Christopher Milliner

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POST-DOCTORAL EXPERIENCE

Postdoc Scholar – Caltech	July 2020-present
Postdoc Fellow - JPL, NASA	Sep. 2017-2020
Postdoc Scholar - UC Berkeley	2016-2017

EDUCATION

University of Southern California, Los Angeles, CA. Advisor: Prof. James Dolan and Charlie Sammis	Geology	Ph.D., 2016
Imperial College of London, London, UK	Geology and Geophysics	M.Sci., 2010
UCLA - Year of international studies		2008-2009

RESEARCH INTERESTS

Characterizing geohazards and risk – Developing a novel probabilistic methodology that quantifies the hazard of fault rupture with collaboration from industry and federal and state agencies.

Quantifying fault zone deformation – Understanding mechanics and processes of how faults release strain, including: off-fault damage patterns, co-seismic slip variation, post-seismic afterslip and viscoelastic relaxation in the upper mantle, and inter-seismic strain accumulation.

Development of geodetic techniques – Optical image correlation, InSAR, lidar differencing and GPS to measure tectonic surface deformation. Development of Air2Lidar3D, a new geodetic method using lidar and optical correlation to quantify, coseismic surface deformation patterns in 3D.

PUBLICATIONS

Milliner, C. W. D., A., Aati, S., Avouac, J-P. (*in review*), Fault Friction Derived from Fault Bend Influence on Coseismic Slip During the 2019 Ridgecrest Earthquake. *Science Advances*

Rodriguez Padilla, A., Oskin, M., **Milliner, C. W. D.**, and Plesch, A. (*in press*), Widespread rock damage from the 2019 Ridgecrest earthquakes. *Nature Geoscience.*

Milliner, C. W. D., Donnellan, A., Aati, S., Avouac, J-P., Zinke, R., Dolan, J. (2021), Bookshelf Tectonics and the Effects of Dilatation on Fault Zone Inelastic Deformation: Examples from Image Correlation of the 2019 M_w 7.1 Ridgecrest Earthquake. *Journal Geophysical Research: Solid Earth.* https://doi.org/10.1029/2020JB020551

Milliner, C. W. D., Bürgmann, R., Teng, W., Inbal, A., Bekaert, D. (2020), Resolving Kinematics of Early Afterslip: Implications for the Shallow Slip Deficit Problem, *Journal Geophysical Research: Solid Earth.* doi:10.1029/2019JB018928

Milliner, C. W. D., Donnellan, A. (2020), Using Planet Labs Satellite Imagery to Separate the Surface Deformation Between the July 4th M_w 6.4 Foreshock and July 5th M_w 7.1 Mainshock During the 2019 Ridgecrest Earthquake Sequence. *Seismological Research Letters.* doi.org/10.1785/0220190271

Xu, X., Sandwell, D.,Ward, L., **Milliner, C. W. D.**, Smith-Konter, B., Fang, P., Bock, Y., (2020), Surface Deformation Near the 2019 Ridgecrest Earthquake Sequence: Compliant Faults or Triggered Frictional Slip? *Science.* doi: 10.1126/science.abd1690

Milliner, C. W. D., Materna K., Bürgmann, R., Fu, Y., Bekaert, D., Adhikari, S., D., Argus (2018), Tracking the Weight of Hurricane Harvey's Stormwater using GPS data, *Science Advances.* doi: 10.1126/sciadv.aau2477

DuRoss, C. B., R. D. Gold, T. E. Dawson, K. M. Scharer, K. J. Kendrick, S. Akciz, S. J. Angster, J. Bachhuber, S. Bacon, S. EK. Bennett, **Milliner, C. W. D.**, et al. (2020). Surface Displacement Distributions for the July 2019 Ridgecrest, California,Earthquake Ruptures,Bull. Seismol. Soc. Am.,1–19, doi.org/10.1785/0120200058

Ponti, D.J., Blair, J.L., Rosa, C.M., Thomas, K., Pickering, A.J., Akciz, S., Angster, S., Avouac, J.P., Bachhuber, J., **Milliner, C. W. D.**, et al. (2020). Documentation of surface fault rupture and ground deformation features produced by the Ridgecrest M6. 4 and M7. 1 earthquake sequence of July 4 and 5, 2019. *Seismol. Res. Lett.* doi.org/10.1785/0220190322

Chen, K., **Milliner, C. W. D.,** Avouac, J.P., (2019), The Weitin fault, Papua New Guinea, ruptured twice by M_w 8.0 and M_w 7.6 earthquakes in 2000 and 2019. *Geophysical Research Letters.* doi.org/10.1029/2019GL084645

Chen, K., Avouac, J.P., Aati, S., **Milliner, C. W. D.,** Zheng F., Shi C., (2019) Cascading and pulse-like ruptures during the 2019 Ridgecrest earthquakes in East California Shear Zone. *Nature Communications.* https://doi.org/10.1038/s41467-019-13750-w

Donnellan, A., Parker, J., **Milliner, C. W. D**., Farr, T., Glasscoe, M., Lou, Y., Zheng, Y., Hawkins, B., (2018) UAVSAR and Optical Analysis of the Thomas Fire Scar and Montecito Debris Flows: Case Study of Methods for Disaster Response using Remote Sensing Products. *Earth and Space Science.* doi.org/10.1029/2018EA000398

Allam, A.A., Kroll, K.A., **Milliner, C.W.D.**, Richards-Dinger, K.B., (2019) Effects of Fault Roughness on Coseismic Slip and Hypocenter Locations. *Journal Geophysical Research: Solid Earth.* doi.org/10.1029/2018JB016216

Bao, H., Ampuero, J. P., Meng, L., Fielding, E., Liang, C., **Milliner, C. W. D.,** Huang, H., and Feng, T., (2019) Early and persistent supershear rupture of the 2018 magnitude 7.5 Palu earthquake. *Nature Geoscience.* doi.org/10.1038/s41561-018-0297-z

Williamson, A., Melgar, D., Xu, X., and **Milliner, C. W. D.** (2020) Complex co-seismic and landslide source of the 2019 Palu, Indonesia tsunami. *Seismological Research Letters.*

Milliner, C. W. D., C. Sammis, A. Allam, J. Dolan, J. Hollingsworth, S. Leprince, and F. Ayoub (2016a), Resolving Fine-Scale Heterogeneity of Co-Seismic Slip and the Relation to Fault Structure, *Nature Scientific Reports, 6,* 27201. doi:10.1038/srep27201

Milliner, C. W. D., J. F. Dolan, J. Hollingsworth, S. Leprince, and F. Ayoub (2016b), Comparison of Coseismic Near-Field and Off-Fault Surface Deformation Patterns of the 1992 Mw 7.3 Landers and 1999 Mw 7.1 Hector Mine Earthquakes: Implications for Controls on the Distribution of Surface Strain, *Geophys.Res.Lett., 43,* 10,115-10,124, doi:10.1002/2016GL069841.

Milliner, C. W. D., J. F. Dolan, J. Hollingsworth, S. Leprince, F. Ayoub, and C. G. Sammis (2015), Quantifying near-field and off-fault deformation patterns of the 1992 M_w 7.3 Landers earthquake, *Geochem. Geophys. Geosyst*., 16, doi:10.1002/2014GC005693.

Xu, X., X. Tong, D. T. Sandwell, **C. W. D. Milliner**, J. F. Dolan, J. Hollingsworth, S. Leprince, and F. Ayoub (2016), Refining the Shallow Slip Deficit, *Geophysical Journal International, 204,* 1867-1886. doi: 10.1093/gji/ggv563

GRANTS and AWARDS and ACHIEVEMENTS

2021 – European Space Agency astronaut candidate – currently at second stage of interview process.
2020 – Awarded 3-year NASA ROSES ESI grant as Science PI with Prof. Jean-Philippe Avouac
2020 – Awarded SSA Global Travel Grant ($1,100)
2019 – $19,580 SCEC grant – Development of Next-Generation PFDHA Using Geodetic Imaging Data.

2019 – Convener for Ridgecrest earthquake session at 2020 SSA annual meeting.
2019 – Reviewer Panelist for NASA ROSES Graduate Student Fellowship (FINNEST).
2018 – Awarded 3-year NASA ROSES ESI grant with Don Argus: *'Distinguishing between Solid Earth Deformation produced by Seismic Transients, Water Loading, and Groundwater Change*'.
2018 – JPL's Outstanding Postdoctoral Research Award, selected by JPL scientists for work in Earth Science.
2016 – Awarded nationally competitive NASA Postdoc fellowship: *"Numerical Modeling of Geodetic Imaging"*
2016 – Awarded 3-year NASA ROSES ESI grant as Science PI with Roland Burgmann
2015 – Gordon Conference Research award on Rock Deformation - $1500.
2015 – Technical assistant for Team-X at NASA, JPL for Earth Venture proposal, developing a new satellite sensor specifically for tectonic geodesy and earthquake geology.
2015 – Seismological Society of America - Outstanding Student Award for oral presentation.
2015 – Awarded $20,000 SCEC grant - Air2Lidar3D – a new geodetic technique to measure coseismic near-field deformation in 3D for historic earthquakes that lack pre-event Digital Elevation Models.
2015 – STEM 2nd place winner USC graduate research competition - $750.
2015 – Adam Fischer Research award - $1500.
2015 – Session Chair and organizer, AGU meeting: *"Characterization of fault zones from the surface through the seismogenic zone using field, geodetic, and seismological methods."*
2015 – USC graduate research fellowship award.
2011 – USC graduate merit scholarship award.

INVITED TALKS

- "Measuring the Degree of Strain localization along Coseismic Surface Ruptures Using Optical Image Correlation: Implications for Understanding Fault Mechanics and Displacement Hazard", T11D-01. **2021 AGU Fall meeting,** New Orleans, Lo., 13th Dec.
- "Measuring Distributed Inelastic Deformation Using Optical Image Correlation to Understand the Mechanics and Hazard of Fault Zones", **Keynote talk at Southern California Earthquake Center** Annual Meeting, 2021.
- "Overview of a Geodetic-based PFDHA approach", **International Atomic Energy Agency**, Vienna, Austria. https://www.iaea.org/events/evt2003697
- "Estimating the Driving Coseismic Stress Field Using 3D Geodetic Imaging Data" **Seismological Society of America,** Annual Virtual Conference, April 2021.
- "Development of a Geodetic-based Probabilistic Fault Displacement Hazard Analysis" **Caltech,** Pasadena, 2019.
- "How do Fault Systems Release Strain? Insights Using Novel Geodetic Imaging Techniques". **San Diego State University.** San Diego, 2018
- "How do Fault Systems Release Strain? Insights Using Novel Geodetic Imaging Techniques". **California State University Northridge.** Northridge, 2017
- "Quantifying Near-Field Deformation of Large Magnitude Strike-Slip Earthquakes using Optical Image Correlation: Implications for Empirical Earthquake Scaling Laws and Safeguarding the Built Environment." **2016 AGU Fall meeting,** San Francisco, Calif, 16 Dec.
- "Quantifying Near-Field Deformation of Large Magnitude Strike-Slip Earthquakes using Optical Image Correlation: Implications for Empirical Earthquake Scaling Laws and Safeguarding the Built Environment." Fault Displacement Hazard Workshop**, USGS Menlo** Calif, 16 Dec, 2016
- "Near-Field Deformation Patterns of Large Magnitude Strike-Slip Earthquakes Using Sub-Pixel Correlation of High-Resolution Air Photos" **Gordon Conference on Rock Deformation**.

Hanover, NH, 2016.

FEATURES IN THE NATIONAL/ INTERNATIONAL NEWS

- Video and article by Science AAAS on hurricane Harvey study: (https://bit.ly/2ptvwcL).
- Radio interviews with BBC (https://bbc.in/2PRclom) and CBC (https://bit.ly/2DaPYrJ) on hurricane Harvey study.
- NASA press release: https://go.nasa.gov/2DiWSfL
- Select articles on hurricane Harvey study: the U.N. Disaster Reduction (https://bit.ly/2zdUEJ5), Science News (https://bit.ly/2RmkodF), The Independent (https://ind.pn/2yE5tVA).

TEACHING and MENTORSHIP EXPERIENCE

Teaching Assistant – Graduate Level (USC) 2015

Advanced Seismology – Graduate level class – Developed lab materials and led problem solving for

Teaching Assistant – Undergraduate Level (USC) 2013-2016

- Head TA for Introduction to Earthquakes, leading a team of 3 other TA's
- 3 years experience teaching Introduction to Earthquakes. Responsible for 60 students for three, 2 hour weekly labs, which includes 20 minute presentation, proctoring of quizzes and exams, and office hours.
- Recipient of TA award twice, based on anonymous student feedback surveys.
- Lead and organized 2-day field trips of active tectonics around the LA area including, mapping of San Andreas, Hollywood, and San Gabriel faults and overview of earthquake engineering of LA's infrastructure.

Volunteer service

- Mentored a high-school female science student from a disadvantaged background to help inspire interest in science and research. This required weekly mentorship and guidance and creating a feasible research project for the 3-month duration of the research program.
- Mentored Masters student at UC Berkeley, gave guidance and direction for help with Masters thesis and research project.
- Volunteer Earth Science ambassador at JPL, NASA. This involved educating the public on Earth Science and communicating what we do and the types of remote sensing instrumentation we use to study geohazards.

WORKSHOPS

2019 – Fault Displacement Hazards Workshop, SCEC, Pomona, CA.
2019 – Community Geodetic Model, SCEC, Palm Springs, Annual meeting 2019
2016 – Fault Displacement Hazards Workshop (PFDHA), USGS Menlo Park, CA.
2016 – SoSAFE: Project Successes and Future Challenges. SCEC annual meeting
2016 – Gordon Conference: Rock Deformation – Hanover, NH.
2015 – Caltech Software Carpentry – Computational workshop for geoscientists
2014 – Post-Earthquake Rapid Scientific Response Workshop, Palm Springs, CA, SCEC annual meeting

2013 – GMTSAR, InSAR processing workshop. Boulder, CO. UNAVCO
2013 – Lidar processing workshop, UC San Diego. UNAVCO
2012 – Advanced numerical crustal modeling workshop, Golden, CO. SCEC