

# Xiaochuan Tian (田小川)

Summa and Awwiller Postdoctoral Fellow, Department of Earth and Planetary Sciences, UC Davis

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## RESEARCH INTERESTS

By leveraging advancements in **geodynamic** modeling, global datasets, and interdisciplinary constraints, my research seeks to reveal *principal mechanisms* and quantify *key parameters* that control the phenomena vital to civilizations — e.g., *earthquakes, volcanism, topography, and climate*.

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## EDUCATION

2015-2021     *Ph.D. in Geophysics, Columbia University*, Advisor: W. Roger Buck  
2013-2015     *M.Sc. in Geophysics, University of Memphis*, Advisor: Eunseo Choi  
2009-2013     *B.S. in Geology, Sun Yat-sen University*, Advisor: Gu Cheng

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## ACADEMIC APPOINTMENTS

2024-Present     **Summa and Awwiller Postdoctoral Fellow**, UC Davis. With: Magali Billen & Mike Oskin  
2021-2024     **Postdoctoral Research Fellow**, Boston College. With: Mark Behn & Garrett Ito  
2015-2019     **Graduate Research & Teaching Fellow**, Columbia University  
2013-2015     **Graduate Research Assistant**, University of Memphis

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## PUBLICATIONS

### *Peer-reviewed journal articles*

1. **Tian, X.**, & Buck, W. R. (2025). Contrasting Topography of Continental Large Igneous Provinces: Crucial Role of Crustal Flow and Intrusion Dynamics. *Earth and Planetary Science Letters* →[accepted](#)
2. **Tian, X.**, Behn, M.D., Ito, G, Schierjott, J. C., Kaus, B. J., Popov, A. (2024). Magmatism controls global oceanic transform fault topography. *Nature Communications*, 15, 1914. →[link](#)
3. Schierjott, J. C., Ito, G., Behn, M. D., **Tian, X.**, Morrow, T., Kaus, B. J., & Escartín, J. (2023). How transform fault shear influences where detachment faults form near mid-ocean ridges. *Scientific Reports*, 13(1), 9259. → [link](#)
4. **Tian, X.**, & Buck, W. R. (2022). Intrusions induce global warming before continental flood basalt volcanism. *Nature Geoscience*. 15, 417–422. →[link](#)
5. **Tian, X.**, & Buck, W. R. (2019). Lithospheric Thickness of Volcanic Rifting Margins: Constraints from Seaward Dipping Reflectors. *Journal of Geophysical Research: Solid Earth*, 124(4), 3254-3270. →[link](#)
6. **Tian, X.**, & Choi, E. (2017). Effects of Axially Variable Diking Rates on Faulting at Slow Spreading Mid-Ocean Ridges. *Earth and Planetary Science Letters*, 458, 14-21. →[link](#)

### ***Manuscripts under review or in preparation***

1. **Tian, X.**, & Billen, M. I. Obliquity limit of global megathrust earthquakes. submitting to ***Science***\*.
2. **Tian, X.**, Janin A., Fraters M., Behn M., Gruber B., Chin E., Urann B., Le Roux V. Numerical simulations of clinopyroxene fabric development under laboratory and natural conditions. Submitting to ***JGR***\*.
3. **Tian, X.**, Behn M., Gruber B., Chin E., Le Roux V. Crustal Delamination Induced Finite Strain and Rock Fabrics: Constraints and Insights from Arclogite Samples and 3D Numerical Models, in prep.
4. **Tian, X.**, Billen, M. I., Oskin, M. Stress-State Inboard of the Mendocino Triple Junction, in prep.
5. **Tian, X.**, Choi, E., Tominaga, M., Janin A., Behn, M.D., Ito, G. Magmatism and cooling control global fracture zone depths, in prep.

\*manuscript available upon request

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### **GRANTS & AWARDS** (Total Funding as PI: ~\$330,000)

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|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2024-2026 | <b>Lori Summa and David Awwiller Postdoctoral Research Fellowship:</b> \$313,875 (PI)<br><i>"Ups and Downs of Northern California Forearc"- a multidisciplinary geology/geodynamics project focusing on dynamics of forearc deformation in Northern California</i> (Collaborate with Michael Oskin and Magali Billen). →link |
| 2025-2026 | <b>Statewide California Earthquake Center Awards SCEC-25188:</b> \$25,056 (PI)<br><i>"Numerical Simulations of the Change in Stress-State Inboard of the Mendocino Triple Junction"</i> (Co-PI: M. Oskin and M. Billen) →link                                                                                                |
| 2024      | <b>AGU 2024 Tectonophysics Caregiver Awards:</b> \$500                                                                                                                                                                                                                                                                       |
| 2017-2020 | <b>National Science Foundation Awards OCE-1654745:</b> \$319,977 (Contributor)<br><i>"Evaluating mechanisms for the formation, propagation and evolution of volcanic rifts and margins"</i> (Contributed to proposal writing. PI: W. Roger Buck). →link                                                                      |
| 2017      | <b>National Science Foundation Awards OCE-1658072:</b> \$179,333 (Contributor)<br><i>"Fully three-dimensional numerical models for along-axis variations in magmatic and tectonic processes at slow-spreading mid-ocean ridges"</i> (Funded by the project; mentored PhD student Hao Lu. PI: Eunseo Choi). →link             |
| 2015-2020 | <b>Columbia University Dean's Fellow:</b> \$409,515<br>The highest honor conferred upon entering graduate students in the Department of Earth and Environmental Sciences.                                                                                                                                                    |

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### **SELECTED PRESENTATIONS**

#### ***Invited Talks***

- ♦ **Tian, X.** (2024). Deformation across scales: from plate boundaries to lab experiments. *UC Davis* (Nov 15); *SZ4Grads* (Oct 30); *Boston College* (Sep).
- ♦ **Tian, X.**, Behn M., Ito G., Schierjott J., Kaus B., Popov A. (2023). Magmatism Controls Global Oceanic Transform Fault Topography. *MGG Lecture Series, University of Rhode Island* (Oct 6); *G&G Department Seminar, Woods Hole Oceanographic Institution* (Jun 6).

- ♦ **Tian, X., & Buck, W. R. (2022).** Intrusions induce global warming before continental flood basalt volcanism. *AGU Fall Meeting* (Dec); *University of Memphis* (Sep 30).
- ♦ **Tian, X., & Buck, W. R. (2017).** Seaward Dipping Reflectors at Rifted Margins: Formation Mechanism and Implications for Lithospheric Strength during Incipient Rifting. *CERI, University of Memphis* (Jul).

### ***Selected Conference Presentations***

- ♦ **Tian, X.,** Janin A., Fraters M., Behn M., Gruber B., Chin E., Urann B., Le Roux V. (2024). Numerical simulations of clinopyroxene fabric development under laboratory and natural conditions. *AGU Fall Meeting* (Poster).
- ♦ **Tian, X.,** Behn M., Ito G., Schierjott J., Kaus B., Popov A. (2023). Magmatism Controls Global Oceanic Transform Fault Topography. *AGU Fall Meeting* (Talk).
- ♦ **Tian, X., & Buck, W. R. (2023).** Effects of Large Igneous Province Magmatism on Earth's Structure and Climate. *CIDER research talk, UC Berkeley* (Jul 13).

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### **FIELD AND SEAGOING EXPERIENCE**

- ♦ **Peru (2019):** 12-day Storke Memorial multi-disciplinary field trip. Andean culture; Tectonics & earthquakes; Mountain building and the Altiplano; Marine life; Terrestrial biodiversity; El Nino/La Nina; Coastal upwelling & productivity; Arc volcanism; Rainbow mountain; Tropical glaciers; Desert and sand dunes; Coastal geomorphology ;
- ♦ **Atlantic Ocean (2018):** 35-day RV Atlantis cruise. Western North Atlantic Survey. Multi-channel seismic and multi-beam sonar data acquisition, processing, visualization. Principal Investigators: Mitch Lyle and Gregory Mountain. (NSF OCE-1656960)
- ♦ **Azores (2017):** 11-day field trip focusing on Volcanology.
- ♦ **Basin and Range (2016):** 9-day field trip on normal faulting at Basin and Range.
- ♦ **Additional field experience:**  
North Kentucky (2014), Memphis (2013) - seismic instrument deployments, geophysical surveys

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### **TEACHING EXPERIENCE**

#### **Columbia University – Teaching Assistant (2016-2019)**

Delivered guest lectures, designed lab experiments, held office hours, graded assignments.

- ♦ Earth: Origin, Evolution, Processes and Future (2019)
- ♦ Earth's Environmental Systems: Solid Earth (2018)
- ♦ Geodynamics (2016)

#### **Courses Prepared to Teach:**

- ♦ Undergraduate: Structural Geology, Introduction to Earth Sciences, Introduction to Geophysics
- ♦ Graduate: Geodynamics, Plate Boundary Processes, Tectonophysics, Geophysical Fluid Dynamics

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## SERVICE & LEADERSHIP

- ♦ **Manuscript Reviewer** (2019-present): Nature Communications, Geology, Geophysical Research Letters, Journal of Geophysical Research, Earth and Planetary Science Letters, Tectonophysics, Geochemistry, Geophysics, Geosystems, Seismica.
- ♦ **Proposal Reviewer** (2022-present): National Science Foundation, NSF-NERC.
- ♦ **Executive Committee Member**, SZ4Grads (2025-Present)
- ♦ **AGU Fall Meeting session chair** (2014): T43A - Three-Dimensional Observations and Models of Lithospheric Extension

## *Outreach*

- ♦ Invited intern lecture on “Modeling Interactions of Magma and Tectonics” at Lamont-Doherty Earth Observatory (2019)
- ♦ Volunteer for lava flow demonstrations at the World Science Festival, NYU (2017)
- ♦ Exhibitions at Lamont-Doherty Earth Observatory Open House: Demonstrate analog models of Mantle Plume induced Rifting; Mantle Plume upwelling; Visualizing stress patterns due to faults and flexure with Photoelasticity (2015-2018)

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## TECHNICAL SKILLS

- ♦ **Numerical Modeling**: 2D/3D finite difference/element geodynamic codes (LaMEM, ASPECT, FLAC), Fabric development code (D-Rex), Climate model (LOSCAR)
- ♦ **Programming**: C++, C, Python, MATLAB, Fortran, Shell scripting
- ♦ **Geophysical Analysis**: Seismic data processing, GPS/geodetic analysis, global centroid moment tensor analysis, bathymetric data analysis
- ♦ **Field Methods**: Structural mapping, seismic deployment, various geophysical surveys

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## PROFESSIONAL MEMBERSHIPS

- ♦ American Geophysical Union (AGU)
- ♦ Geological Society of America (GSA)