

William B. Frank

Assistant Professor of Earth 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

starting 2020	Assistant Professor	Massachusetts Institute of Technology
2019–present	Visiting Scientist	Massachusetts Institute of Technology
2018–present	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 <i>Using low-frequency earthquakes as a fault probe in Guerrero, Mexico</i> (advisor: Nikolai Shapiro)	Institut de Physique du Globe de Paris
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 (<i>Geophysical Research Letters</i>)
2016	Editor's Citation for Excellence in Refereeing (<i>Journal of Geophysical Research</i>)
2016	Editor's Citation for Excellence in Refereeing (<i>Geophysical Research Letters</i>)
2015–2017	National Science Foundation Postdoctoral Fellowship
2011–2014	Ministry of Higher Education and Research (France) Doctoral Fellowship

Grants and fellowships

2019–2021	<i>Revealing the solid Earth's response to slow slip at a plate boundary</i> FACE Foundation – Thomas Jefferson Fund PIs: William B. Frank (\$10,000) and Piero Poli (Institut des Sciences de la Terre; \$10,000)
2019–2022	<i>Collaborative Research: What makes Low-Frequency Earthquakes low frequency?</i> National Science Foundation – EAR Geophysics PIs: William B. Frank (\$297,798) and Rachel E. Abercrombie (Boston University; \$158,998)
2019–2020	<i>Small earthquakes in Big Data: systematic detection of low-frequency seismicity in the Hikurangi margin</i> 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)

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)

23. Jolivet, R. and **W. B. Frank** (2020). The transient and intermittent nature of slow slip. *AGU Advances*. (accepted).
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

3. [†]Aden-Antoniow, F., C. Satriano, P. Bernard, N. Poiata, E.-M. Aissaoui, J.-P. Villotte, and **W. B. Frank** (in review). Statistical evidence of a seismic quiescence before the M_w 8.1 Iquique earthquake, Chile. *Journal of Geophysical Research: Solid Earth*.
2. Husker, A. L., J. Castillo Castellanos, X. Perez-Campos, **W. B. Frank**, and R. Valenzuela (in review). Structural constraints on low-frequency earthquake activity in the Guerrero subduction zone. *Journal of Geophysical Research: Solid Earth*.
1. [†]Farge, G., N. M. Shapiro, and **W. B. Frank** (in revision). Moment-duration scaling of low-frequency earthquakes in Guerrero, Mexico. *Journal of Geophysical Research: Solid Earth*.

Papers in preparation

1. [†]Alves da Silva, J., **W. B. Frank**, R. Juanes, and M. Campillo (in prep.). Modeling slow slip events in Guerrero (Mexico) along a complex fault geometry in a deformable elastic medium.

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 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

29. Department of Earth Sciences, University of Southern California (2020).
28. Department 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. Department of Earth, Atmospheric, and Planetary Sciences, Massachusetts Institute of Technology (2019).
24. Berkeley Seismological Laboratory, University of California, Berkeley (2019).
23. Department of Earth Sciences, University of California, Riverside (2019).
22. Department of Earth, Planetary, and Space Sciences, University of California, Los Angeles (2018).
21. Geophysics Department, Stanford University (2018).
20. Department 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. Department of Earth and Planetary Sciences, University of Tokyo (2017).
14. Department of Earth, Atmospheric, and Planetary Sciences, Massachusetts Institute of Technology (2017).

13. Department of Earth, Environmental, and Planetary Sciences, Brown University (2017).
12. Department of Earth Sciences, University of Southern California (2017).
11. Institut des Sciences de la Terre, Université Grenoble Alpes (2016).
10. Department 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. Department 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).

Current advised

Postdoctoral researchers

- Florent Aden-Antoniow at University of Southern California (since 2019)
- Qingyu Wang at University of Southern California (since 2020)
- Rino Salman at Massachusetts Institute of Technology (starting 2020)

Graduate students

- Caroline Mouchon (Master's) at University of Southern California (2020)
- Mathilde Wimez (PhD) at University of Southern California (since 2018)
- Xiaoyu Bruce Zhou (PhD) at University of Southern California (with Yehuda Ben-Zion; since 2018)

Past advised

Graduate students

- Camila Cesar (Master's) at University of Southern California (2018)
Now a graduate student at Universität Bern (since 2018)

Co-advised

- Éric Beaucé (Master's) at Institut des Sciences de la Terre (with Michel Campillo; 2015)
Now a graduate student at Massachusetts Institute of Technology (since 2016)
- Ophélie Rohmer (Master's) at Institut des Sciences de la Terre (with Michel Campillo; 2016)
Now a graduate student at Cerema, Nice (since 2018)
- Gaspard Farge (Master's) at Institut de Physique du Globe de Paris (with Nikolai Shapiro; 2017)
Now a graduate student at Institut de Physique du Globe de Paris (since 2019)
- Guillermo González (Master's) at Universidad Nacional Autónoma de México (with Allen Husker; 2019)
Now a graduate student at Universidad Nacional Autónoma de México (since 2019)

Committee member

- Thomas Luckie (PhD) at University of Southern California (advised by David Okaya)
- Haoran Meng (PhD 2019) at University of Southern California (advised by Yehuda Ben-Zion)
- Yifang Cheng (PhD) at University of Southern California (advised by Yehuda Ben-Zion)

- Malcolm White (PhD) at University of Southern California (advised by Yehuda Ben-Zion)
- Feng Zhu (PhD) at University of Southern California (advised by Julien Emile-Geay)

Departmental service

Member	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	2016–2017: FISH (Friday Informal Seminar Hour) seminar series at the Earth Resources Laboratory (Massachusetts Institute of Technology)

Professional service

Member	Subduction Zone 4D (SZ4D) initiative “Faulting and Earthquake Cycles” working group
Convener	2020 SSA Annual Meeting 2019 SSA Annual Meeting 2018 AGU Fall Meeting session T036 2017 AGU Fall Meeting session S019 2016 AGU Fall Meeting session S003
Review panelist	2018 U.S. Geological Survey External Grants Program
Reviewer	<i>Geophysical Research Letters</i> ; <i>Nature Communications</i> ; <i>Earth and Planetary Science Letters</i> ; <i>Journal of Geophysical Research: Solid Earth</i> ; <i>Seismological Research Letters</i> ; <i>Geophysical Journal International</i> ; <i>Earth, Planets and Space</i> ; <i>Tectonophysics</i> ; <i>Pure and Applied Geophysics</i> ; <i>Scientific Reports</i> , the Marsden Fund Council (Royal Society Te Apārangi, New Zealand); the Earthquake Commission (New Zealand), the Czech Science Foundation; the U.S. Geological Survey, and the National Science Foundation

Professional associations

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