

Christopher W Johnson

EES-17 Geophysics
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Appointments

Staff Scientist Level 3 10/2021-present
EES-17 Earth and Environmental Science Division: Geophysics
Los Alamos National Laboratory, Los Alamos, New Mexico

Experience

Richard P. Feynman Distinguished Postdoctoral Fellow 3/2020-10/2021
Los Alamos National Laboratory, Los Alamos, New Mexico

NSF Postdoctoral Fellow 9/2017-3/2020
Scripps Institution of Oceanography
Uni. of California San Diego, La Jolla, CA

NSF Graduate Research Fellowship Program 8/2012-8/2017
Berkeley Seismological Laboratory
University of California Berkeley, Berkeley, CA

Undergraduate Research Assistant 6/2010-7/2012
Georgia Institute of Technology, Atlanta, GA

Education

University of California Berkeley 08/2017
Ph.D. in Earth and Planetary Science

Georgia Institute of Technology 05/2012
B.Sc. in Earth and Atmospheric Sciences
Highest Honors, Geophysics Track with Research Option

Georgia Perimeter College 12/2000
Associate in Science

Funding

Richard P. Feynman Postdoctoral Fellow, Los Alamos Nat. Lab. (PI)	(\$354k)	2020-2023
DOE Shallow crustal properties (Co-I with Yehuda Ben-Zion)	(\$200k)	2019-2022
NASA Earth Surface Interior (Co-I with Estelle Chaussard)	(\$50k)	2019-2021
San Diego Super Computer COMET mini-proposal startup allocation		2018-2019
Southern California Earthquake Center (w/ Y. Ben-Zion & F. Vernon)	(\$15k)	2018-2019
National Science Foundation EAR Postdoctoral Fellowship (PI)	(\$174k)	2017-2019

Southern California Earthquake Center (proposal with R. Bürgmann) (\$28k/yr)	2014-2017
Northern CA Earthquake Hazard Program (proposal with R. Bürgmann) (\$24k)	2015-2016
National Science Foundation Graduate Research Fellowship Program (\$120k)	2012-2017

Peer Reviewed Publications

In-review

- Johnson, C.W.** and P.A. Johnson (*in review*) EQDetect: Earthquake phase arrivals and first motion polarity applying deep learning
- Euser, B., **C.W. Johnson**, R. Guyer, R., E. Rougier, C.M. Donahue, G. Guthrie, A. Munjiza, P.A. Johnson, (*in review*) Straining to Learn Permeability
- Wang, K., **C.W. Johnson**, K.C. Bennett, P.A. Johnson (*in review*) The temporal limits of predicting fault failure
- Alfaro-Diaz, R., S.H. Roberts, A.A. Delory, C.W. Johnson, R. Guyer, P.A. Johnson, (*in review*) Dynamic Triggering and Seismic Quiescence Induced by the 2019 Ridgecrest Earthquakes at the Coso Geothermal Field
- Guyer, R., S. Roberts, **C.W. Johnson**, R. Alfaro-Diaz, A.A. Delorey, P.A. Johnson, (*in review*) InSAR field to formation stress: using a Mogi lattice, a Mogi cloud

2022

- [37] Chen, K.H., T-C. Yeh, Y. Chen, **C.W. Johnson**, C-H Lin, Y-C Lai, M-H Shih, P. Gueguen, W-G, Huang, B-S Huang, K-C Chen, C-J Lin, and C-S Ku (2022) Characteristics and impact of environmental shaking in the Taipei metropolitan area *Scientific Reports* 12, 743 . doi: 10.1038/s41598-021-04528-6

2021

- [36] Xue, L., Fu, Y., **Johnson, C. W.**, Otero Torres, J. J., Shum, C. K., & Bürgmann, R. (2021). Seasonal seismicity in the Lake Biwa region of central Japan moderately modulated by lake water storage changes. *Journal of Geophysical Research: Solid Earth*, 126, e2021JB023301. doi.org/10.1029/2021JB023301
- [35] Wang, K., **C.W. Johnson**, K.C. Bennett, P.A. Johnson, (2021) Predicting fault slip via transfer learning. *Nat Commun* 12, 7319. doi.org/10.1038/s41467-021-27553-5
- [34] Delorey, A.A., G.H.R. Bokelmann, **C.W. Johnson**, and P.A. Johnson, (2021) Estimation of the orientation of stress in the Earth's crust without earthquake or borehole data. *Nature Commun Earth Environ* 2, 190. doi: 10.1038/s43247-021-00244-1
- [33] **Johnson, C.W.** and P.A. Johnson, (2021) Learning the low frequency earthquake activity on the central San Andreas Fault. *Geophysical Research Letters*, 48, e2021GL092951. doi: 10.1029/2021GL092951
- [32] Meng, H., Ben-Zion, Y., **Johnson, C. W.** (2021) Analysis of seismic signals generated by vehicle traffic with application to derivation of subsurface Q values. *Seismological Research Letters*, doi: 10.1785/0220200457
- [31] Dutilleul, P.R.L., **C.W. Johnson**, R. Bürgmann (2021) Periodicity analysis of earthquake occurrence and hypocenter depth near Parkfield, California, 1994-2002 versus 2006-2014. *Geophysical Research Letters*, 48, e2020GL089673. doi.org/10.1029/2020GL089673
- [30] **Johnson, C.W.**, Lau, N., Borsa, A. (2021) An assessment of GPS velocity uncertainty in California. *Earth and Space Science*, 7, e2020EA001345. doi:10.1029/2020EA001345

2020

- [29] Dutilleul, P.R.L., **C.W. Johnson**, R. Bürgmann (2020) Marked spatio-temporal point patterns, periodicity analysis and earthquakes: an analytical extension including hypocenter depth. *Environmental and Ecological Statistics*, doi:10.1007/s10651-020-00470-4
- [28] Snover, D., **Johnson, C.W.**, Bianco, M.J., Gerstoft, P. (2020) Deep clustering to identify sources of urban seismic noise in Long Beach, CA. *Seismological Research Letters*, 1-12, doi: 10.1785/0220200164.
- [27] **Johnson, C.W.**, Ben-Zion, Y., Meng, H., Vernon, F.L. (2020), Identifying different classes of seismic noise signals using unsupervised learning. *Geophysical Research Letters*, 47. doi:10.1029/2020GL088353
- [26] Cheng, Y., Ben-Zion, Y., Brenguier, F., **Johnson, C. W.**, Li, Z., Share, P., Mordret, A., Boué, P., Vernon F.L. (2020) Automated method for developing catalog of small earthquakes using data of dense seismic array and nearby stations. *Seismological Research Letters*, 91 (5): 2862–2871 doi:10.1785/0220200134
- [25] **Johnson, C.W.**, Kilb, D., Baltay, A., Vernon F.L. (2020) Peak ground velocity spatial variability revealed by dense seismic array in southern California. *Journal of Geophysical Research: Solid Earth*, 125. doi:10.1029/2019JB019157.
- [24] Xue, L., **C.W. Johnson**, Y. Fu and R. Bürgmann (2020) Seasonal seismicity in the Western Branch of the East African Rift System, *Geophysical Research Letters*, 47, doi:10.1029/2019GL085882
- [23] **Johnson, C.W.**, Y. Fu, and R. Burgmann (2020) Hydrospheric modulation of stress and seismicity on shallow faults in southern Alaska, *Earth and Planetary Science Letters*, doi:10.1016/j.epsl.2019.115904

2019

- [22] Brenguier, F., Boué, P., Ben-Zion, Y., Vernon, F., **Johnson, C. W.**, Mordret, A., et al. (2019) Train traffic as a powerful noise source for monitoring active faults with seismic interferometry. *Geophysical Research Letters*. 46, 9529– 9536. doi:10.1029/2019gl083438
- [21] Meng, H., Ben-Zion, Y., and **Johnson, C. W.** (2019). Detection of random noise and anatomy of continuous seismic waveforms in dense array data near Anza California. *Geophysical Journal International*. 219 (3), 1463–1473. doi:10.1093/gji/ggz349
- [20] **Johnson, C. W.**, Meng, H., Vernon, F., & Ben-Zion, Y. (2019). Characteristics of ground motion generated by wind interaction with trees, structures, and other surface obstacles. *Journal of Geophysical Research: Solid Earth*, 124. doi:10.1029/2018jb017151
- [19] Qin, L., F.L. Vernon, **C.W. Johnson**, and Y. Ben-Zion (2019) Spectral characteristics of daily to seasonal ground motions using coherences at the Piñon Flats Observatory. *Bulletin of the Seismological Society of America*, 109 (5), 1948-1967. doi.org/10.1785/0120190070
- [18] **Johnson, C.W.**, F.L. Vernon, N. Nakata, and Y. Ben-Zion (2019) Atmospheric Processes Modulating Noise in Fairfield Nodal 5 Hz Geophones. *Seismological Research Letters*, 90 (4), 1612-1618. doi.org/10.1785/0220180383

2018

- [17] Xu, W., Wu, S., Materna, K., Nadeau, R., Floyd, M., Funning, G., Chaussard, E., **Johnson, C.W.**, Murray, J.R., Ding, X., Bürgmann, R. (2018). Interseismic ground deformation and fault slip rates in the greater San Francisco Bay Area from two decades of space geodetic data. *Journal of Geophysical Research: Solid Earth*, 123. <https://doi.org/10.1029/2018JB016004>
- [16] Chen, K. H., Tai, H.-J., Ide, S., Byrne, T., **Johnson, C. W.** (2018). Tidal modulation and tectonic implications of tremors in Taiwan. *Journal of Geophysical Research: Solid Earth*, 123. <https://doi.org/10.1029/2018JB015663>
- [15] Xue, L., R. Bürgmann, D.R. Shelly, **C.W. Johnson**, T. Taira (2018) Kinematics of the 2015 San Ramon, California earthquake swarm: Implications for fault zone structure and driving mechanisms, *Earth and Planetary Science Letters*, 489. doi.org/10.1016/j.epsl.2018.02.018
- [14] María Teresa Ramírez-Herrera, Krzysztof Gaidzik, Steven Forman, Vladimir Kostoglodov, Roland Bürgmann, **Christopher W. Johnson** (2018) Relating the long-term and short-term vertical deformation across a transect of the forearc in the central Mexican subduction zone. *Geosphere*; 14 (2): 419–439. doi: <https://doi.org/10.1130/GES01446.1>

2017

- [13] **Johnson, C. W.**, Y. Fu, and R. Bürgmann (2017), Stress models of the annual hydrospheric, atmospheric, thermal, and tidal loading cycles on California faults: Perturbation of background stress and changes in seismicity, *Journal of Geophysical Research: Solid Earth*, 122. <https://doi.org/10.1002/2017JB014778>.
- [12] Han, L., Z. Peng, **C.W. Johnson**, F.F. Pollitz, L. Li, B. Wang, J.Wu, Q. Li (2017) Shallow microearthquakes near Chongqing, China triggered by the Rayleigh waves of the 2015 M7.8 Gorkha, Nepal earthquake, *Earth and Planetary Science Letters*. 479 (1), [doi:10.1016/j.epsl.2017.09.024](https://doi.org/10.1016/j.epsl.2017.09.024).
- [11] **Johnson, C. W.**, Y. Fu, and R. Burgmann (2017), Seasonal water storage, stress modulation, and California seismicity, *Science*, 356(6343), 1161-1164, [doi:10.1126/science.aak9547](https://doi.org/10.1126/science.aak9547).
- [10] Delbridge, B. G., S. Kita, N. Uchida, **C. W. Johnson**, T. Matsuzawa, and R. Bürgmann (2017), Temporal variation of intermediate-depth earthquakes around the time of the M9.0 Tohoku-oki earthquake, *Geophysical Research Letters*, 44(8), 3580-3590, [doi:10.1002/2017GL072876](https://doi.org/10.1002/2017GL072876).

2016

- [9] **Johnson, C.W.**, E.J.Totten, and R. Bürgmann (2016), Depth migration of seasonally induced seismicity at The Geysers geothermal field, *Geophysical Research Letters*, 43,6196–6204, [doi:10.1002/2016GL069546](https://doi.org/10.1002/2016GL069546)
- [8] Chaussard, E., **C.W. Johnson**, H. Fattahi, and R. Bürgmann (2016), Potential and limits of InSAR to characterize interseismic deformation independently of GPS data: application to the southern San Andreas Fault system, *Geochemistry, Geophysics, Geosystems*, 17, 1214– 1229, [doi:10.1002/2015GC006246](https://doi.org/10.1002/2015GC006246).

2015

- [7] **Johnson, C. W.**, and R. Bürgmann (2015), Delayed dynamic triggering: Local seismicity leading up to three remote M≥6 aftershocks of the 11 April 2012 M8.6 Indian Ocean

- earthquake, *Journal of Geophysical Research: Solid Earth*, 120, doi:10.1002/2015JB012243.
- [6] Dutilleul, P., **C. W. Johnson**, R. Bürgmann, Y. Wan, and Z.-K. Shen (2015), Multi-frequential periodogram analysis of earthquake occurrence: An alternative approach to the Schuster spectrum, with two examples in central California, *Journal of Geophysical Research: Solid Earth*, 120, doi:10.1002/2015JB012467.
- [5] Chaussard, E., R. Bürgmann, H. Fattahi, **C. W. Johnson**, R. Nadeau, T. Taira, and I. Johanson (2015), Interseismic coupling and refined earthquake potential on the Hayward-Calaveras fault zone, *Journal of Geophysical Research: Solid Earth*, 120, doi:10.1002/2015JB012230.
- [4] Chaussard, E, R Bürgmann, H Fattahi, RM Nadeau, T Taira, **CW Johnson**, and I Johanson (2015), Potential for larger earthquakes in the East San Francisco Bay Area due to the direct connection between the Hayward and Calaveras Faults. *Geophysical Research Letters*, 42, 2734–2741. doi: 10.1002/2015GL063575.
- [3] **Johnson, C.W.**, R. Burgmann, and F. F. Pollitz (2015), Rare dynamic triggering of remote $M \geq 5.5$ earthquakes from global catalog analysis, *Journal of Geophysical Research: Solid Earth*, 120, doi:10.1002/2014JB011788.

2013

- [2] Lifton, Z.M., A. V. Newman, K. L. Frankel, **C.W. Johnson**, and T. H. Dixon (2013), Insights into distributed plate rates across the Walker Lane from GPS geodesy, *Geophysical Research Letters*, 40, doi:10.1002/grl.50804.

2012

- [1] Foy, T. A., K. L. Frankel, Z. M. Lifton, **C. W. Johnson**, M. W. Caffee (2012), Distributed extensional deformation in a zone of right-lateral shear: Implications for geodetic versus geologic rates of deformation in the eastern California shear zone-Walker Lane, *Tectonics*, 31, TC4008, doi:10.1029/2011TC002930.

Teaching Experience

University of California San Diego

Machine Learning for Physical Applications Upper division / Graduate course
Assisted Peter Gerstoft with ECE228 Spring 2019

University of California Berkeley

Structural Geology Upper division

Teaching Assistant Spring 2015 & Spring 2016

2015 Student Instructor Evaluations 6.2 (dept. avg. 5.75)

2016 Student Instructor Evaluations 6.2 (dept. avg. 5.95)

Case Studies in Earth Systems Upper division scientific writing

Teaching Assistant Fall 2013, Fall 2014, & Fall 2015

Georgia Institute of Technology
Energy and Society Lower division scientific writing
Teaching Assistant Spring 2012
Thermodynamics of Earth Systems Upper division
Teaching Assistant Fall 2011

Awards and Honors

Richard P. Feynman Postdoctoral Fellow, Los Alamos NL	2020-2023
National Science Foundation EAR Postdoctoral Research Fellowship	2017-2019
Louderback Award, Earth and Planetary Science, UC Berkeley	2017
National Science Foundation Graduate Research Fellowship Program	2012-2017
Earth and Atmospheric Sciences Quarter Century Award, Georgia Tech	2012
Rutt Bridges Research Initiative Award, Georgia Tech	2011
Presidential Undergraduate Research Award, Georgia Tech	2011
Anadarko/SEG Tuition Scholarship	2011-2012
Geological Society of America, Undergrad Research Grant, Georgia Tech	2011
Georgia Hope Scholarship	2008-2011

Invited Talks

Purdue University, West Lafayette, IN. Seismic noise is the signal: Learning the earthquake activity on the central San Andreas Fault. August 2021, Virtual Seminar Series

GAGE/SAGE 2021 Science Workshop, Online. Probing fault systems using hydrospheric induced stress modulation. August 2021

Princeton University, Princeton, NJ. Seismic noise is the signal: Learning the earthquake activity on the central San Andreas Fault. March 2021, Virtual Seminar Series

Berkeley Seismological Laboratory, Berkeley, CA. Seismic noise is the signal: Learning the earthquake activity on the central San Andreas Fault. March 2021, Virtual Seminar Series

ERC Tectonics Virtual Seminar Series. Characterizing emergent and impulsive non-tectonic signals in seismic waveforms. September 2020, Virtual Seminar Series

GAGE/SAGE 2020 Science Workshop, Breckenridge, Colorado. Probing fault systems using hydrospheric induced stress modulation. August 2020 CANCELED COVID-19

Japan Geoscience Union Meeting 2020, Chiba, Japan. Multiple classes of non-tectonic emergent and impulsive seismic noise identified in continuous waveforms. May 2020 Virtual Conference COVID-19

University of Southern California, Los Angeles, CA, "Seasonal water storage, stress modulations, and variations in seismicity", November 2019

Los Alamos National Laboratory, Los Alamos, NM, "What's all that seismic noise? Classifying emergent and impulsive signals in continuous waveforms", July 2019

California Institute of Technology, Pasadena, CA, "What's all that seismic noise? Classifying emergent and impulsive signals in continuous waveforms", July 2019

University of Grenoble Alpes, Grenoble, "Climate modulated water storage, the deformation, and California earthquakes" France, June 2019

Institute of Geophysics and Planetary Physics, University of California, San Diego. "Classifying emergent and impulsive seismic noise in continuous waveforms with machine learning models" April 2019

IRIS Workshop 2018, Albuquerque, New Mexico. "Climate modulated water storage, the deformation, and California earthquakes" June 2018

Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Yokohama Institute for Earth Science, Yokohama, Japan. "Climate modulated water storage, the deformation, and California earthquakes" May 2018

Japan Geoscience Union Meeting 2018, Chiba, Japan. "Climate modulated water storage, the deformation, and California earthquakes" May 2018

Institute of Geophysics and Planetary Physics, University of California, San Diego. "Climate modulated water storage, the deformation, and California earthquakes" Feb 2018

Department of Geological Sciences, University of Florida, Gainesville, FL. "Climate modulated water storage, the deformation, and California earthquakes" Feb 2018

American Geophysical Union Fall Meeting 2017, New Orleans, LA. "Seasonal water storage, stress modulation and California seismicity" G53B-01 Dec 2017

Institute of Earth Sciences, Academia Sinica, Taipei, Taiwan. Workshop on Seasonal variations in hydrological, atmosphere, and tidal loads, and the association with fault deformation. Keynote Speaker "Evaluating surface loading sources, the background stress orientation, and seismic rate variations" Sept 2017

Dept. of Earth Sciences, National Taiwan Normal Univ., Taipei, Taiwan. "Stress models of the hydrospheric, atmospheric, thermal, and tidal loading: Perturbations to the background stress and changes in seismicity" Sept 2017

Lawrence Berkeley National Lab. Berkeley, CA. "Seasonal stress modulation on active California fault structures" July 2017

Computation in Geophysics Workshop. Denver, CO. "Seasonal stress modulation on active California fault structures" June 2017

EarthScope National Meeting. Anchorage, AK. "Seasonal stress modulation on active California fault structures" May 2017

Department of Geological Sciences, University of Texas at Austin. Austin, TX. "Seasonal loading modulating seismicity on California faults" April 2017

Synergistic Activities

Workshops

Apr 2022 SSA Instructor: Adv. Topics in Machine Learning, Seattle, WA

Mar 2019 Machine Learning in Solid Earth Geosci., LANL, Santa Fe, NM

Sept 2018 SCEC Community Rheology Workshop, Palm Springs, CA

June 2018 IRIS Workshop, Albuquerque, NM

Mar 2018 UNAVCO Annual Workshop, Boulder, CO

Feb 2018 Machine Learning in Solid Earth Geosci., LANL, Santa Fe, NM

Oct 2017 EarthScope Hydrogeodesy Workshop, SIO, La Jolla, CA

Sep 2017 Institute of Earth Sciences, Academia Sinica, Taipei, Taiwan

Jun 2017 Computation in Geophysics Workshop. Golden, CO
Jan 2017 USGS Earthquake Hazards Workshop, Menlo Park, CA
Oct 2016 State of Stress in the Earth, LANL, Santa Fe, NM
Sep 2016 SCEC Community Geodetic Model Workshop
Mar 2016 UNAVCO Annual Workshop, Boulder, CO
Jan 2016 USGS National Hazards Workshop, Menlo Park, CA
Sep 2014 SCEC Community Geodetic Model, Palm Springs, CA
Jul 2014 UNAVCO GMTSAR Workshop, Longmont, CO
Jul 2014 CIG PyLith Workshop, Palo Alto, CA
Oct 2013 Statistics and Triggering of Earthquakes, Banff, Canada

Peer Review

AGU Advances
Earth and Planetary Science Letters
Geochemistry, Geophysics, Geosystems
Geophysical Journal International
Geophysical Research Letters
Nature Communication
NSF proposals
Journal of Geophysical Research: Solid Earth
Pure and Applied Geophysics
Science Advances
Seismological Research Letters

Outreach

Sally Ride Junior Academy Instructor, San Diego CA. 2018
EPS Department Coordinator for Bay Area Science in Schools outreach program organized by Community Resources for Science (crscience.org) from 2015-2017.
Lead activities for the Berkeley Seismological Laboratory outreach program. Involvement includes developing lesson plans for earthquakes, faulting, earthquake safety, and preparedness for the 6th – 8th grade level. Travel to local middle schools, with a focus on underrepresented communities, and give 1-2 hour lessons with a lab component on earthquake faulting, liquefaction, and safety.

Media

Masumi Yamada (2020), Super Dense Array Measurement Magnifies Seismic Wavefields, *Eos Geology and Geophysics Editors' Highlights*. Published on 5 August 2020.
Kornei, K. (2019), Wind-triggered ground shaking masks microseismicity, *Eos*, 100, <https://doi.org/10.1029/2019EO130989>. Published on 20 August 2019.
Something You Probably Didn't Expect From the Huge Sierra Snowpack: Earthquakes, Craig Miller, *NPR station KQED*, 06/15/2017
San Andreas Fault Earthquakes Are Triggered by Winter Rain and Snow, Scientists Discover, Hannah Osborne, *Newsweek*, 06/15/2017

Shifting water weight can trigger small earthquakes in California, Warren Cornwall, *Sciencemag*, 06/15/2017

Seasonal water changes may trigger earthquakes, UC Berkeley researchers say, Jana Katsuyama, *KTVU*, 06/16/2017

Rain and snow help stress out earthquake faults, A little bit, Mary Beth Griggs, *Popular Science*, 06/15/2017

How Rain and Snow Could Play a Role in Triggering Earthquakes, John Perritano, *How Stuff Works*, 06/22/2017

Snow and rain tug on earthquake faults in California, Maria Temming, *Science News*, 07/03/2017

Affiliations

American Geophysical Union, since 2010

Seismological Society of America, since 2013

UNAVCO / WInSAR, since 2012

Southern California Earthquake Center, since 2012

Non-academic Experience

Diesel Technician (2000-2008)

Certified ASE Master Level Technician Medium/Heavy Trucks (2003-2008)