- *New numerical mid-ocean ridge models for interactions between plate-driving and resistant forces* by **H. Choi.** and E. Choi., AGU Fall Meeting 2019 T13I-0281, Dec. 9-13, 2019, San Francisco, CA
- *Modeling interactions between plate-boundary forces and evolving resistance at mid-ocean ridges as the origin of non-uniform seafloor growth* by **H. Choi.**, E. Choi., and R. Reece., AGU Fall Meeting 2018 T33G-3847, Dec. 10-14, 2018, Washington, D.C.

Professional Services

Reviewer
Earth and Planetary Science Letters (EPSL)

Session Chair

- *Outer Space Rocks! Enhancing the Understanding of our Planetary Neighbors*, GSA 2025 Joint Northeastern/North-Central Section Meeting, Mar 27–30, 2025

Teaching Experience

Instructor
Summer course: Numerical Modeling and Data Visualization
Pennsylvania State University

SU2023, SU2024

- Taught a short summer course covering Python fundamentals, NumPy arrays, and Matplotlib plotting for geoscience applications.
- Guided students to complete a mini-project solving an easy geoscience problem in a reproducible notebook.

Graduate Teaching Assistant

Physical Process of Geology   *Fa2022, SP2023,*
Pennsylvania State University   *FA2024*

- ○ Led weekly labs applying physics/math to geologic problems; coached students through MATLAB workflows and quantitative reasoning.
- ○ Ran field labs (gravity survey); supervised data collection, instrument setup, and field safety.
- ○ Coordinated with the instructor to align labs with lectures; updated materials based on student performance and end-of-term feedback.

Graduate Teaching Assistant

The Earth System and Global Change   *SP2024*
Pennsylvania State University

- ○ Held office hours and review sessions; clarified climate, ozone, deforestation, and biodiversity concepts with real-world datasets.
- ○ Graded quizzes/labs with rubric-based feedback that improved figure quality, units/uncertainty reporting, and scientific reasoning.
- ○ Supported inclusive teaching practices: structured participation and gentle scaffolding for non-STEM majors new to quantitative reasoning.

Scholarships and Awards

Paul D. Krynine Awards   *SP2022, SP2023*
Pennsylvania State University

Integrated Geoscience & Technology Education Program(CK1) Scholarship   *FA2014, SP2015*
Kangwon National University

Semester Honor Scholarship   *FA2013, SP2014,*
Kangwon National University   *FA2014, FA2015*

Merit Scholarship   *FA2013*
Kangwon National University