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EDUCATION

Stanford University (Stanford, CA) / Sep 2024 - Present

Ph.D., Department of Geophysics

Kyoto University (Kyoto, Japan) / Apr 2020 - Mar 2024

B.S., Department of Geophysics

RESEARCH EXPERIENCE

Tohoku University (Sendai, Japan) / Apr 2024 – Jul 2024

Part-time Researcher, Department of Geophysics

California Institute of Technology (California, USA) / Jun 2023 - Aug 2023

Research Internship, Division of Geological and Planetary Sciences

RESEARCH PROJECT

1. **Understanding the Earthquake Rupture Mechanics through Adjoint Method** / Sep 2024 -
   - Examined how the frictional parameters govern the earthquake rupture behavior based on the variation method to the analytical solution of a semi-infinite crack.
   - Derived the adjoint simulation framework to evaluate the parameter sensitivity to the rupture behavior through the numerical simulation.
2. **The Estimation of Spatially Variable Frictional Properties with Physics-Informed Neural Networks** (publication [1]) / Jun 2023 – Mar 2024
   - Applied Physics-Informed Neural Networks (PINNs) to the simulation of a slow slip event with the Boundary Integral Element Method in a 2D planar fault plane.
   - Synthetic test showed that PINNs can successfully estimate the spatial distribution of frictional parameters from crustal deformation observed by GNSS stations.
3. **The Application of Physics-Informed Neural Networks for Spring Slider** (publication [2]) / May 2022 – Mar 2023
   - Developed the PINN-based method to simulate fault slip with rate and state friction law and estimate the frictional parameters in a spring-slider system.

AWARDS AND HONORS

1. Outstanding Student Presentation Award, JpGU / May 2025
2. Seto Prize of the Geodetic Society of Japan / Dec 2023
   - Awarded to young researchers in the Geodetic Society of Japan and provides financial support for the publication of papers. This award supported the publication [2]
3. Outstanding Student Presentation Award, Seismological Society of Japan (SSJ) / Nov 2023

FELLOWSHIP AND GRANTS

1. Stanford Graduate Fellowship in Science and Engineering / Sep 2024 – (Aug 2027)
2. The Summer Undergraduate Research Fellowship award / June 2023
   - Fellowship for a summer research internship at the California Institute of Technology

PUBLICATION

1. **Fukushima, R.**, Kano, M., Hirahara, K., Ohtani, M., Im, K., & Avouac, J.-P. (2025). Physics-informed deep learning for estimating the spatial distribution of frictional parameters in slow slip regions. Journal of Geophysical Research: Solid Earth, 130, e2024JB030256. https://doi.org/10.1029/2024JB030256
2. **Fukushima, R.**, Kano, M., & Hirahara, K. (2023). Physics-Informed Neural Networks for fault slip monitoring: simulation, frictional parameter estimation, and prediction on slow slip events in a spring-slider system. Journal of Geophysics Research: Solid Earth, 128, e2023JB027384. https://doi.org/10.1029/2023JB027384

SKILLS

Language: Japanese (Native), English

Programming: Python, Julia, MATLAB