Yudong Sun

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Education

09/2020~12/2025 **Massachusetts Institute of Technology**
Department of Earth, Atmospheric and Planetary Sciences
Ph.D. in Geophysics and Seismology
Advisor: Camilla Cattania

09/2017~07/2020 **University of Science and Technology of China**
School of Earth and Space Sciences
Master of Geophysics and Geomechanics
Advisor: Wei Leng

09/2013~07/2017 **University of Science and Technology of China**
School of the Gifted Young
B.A. in Geophysics
Honor Graduate Student in Zhao Jiuzhang Talent Program

Professional Experience

01/2026~now **Stanford University**
Advisor: Paul Segall
Project: Earthquake simulator on 3D geometrically complex faults with applications to induced seismicity

05/2024~08/2024 **BP, Houston**
Seismic Technology Group
Subsurface Geophysical Specialist Intern
Advisor: Xukai Shen
Project: Multiparameter Full-waveform inversion with Vp, Vs and density. I implemented the code, did synthetic tests and studied the inversion strategy.

09/2022~12/2022 **Massachusetts Institute of Technology**
Teaching assistant
Course 12.421 “Principles of Remote Sensing”

Research Experience

10/2024~now **Bridging Earthquake Cycle Modeling in Experiments and Simulations on Heterogeneous Faults**
I collaborate with a group at Cornell to conduct fully-dynamic and quasi-dynamic seismic cycle simulations on a fault with asperities and barriers and compare them with experiments and assess the seismic wave mediation effects.

09/2024~now **Modeling Seismicity on Geometrically Complex Faults with Fractured Zone**

I am developing code FDRA to model earthquakes on a rough fault surrounded by small fractures to investigate the evolution of foreshocks, mainshocks and aftershocks and statistics of seismicity.

05/2023~09/2023 **Software Development of Earthquake Simulator: Bridging Long-timescale Stress Transfer and Short-timescale Elastic Wave Modeling**
I am developing a code combining static stress transfer with frictional evolution (hundreds of years) and dynamic failure of a fault in elastic media (seconds) to better understand how the earthquakes nucleate on a more realistic fault system and how the process can be observed by seismology.

09/2022~01/2026 **Modeling Boomerang Earthquakes**
Seismic observations show that earthquakes can sometimes propagate backward through areas that ruptured previously, which can increase the seismic hazard. I quantify the conditions for back-propagating behaviors and develop theory to explain this phenomenon.

09/2020~09/2024 **Modeling Slow Slip Events on a Rough Fault**
I use high-resolution numerical simulation to model slow slip events, which is closely related to megathrust earthquakes. I have developed analytical models to answer questions such as: how fast can the slow slip events propagate on a given rough fault?

08/2021~08/2023 **Antarctican Landfast Sea Ice Motion from Remote Sensing**
I used advanced algorithms to process the remote sensing data and use an inversion method to extract crucial signals to study the sea ice which is fastened to the coastline. I found several fracturing crevasses before the collapse of the landfast sea ice and clarified the question whether sea ice can slow down the glaciers on land.

01/2018~07/2020 **Modeling Tectonic Deformation of SE Tibet**
I developed a geodynamic model incorporating GPS, active faults and seismic imaging. I aimed to answer the question whether the Tibet plateau is built in a way similar to rigid blocks or flowing glaciers. In this project, I construct a 3D fault model and estimate how viscous the deep part of the crust is.

Publications

In preparation

Song J. Y., **Sun Y.**, Cattania C., McLaskey G. C. An Experimental Study on the Interaction between Three Velocity-Weakening Patches Separated by Velocity-Strengthening Patches

Sun Y., Cattania C. Propagation of Slow Slip Events on Rough Faults: Slow Forward Propagation and Fast Back Propagation.

Accepted

Sun Y., Cattania C. Back-propagating Earthquakes on a Simple Fault. *AGU Advances.*

2025

Sun Y, Cattania C. Propagation of slow slip events on rough faults: Clustering, back propagation, and re-rupturing. *Journal of Geophysical Research: Solid Earth*.

2023

Sun, Y., Riel, B., & Minchew, B. Disintegration and Buttressing Effect of the Landfast Sea Ice in the Larsen B Embayment,

Antarctic Peninsula. *Geophysical Research Letters.*

Erickson, B. A., Jiang, J., Lambert, V., Abdelmeguid, M., Almquist, M., Ampuero, J. P., Ando, R., Barbot, S., Cattania, C., Chen, A., Dal Zilio, L., Dunham, E. M., Elbanna, A., Gabriel, A., Harvey, T., Huang, Y., Kaneko, Y., Kozdon, J., Lapusta, N., Li, D., Li, M., Liang, C., Liu, Y., Ozawa, S., Pranger, C., Segall, P., **Sun, Y.**, Thakur, P., Uphoff, C., van Dinther, Y. & Yang, Y. Incorporating Full Elastodynamic Effects and Dipping Fault Geometries in Community Code Verification Exercises for Simulations of Earthquake Sequences and Aseismic Slip (SEAS). *Bulletin of the Seismological Society of America.*

Invited talks

12/13/2026
When Machine Learning Meets Radar: New Opportunities for Environmental Monitoring, PassionU Lab, Online

07/30/2025
Earthquake simulation code FDRA2C Hackathon. MIT, MA

02/20/2025
Unraveling Complex Propagation of Earthquakes and Slow Earthquakes. Stanford University, CA

10/25/2024
Propagation of Slow Slip Events on Rough Faults. Informal Discussion. École normale supérieure, Paris

08/29/2024
Back-propagating Earthquakes on a Simple Fault. Tongji University, Shanghai

06/26/2024
Evolution of the Antarctic Landfast Sea Ice from Synthetic Aperture Radar. BP, Houston

12/22/2023
Dynamics of Earthquakes and Slow Slip Events on Rough Faults: Nucleation Location, Back Propagation, and Clustering. Peking University, Beijing

Conferences

2025
Sun Y., Song J. Y., Cattania C., McLaskey G. C. Numerical Modeling of Rupture Interactions Across Multiple Asperities: Comparison with Laboratory Earthquake Cycles
Southern California Earthquake Center Annual Meeting, Palm Spring, CA
AGU Fall Meeting, New Orleans, LA

2024
Sun Y., Cattania C. Back-propagating Earthquakes on a Simple Fault.
SCEC Annual Meeting, Palm Spring, CA
Cargèse international workshop on earthquakes, Cargèse, Corsica, France
AGU Fall Meeting, Washington DC

2023

Sun, Y., Riel, B., & Minchew, B. Disintegration and Buttressing Effect of the Landfast Sea Ice in the Larsen B Embayment, Antarctic Peninsula.
Poster exhibition for John H. Carlson Lecture, the Simons Theatre of the New England Aquarium, Boston, MA
MIT Energy and Climate Night, MIT Museum, Cambridge, MA

Sun Y., Cattania, C. Boomerang Earthquakes and Rapid Tremor Reversals: Exploring the Role of Fault Roughness on the Back Propagation of Earthquakes and Slow Slip Events
Southern California Earthquake Center Annual Meeting, Palm Spring, CA

2022

Sun Y., Riel B., Minchew B. Buttressing Effect and Disintegration of the Landfast Sea Ice Pack in the Larsen B Embayment, Antarctic Peninsula.
AGU Fall Meeting, Chicago, IL

Sun Y., Cattania C. Fault Roughness Promotes Re-rupturing and Back Propagation.
Slow-to-fast Earthquake Workshop, Nara, Japan
AGU Fall Meeting, New Orleans, LA

2021

Sun Y., Cattania C. Propagation of Slow Slip Events on a Rough Fault.
AGU Fall Meeting, online
Southern California Earthquake Center Annual Meeting, online

2019

Sun Y., Leng W. A Geodynamic Deformation Model of Southeastern Tibet: Constraints from GPS data, Faults and Low Shear Wave Velocity Zones.
AGU Fall Meeting, San Francisco, CA

Awards

01/2023~09/2023 MathWorks Science Fellow

09/2021~05/2022 Sven Treitel Fellow, MIT EAPS

09/2020~09/2021 Fellowship, MIT EAPS

09/2017~07/2020 Scholarship for Postgraduates, University of Science and Technology of China

01/2019 Outstanding Academic Presentation Award, the 1st Annual Meeting of Earth and Space Sciences, University of Science and Technology of China

09/2013~07/2017 Scholarship for Undergraduates, University of Science and Technology of China

06/2017 Outstanding Research Award, National Innovative Science Program for Undergraduates

12/2016 Honor Graduate Student in Zhao Jiuzhang Talent Program, University of Science and Technology of China

Computer Skills

Language: Matlab, C, C++, Python, Fortran

Software: GMT, QGIS, Paraview, OpenMP, MPI, ISCE, GMTSAR