William B. Frank

Assistant Professor

Dept. of Earth, Atmospheric and Planetary Sciences

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Research statement

My research illuminates the physical mechanisms that control deformation within the Earth's crust. Understanding the continuum of rupture modes and fault instability within the Earth, from shallow stick-slip earthquakes to deep slow transients, to still deeper steady creep, is key to improved estimates of earthquake hazard. My multidisciplinary approach combines seismological techniques with geodetic observations to yield knowledge about the evolution of faulting processes in time and space and how the solid Earth responds to tectonic, volcanic, and anthropogenic forcings.

Academic positions

2020–present	**Assistant Professor**	Massachusetts Institute of Technology
2019–2020	**Visiting Scientist**	Massachusetts Institute of Technology
2018–2020	**Assistant Professor of Earth Sciences**	University of Southern California
2015–2017	**NSF Postdoctoral Fellow**	Massachusetts Institute of Technology
2014–2015	**Postdoctoral Researcher**	Institut de Physique du Globe de Paris
2011–2014	**Graduate Research/Teaching Assistant**	Institut de Physique du Globe de Paris

Education

2014	Ph.D. Geophysics	Institut de Physique du Globe de Paris
	Using low-frequency earthquakes as a fault probe in Guerrero, Mexico	
	(advisor: Nikolaï Shapiro)	
2011	M.Sc. Geophysics	Institut de Physique du Globe de Paris
2009	B.Sc. Earth Systems Science	University of Michigan, Ann Arbor

Awards and honors

2017	Two Editor's Citations for Excellence in Refereeing (*Geophysical Research Letters*)
2016	Editor's Citation for Excellence in Refereeing (*Journal of Geophysical Research*)
2016	Editor's Citation for Excellence in Refereeing (*Geophysical Research Letters*)
2015–2017	National Science Foundation Postdoctoral Fellowship
2011–2014	Ministry of Higher Education and Research (France) Doctoral Fellowship

Grants and fellowships

2022–2024	*Teasing out the hidden complexities of slow slip from the geodetic record in Cascadia* National Aeronautics and Space Administration – ROSES Earth Surface & Interior PI: **William B. Frank** ($542,970)
2021–2024	*The interplay between slow slip, fault coupling, and crustal earthquakes* National Aeronautics and Space Administration – ROSES Earth Surface & Interior PI: **William B. Frank** ($538,287, includes subaward of $66,539 to Laura M. Wallace at University of Texas at Austin)
2021	*Improving seismicity detection to map active structures in the Central Virginia Seismic Zone: Collaborative Research with Massachusetts Institute of Technology and Boston University* U.S. Geological Survey Earthquake Hazards Program PIs: **William B. Frank** ($64,734) and Rachel E. Abercrombie (Boston University; $26,626)
2019–2021	*Revealing the solid Earth's response to slow slip at a plate boundary*

	FACE Foundation – Thomas Jefferson Fund PIs: **William B. Frank** ($10,000) and Piero Poli (Institut des Sciences de la Terre; $10,000)
2019–2022	*Collaborative Research: What makes Low-Frequency Earthquakes low frequency?* National Science Foundation – EAR Geophysics PIs: **William B. Frank** ($297,798) and Rachel E. Abercrombie (Boston University; $158,998)
2019–2020	*Small earthquakes in Big Data: systematic detection of low-frequency seismicity in the Hikurangi margin* Royal Society Te Apārangi (New Zealand) – Catalyst: Seeding PI: Stephen Bannister (GNS Science) International collaboration Partner: **William B. Frank** ($59,330 NZD)
2018–2019	*Multidisciplinary exploration for slow aseismic slip and low-frequency earthquakes in the Anza Gap (San Jacinto fault zone)* Southern California Earthquake Center PIs: **William B. Frank** ($16,000) and Roland Bürgmann (University of California, Berkeley; $16,000)
2015–2017	*Exploring the evolution of faults and friction through dense repeater event catalogs* National Science Foundation – EAR Postdoctoral Fellowship PI: **William B. Frank** ($174,000)

Teaching experience

(* *indicates a course conducted in French*)

2022	Geophysics Field Camp	Massachusetts Institute of Technology
2021	Introduction to Seismology	Massachusetts Institute of Technology
2021	Earthquakes Dynamics	Massachusetts Institute of Technology
2020	Dynamics of Subduction Zones	University of Southern California
2018–2019	Planet Earth	University of Southern California
2017 (Guest)	Introduction to Seismology	Massachusetts Institute of Technology
2016	Kaufman Teaching Certificate	Massachusetts Institute of Technology
2015	Repeating seismicity tutorial	Universidad Nacional Autónoma de México Georgia Institute of Technology
2014	Intro to scientific computing*	Institut de Physique du Globe de Paris
2011–2013	Data analysis in the Earth sciences*	Institut de Physique du Globe de Paris
2011	Intro to office software*	Institut de Physique du Globe de Paris

Peer-reviewed papers

(† *indicates an advised student or postdoc author*)

30. Mikesell, T. D., A. Mordret, Z. Xu, and **W. B. Frank** (2022). Crustal Structure across the West Antarctic Rift System from Multicomponent Ambient Noise Surface Wave Tomography. *Seismological Research Letters*. DOI: 10.1785/0220210026.
29. Cabrera, L., P. Poli, and **W. B. Frank** (2022). Tracking the spatio-temporal evolution of foreshocks preceding the Mw 6.3 2009 L'Aquila Earthquake. *Journal of Geophysical Research: Solid Earth*. DOI: 10.1029/2021JB023888.
28. †Aden-Antoniow, F., **W. B. Frank**, and L. Seydoux (2022). An Adaptable Random Forest Model for the Declustering of Earthquake Catalogs. *Journal of Geophysical Research: Solid Earth*. DOI: 10.1029/2021JB023254.
27. Chamberlain, C. J., **W. B. Frank**, F. Lanza, J. Townend, and E. Warren-Smith (2021). Illuminating the Pre-, Co-, and Post-Seismic Phases of the 2016 M7. 8 Kaikōura Earthquake With 10 Years of Seismicity. *Journal of Geophysical Research: Solid Earth*. DOI: 10.1029/2021JB022304.
26. Husker, A. L., J. Castillo Castellanos, X. Perez-Campos, R. Valenzuela, and **W. B. Frank** (2021). Crust and upper-mantle seismic anisotropy variations from the coast to inland in central and Southern

Mexico (2): correlations with tectonic tremor. *Geophysical Journal International*. DOI: 10.1093/gji/ggab429.

25. †Aden-Antoniow, F., C. Satriano, P. Bernard, N. Poiata, E.-M. Aissaoui, J.-P. Villotte, and **W. B. Frank** (2020). Statistical evidence of a seismic quiescence before the M_w8.1 Iquique earthquake, Chile. *Journal of Geophysical Research: Solid Earth*. DOI: 10.1029/2019JB019337.
24. Jolivet, R. and **W. B. Frank** (2020). The transient and intermittent nature of slow slip. *AGU Advances*. DOI: 10.1029/2019AV000126.
23. †Farge, G., N. M. Shapiro, and **W. B. Frank** (2020). Moment-duration scaling of low-frequency earthquakes in Guerrero, Mexico. *Journal of Geophysical Research: Solid Earth*. DOI: 10.1029/2019JB019099.
22. †Beaucé, E., **W. B. Frank**, A. Paul, M. Campillo, and R. D. van der Hilst (2019). Systematic Detection of Clustered Seismicity Beneath the Southwestern Alps. *Journal of Geophysical Research*. DOI: 10.1029/2019JB018110.
21. **Frank, W. B.** and E. E. Brodsky (2019). Daily measurement of slow slip from low-frequency earthquakes is consistent with ordinary earthquake scaling. *Science Advances*. DOI: 10.1126/sciadv.aaw9386.
20. Chao, K., Z. Peng, **W. B. Frank**, G. A. Prieto, and K. Obara (2019). Isolated Triggered Tremor Spots in South America: Southern Chile, Ecuador, and Central Colombia. *Seismological Research Letters*. DOI: 10.1785/0220190009.
19. Husker, A. L., **W. B. Frank**, †G. Gonzales, L. Avila, V. Kostoglodov, and E. Kazachkina (2019). Characteristic tectonic tremor activity observed over multiple slow slip cycles in the Mexican subduction zone. *Journal of Geophysical Research: Solid Earth*. DOI: 10.1029/2018JB016517.
18. Perfettini, H., **W. B. Frank**, D. Marsan, and M. Bouchon (2019). Updip and along-strike aftershock migration model driven by afterslip: application to the 2011 Tohoku-Oki aftershock sequence. *Journal of Geophysical Research: Solid Earth*. DOI: 10.1029/2018JB016490.
17. **Frank, W. B.**, B. Rousset, C. Lasserre, and M. Campillo (2018). Revealing the cluster of slow transients behind a large slow slip event. *Science Advances*. DOI: 10.1126/sciadv.aat0661.
16. **Frank, W. B.**, N. M. Shapiro, and A. A. Gusev (2018). Progressive reactivation of the volcanic plumbing system beneath Tolbachik volcano (Kamchatka, Russia) revealed by long-period seismicity. *Earth and Planetary Science Letters*. DOI: 10.1016/j.epsl.2018.04.018.
15. Perfettini, H., **W. B. Frank**, D. Marsan, and M. Bouchon (2018). A model for migration of aftershocks driven by afterslip. *Geophysical Research Letters*. DOI: 10.1002/2017GL076287.
14. **Frank, W. B.** and R. E. Abercrombie (2018). Adapting the matched-filter search to a wide-aperture network: an aftershock sequence and an earthquake swarm in Connecticut. *Bulletin of the Seismological Society of America*. DOI: 10.1785/0120170190.
13. †Beaucé, E., **W. B. Frank**, and A. Romanenko (2017). Fast matched-filter (FMF): an efficient seismic matched-filter search for both CPU and GPU architectures. *Seismological Research Letters*. DOI: 10.1785/0220170181.
12. Rousset, B., M. Campillo, C. Lasserre, **W. B. Frank**, N. Cotte, A. Walpersdorf, A. Socquet, and V. Kostoglodov (2017). A geodetic matched-filter search for slow slip with application to the Mexico subduction zone. *Journal of Geophysical Research*. DOI: 10.1002/2017JB014448.
11. Lengliné, O., **W. B. Frank**, D. Marsan, and J.-P. Ampuero (2017). Imbricated slip rate processes during slow slip transients imaged by low-frequency earthquakes. *Earth and Planetary Science Letters*. DOI: 10.1016/j.epsl.2017.07.032.
10. **Frank, W. B.**, P. Poli, and H. Perfettini (2017). Mapping the rheology of the Central Chile subduction zone with aftershocks. *Geophysical Research Letters*. DOI: 10.1002/2016GL072288.
9. **Frank, W. B.** (2016). Slow slip hidden in the noise: the intermittence of tectonic release. *Geophysical Research Letters*. DOI: 10.1002/2016GL069537.

8. **Frank, W. B.**, N. M. Shapiro, A. L. Husker, V. Kostoglodov, and M. Campillo (2016). Repeating seismicity in the shallow crust modulated by transient stress perturbations. *Tectonophysics*. DOI: 10.1016/j.tecto.2016.09.003.
7. **Frank, W. B.**, N. M. Shapiro, A. L. Husker, V. Kostoglodov, A. A. Gusev, and M. Campillo (2016). The evolving interaction of low-frequency earthquakes during transient slip. *Science Advances*. DOI: 10.1126/sciadv.1501616.
6. Wu, C., R. A. Guyer, D. R. Shelly, D. Trugman, **W. B. Frank**, J. Gomberg, and P. A. Johnson (2015). Spatial-temporal variation of low-frequency earthquake bursts near Parkfield, California. *Geophysical Journal International*. DOI: 10.1093/gji/ggv194.
5. **Frank, W. B.**, M. Radiguet, B. Rousset, N. M. Shapiro, A. L. Husker, V. Kostoglodov, N. Cotte, and M. Campillo (2015a). Uncovering the geodetic signature of silent slip through repeating earthquakes. *Geophysical Research Letters*. DOI: 10.1002/2015GL063685.
4. **Frank, W. B.**, N. M. Shapiro, A. L. Husker, V. Kostoglodov, H. S. Bhat, and M. Campillo (2015). Along-fault pore-pressure evolution during a slow-slip event in Guerrero, Mexico. *Earth and Planetary Science Letters*. DOI: 10.1016/j.epsl.2014.12.051.
3. **Frank, W. B.**, N. M. Shapiro, A. L. Husker, V. Kostoglodov, A. Romanenko, and M. Campillo (2014). Using systematically characterized low-frequency earthquakes as a fault probe in Guerrero, Mexico. *Journal of Geophysical Research*. DOI: 10.1002/2014JB011457.
2. **Frank, W. B.** and N. M. Shapiro (2014). Automatic detection of low-frequency earthquakes (LFEs) based on a beamformed network response. *Geophysical Journal International*. DOI: 10.1093/gji/ggu058.
1. **Frank, W. B.**, N. M. Shapiro, V. Kostoglodov, A. L. Husker, M. Campillo, J. S. Payero, and G. A. Prieto (2013). Low-frequency earthquakes in the Mexican Sweet Spot. *Geophysical Research Letters*. DOI: 10.1002/grl.50561.

Submitted papers

4. †Aden-Antoniow, F., **W. B. Frank**, C. J. Chamberlain, J. Townend, and S. Bannister (in revision). Low-frequency earthquakes accompany deep slow slip beneath the North Island of New Zealand. *Journal of Geophysical Research: Solid Earth*.
3. †Wimez, M. and **W. B. Frank** (in revision). Recursive detection of swarms of volcanic long-period seismicity in Marie Byrd, Antarctica. *Geophysical Journal International*.
2. †Bryan, J. T., **W. B. Frank**, and P. Audet (under review). Receiver function monitoring with optimal transport.
1. †Mouchon, C., **W. B. Frank**, M. Radiguet, N. Cotte, and P. Poli (submitted). Low-frequency earthquakes are incidental symptoms of slow fault slip.

Invited conference communications

8. **Frank, W. B.**, R. Jolivet, and P. Poli (2019). *The transient and intermittent nature of slow slip*. Abstract T53C-04 presented at 2019 Fall Meeting, AGU, San Francisco, CA 9–13 December.
7. **Frank, W. B.** (2019a). *Bridging the seismic-geodetic divide: multidisciplinary imaging of slow slip dynamics*. Plenary speaker at 2019 SAGE/GAGE Science Workshop, Portland, OR, 9–11 October.
6. **Frank, W. B.** (2019b). *Bridging the seismic-geodetic divide: multidisciplinary imaging of slow slip dynamics*. Keynote speaker at International Joint Workshop on Slow Earthquakes 2019, Sendai, Japan, 21–23 September.
5. **Frank, W. B.** and E. E. Brodsky (2018). *Bridging the observational slow earthquake spectrum*. Abstract presented at 12th Joint Meeting of United States-Japan Cooperative Program in Natural Resources Panel on Earthquake Research, Kumamoto, Japan, 24–26 October.

4. **Frank, W. B.**, B. Rousset, C. Lasserre, and M. Campillo (2017). *Revealing the cascade of slow transients behind a large slow slip event*. Abstract presented at JpGU-AGU Joint Meeting, Chiba, Japan, 20–25 May.
3. **Frank, W. B.**, N. M. Shapiro, M. Campillo, A. L. Husker, V. Kostoglodov, A. A. Gusev, M. Radiguet, B. Rousset, and N. Cotte (2016). *Pinpointing transient aseismic slip at depth with seismological observations*. Abstract presented at Chapman Conference on Slow Slip Phenomena, AGU, Ixtapa, Mexico 22–25 February.
2. **Frank, W. B.**, N. M. Shapiro, A. L. Husker, V. Kostoglodov, A. A. Gusev, and M. Campillo (2015). *Tectonic tremor and the collective behavior of low-frequency earthquakes*. Abstract T22C-01 presented at 2015 Fall Meeting, AGU, San Francisco, CA 14–18 December.
1. **Frank, W. B.**, M. Radiguet, B. Rousset, N. M. Shapiro, A. L. Husker, V. Kostoglodov, N. Cotte, and M. Campillo (2015b). *Exploring slow slip in Guerrero, Mexico through repeating earthquakes*. Abstract presented at Tectonic Tremor and Silent Seismicity Workshop, Mexico City, Mexico 25–27 February.

Invited seminars

33. Dept. of Geosciences, Princeton University (2022).
32. Dept. of Earth and Environmental Sciences, University of Michigan (2022).
31. Institute for Geophysics, University of Texas at Austin (2021).
30. Ottawa-Carleton Geoscience Centre, University of Ottawa (2020).
29. Dept. of Earth Sciences, University of Southern California (2020).
28. Dept. of Earth and Planetary Sciences, University of Tokyo (2019).
27. Earthquake Research Institute, University of Tokyo (2019).
26. Institut des Sciences de la Terre, Université Grenoble Alpes (2019).
25. Dept. of Earth, Atmospheric, and Planetary Sciences, Massachusetts Institute of Technology (2019).
24. Berkeley Seismological Laboratory, University of California, Berkeley (2019).
23. Dept. of Earth Sciences, University of California, Riverside (2019).
22. Dept. of Earth, Planetary, and Space Sciences, University of California, Los Angeles (2018).
21. Geophysics Dept., Stanford University (2018).
20. Dept. of Earth and Planetary Sciences, University of California, Santa Cruz (2018).
19. Seismological Laboratory, California Institute of Technology (2018).
18. Institute of Geological and Nuclear Science (2017).
17. School of Geography, Environment and Earth Sciences, Victoria University of Wellington (2017).
16. Earthquake Research Institute, University of Tokyo (2017).
15. Dept. of Earth and Planetary Sciences, University of Tokyo (2017).
14. Dept. of Earth, Atmospheric, and Planetary Sciences, Massachusetts Institute of Technology (2017).
13. Dept. of Earth, Environmental, and Planetary Sciences, Brown University (2017).
12. Dept. of Earth Sciences, University of Southern California (2017).
11. Institut des Sciences de la Terre, Université Grenoble Alpes (2016).
10. Dept. of Earth and Planetary Sciences, Harvard University (2016).
9. Lamont-Doherty Earth Observatory, Columbia University (2016).
8. Berkeley Seismological Laboratory, University of California, Berkeley (2016).
7. Institut de Physique du Globe de Strasbourg, École et Observatoire des Sciences de la Terre (2016).
6. Instituto Geofísica, Universidad Nacional Autónoma de México (2016).
5. Earth Resources Laboratory, Massachusetts Institute of Technology (2015).
4. Dept. of Earth and Planetary Sciences, Georgia Institute of Technology (2015).

3. Institut de Physique du Globe de Strasbourg, École et Observatoire des Sciences de la Terre (2015).
2. Instituto Geofísica, Universidad Nacional Autónoma de México (2013).
1. Schlumberger Riboud Product Center (2012).

Advised awards and honors

2021	Jared Bryan	Student Presentation Award at the Annual Meeting of the Seismological Society of America
2022	Ayako Tsuchiyama	Seismological Society of America Annual Meeting Travel Grant
2022	Jared Bryan	Seismological Society of America Global Travel Grant

Current advised

Postdoctoral researchers

- Léonard Seydoux (since 2022)
- Louise Maubant (since 2021)
- Qingyu Wang (since 2020)

Graduate students

- Caroline Mouchon (PhD. since 2021)
- Ayako Tsuchiyama (Ph.D. since 2021)
- Jared Bryan (Ph.D. since 2020)

Past advised

Postdoctoral researchers

- Florent Aden-Antoniow (from 2019 to 2021)
  Now R&D Data Scientist at GNS Science

Graduate students

- Mathilde Wimez (M.Sc.) at Massachusetts Institute of Technology (2022)
  Now a field technician at the Alaska Earthquake Center (since 2022)
- Yichen Geng (M.Sc.) at Harvard University (2021)
  Now a graduate student at Harvard University (since 2021)
- Caroline Mouchon (M.Sc.) at University of Southern California (2020)
  Now a graduate student at Massachusetts Institute of Technology (since 2021)
- Xiaoyu Bruce Zhou (Ph.D.) at University of Southern California (with Yehuda Ben-Zion)
- Camila Cesar (M.Sc.) at University of Southern California (2018)
  Now a graduate student at Universität Bern (since 2018)

Co-advised

- Guillermo González (M.Sc.) at Universidad Nacional Autónoma de México (with Allen Husker; 2019)
  Now a graduate student at Universidad Nacional Autónoma de México (since 2019)
- Gaspard Farge (M.Sc.) at Institut de Physique du Globe de Paris (with Nikolaï Shapiro; 2017)
  Now a graduate student at Institut de Physique du Globe de Paris (since 2019)
- Ophélie Rohmer (M.Sc.) at Institut des Sciences de la Terre (with Michel Campillo; 2016)
  Now a graduate student at Cerema, Nice (since 2018)
- Éric Beaucé (M.Sc.) at Institut des Sciences de la Terre (with Michel Campillo; 2015)
  Now a postdoctoral fellow at Lamont-Doherty Earth Observatory, Columbia University (since 2022)

Committee member

- Yudong Sun (Ph.D.) at Massachusetts Institute of Technology (advised by Camilla Cattania)
- Hilary Chang (Ph.D.) at Massachusetts Institute of Technology (advised by Nori Nakata)
- Jing Jian (Ph.D.) at Massachusetts Institute of Technology (advised by Rob van der Hilst)
- Mariona Badenas Agusti (Ph.D) at Massachusetts Institute of Technology (advised by Sara Seager and Julien de Wit)
- Thomas Luckie (Ph.D.) at University of Southern California (advised by David Okaya)
- Haoran Meng (Ph.D. 2019) at University of Southern California (advised by Yehuda Ben-Zion)
- Yifang Cheng (Ph.D.) at University of Southern California (advised by Yehuda Ben-Zion)
- Malcolm White (Ph.D.) at University of Southern California (advised by Yehuda Ben-Zion)
- Feng Zhu (Ph.D.) at University of Southern California (advised by Julien Emile-Geay)

Departmental service

Member	2022–: Diversity, Equity, and Inclusion committee 2019–2020: Computing committee (University of Southern California) 2018–2020: Graduate student review committee (University of Southern California) 2018–2019: Graduate student recruiting committee (University of Southern California) 2018–2019: Annual merit review committee (University of Southern California)
Organizer	2022–: Geophysics seminar series 2016–2017: FISH (Friday Informal Seminar Hour) seminar series at the Earth Resources Laboratory (Massachusetts Institute of Technology)

Professional service

Member	AGU Honors 2020, 2021, 2022 Inge Lehmann Award committee Subduction Zones in 4D (SZ4D) NSF Research Coordination Network "Faulting and Earthquake Cycles" working group
Associate Editor	Seismological Research Letters (since 2020)
Review Editor	Frontiers in Solid Earth Geophysics (since 2020)
Plenary Chair	2021 SAGE/GAGE Science Workshop 2020 SAGE/GAGE Science Workshop (*postponed by COVID-19 pandemic*)
Convener	2022 SSA Annual Meeting 2020 SSA Annual Meeting (*canceled by COVID-19 pandemic*) 2019 SSA Annual Meeting 2018 AGU Fall Meeting session T036 2017 AGU Fall Meeting session S019 2016 AGU Fall Meeting session S003
Review panelist	2022 National Science Foundation 2021 National Science Foundation 2018 U.S. Geological Survey External Grants Program
Reviewer	for many peer-reviewed scientific journals (including *Science*, *Geophysical Research Letters*, *Science Advances*, and *Nature Geoscience*), the National Science Foundation, the U.S. Geological Survey, the International Ocean Drilling Program, the Marsden Fund Council (Royal Society Te Apārangi, New Zealand); the Earthquake Commission (New Zealand), the U.S.-Israel Binational Science Foundation, and the Czech Science Foundation

Professional associations

2014–present	Seismological Society of America
2012–present	American Geophysical Union