

2024 Northern California Earthquake Hazards Workshop – The Too Many Earthquake Anniversaries Edition

January 30 – February 1, 2024

USGS, virtual from Moffett Field, California

Pacific Standard Time (UTC-8)

Day 1, Tuesday, January 30

9:30-9:45 a.m. Welcoming Remarks

Christine Goulet, Earthquake Science Center Director (USGS)
Sarah Minson, Northern California Earthquake Hazards Program Coordinator (USGS)
John Grindle, Workshop Format (Grin Events)

9:45-11:30 a.m. Ethical earthquake investigation

Speakers [15 min each]:

Rachel Adams (CU Boulder Natural Hazards Center) *Resources for Ethical Earthquake Research*
Leila Darwish (Disaster Resilience & Risk Reduction Specialist, City of Vancouver) *Considerations for Equitable Earthquake Recovery & Community Collaboration*
Eduardo Miranda (Stanford) *Post-earthquake reconnaissance in developing countries*
Lindsay Davis (USGS) *Ethical earthquake investigation: an international humanitarian assistance perspective*
Lilia Yumagulova (Preparing Our Home; University of Saskatchewan) *Cultural safety and ethical space in earthquake preparedness planning in Indigenous communities*

Round Table Discussion: 30 min

Moderators: **Sue Hough** (USGS), **Maggie Ortiz-Millan** (EERI)

11:30 a.m.-12:30 p.m. Break

12:30-1:30 p.m. Thunder Talks I [4 min each]

Moderator: **Grace Parker** (USGS)

Arben Pitarka (LLNL), **Michael Barall** (USGS), **Domniki Asimaki** (Caltech), **Irene Liou** (UC Davis), **Albert Kottke** (PG&E), **Evan Reis** (Safehub), **Mike Greenfield** (Greenfield Geotechnical), **Kenneth Hudson** (Hudson Geotechnics, Inc. & UCLA), **Emrah Yenier** (Haley & Aldrich), **John Downes** (UW), **Max Schneider** (USGS), **Zahraa Saiyed** (Scyma Consulting/World Bank)

1:30-1:45 p.m. Break

1:45-2:45 p.m. Thunder Talks II [4 min each]

Moderator: **Josie Nevitt** (USGS)

Clifford Thurber (UW Madison), **Arthur Rodgers** (LLNL), **Eric Matzel** (LLNL), **Guoliang Li** (USC), **Weiqiang Zhu** (UC Berkeley), **Rob Skoumal** (USGS), **Yifang Cheng** (UC Berkeley), **Felix Waldhauser** (Columbia University), **Scott Marshall** (Appalachian State University), **Scott Callaghan** (SCEC), **Mark Benthien** (SCEC/USC)

2:45-3:00 p.m. Break

3:00-4:40 p.m. Earthquake early warning around the world and back to northern California

Speakers [10 min each]:

Mitsuyuki Hoshiba (JMA) *Review of nationwide earthquake early warning in Japan: 15 years' operation by JMA*
Allen Husker (Caltech) *EEW in central Mexico – The Seismic Alert System (SASMEX)*
Francesco Finazzi (University of Bergamo) *Crowd-sourced smartphone-based EEW. The Earthquake Network citizen-science initiative*
Elizabeth Cochran (USGS) *ShakeAlert: An Earthquake Early Warning System for the West Coast of the United States*
Frannie Edwards (SJSU Mineta Transportation Institute) *EEW Systems and Emergency Management*
Ann Bostrom (UW) *Recent evolution of EEW expectations and needs on the US West Coast*

Round Table Discussion and Q&A: 40 min

Moderators: **Sara McBride** (USGS), **Jessie Saunders** (Caltech)

4:40 p.m. SPECIAL PRESENTATION: Mitsuyuki Hoshiba (JMA) Overview of the 2024 Noto peninsula earthquake

5:00 p.m. Adjourn day 1

Welcome to the U.S. Geological Survey. We serve the Nation by providing reliable scientific information. The USGS strives to provide a diverse, inclusive, and respectful environment because it is essential to the integrity of our organization and our science. If anything fails to exemplify these ideals, please alert an organizer for immediate assistance.

Day 2, Wednesday, January 31

9:30-11:00 a.m. 1989 Loma Prieta earthquake: Part I – A lesson in liquefaction

Speakers [15 min each]:

Tom Holzer (USGS) *Liquefaction and the Loma Prieta Earthquake and implications for future Northern California earthquakes*

Jorge Macedo (Georgia Institute of Technology) *Harbor Bay Business Park liquefaction during Loma Prieta earthquake - A critical state perspective*

Kristin Ulmer (Southwest Research Institute) *Energy-based Framework for Evaluating Liquefaction*

Davis Engler (USGS) *A Bayesian framework for incorporating surficial geology and CPT records within the USGS Ground Failure Liquefaction product*

Discussion: 30 min

Moderators: **Robb Moss** (Cal Poly San Luis Obispo), **Eric Thompson** (USGS)

11:00-11:10 a.m. Break

11:10 a.m.-12:30 p.m. 1989 Loma Prieta earthquake: Part II – Impacts on stakeholders then, now, and in the future

Speakers [10 min each]:

Cynthia Kroll, Retired Chief Economist, Association of Bay Area of Governments (ABAG/MTC)

Jeff Bachhuber, Director of Geosciences, Pacific Gas & Electric Company (PG&E)

Roberts McMullin, Senior Civil Engineer, East Bay Municipal Utility District (EBMUD)

Tim Dawson, Manager of Seismic Hazards Program, California Geological Survey (CGS)

Bart Ney, Office Chief Public Affairs & Strategic Communications, Caltrans Bay Area

Discussion: 30 min

Moderators: **Tom Brocher** (USGS scientist emeritus), **Ruth Harris** (USGS)

12:30-1:30 p.m. Break

1:30-3:30 p.m. Earthquakes and climate change: how climate change increases earthquake vulnerability and impacts

Speakers [15 min each]:

Lori Dengler (Cal Poly Humboldt) *The Great Alaska earthquake of 1964 and the evolution of the modern tsunami warning system*

Michael Furniss (Cal Poly Humboldt) *Remembering the Christmas Storm of 1964*

Daniel Swain (UCLA) *Will increasing 'hydroclimate whiplash' in a warming climate amplify co-seismic hazards in California (and beyond)?*

Deepti Singh (Washington State University) *Compounding climate events and their influence on disaster vulnerability and preparedness*

Charles Scawthorn (Pacific Earthquake Engineering Research Center, U.C. Berkeley and PA Risk LLC) *Climate change effects on earthquake risk*

Noah Patton (National Low Income Housing Coalition) *Affordable Housing and Disaster Recovery: Challenges and Best Practices*

Discussion: 30 min

Moderators: **Steve Ingebritsen** (USGS), **Jia Wang-Connelly** (CalOES)

3:30-3:45 p.m. Break

3:45-4:45 p.m. Thunder Talks III [4 min each]

Moderator: **Austin Elliott** (USGS)

Christie Rowe (McGill University), **Dana Marino** (McGill University), **Chris Bloszies** (LCI), **Kim Blisniuk** (SJSU), **Tyler Ladinsky** (CGS),

Ben Melosh (USGS), **Don Hoirup** (CADWR), **Allyson Carroll** (Cal Poly Humboldt), **Stephen DeLong** (USGS), **Clara Yoon** (USGS),

Danielle Lindsay (UC Berkeley), **John Eidinger** (G&E Engineering Systems), **Lori Dengler** (Cal Poly Humboldt)

4:45 p.m. Adjourn day 2

Day 3, Thursday, February 1

9:30-11:15 a.m. **2014 South Napa, 2004 Parkfield, and earthquakes around the world: afterslip, afterslip, and more afterslip**

Speakers [15 min each]:

Jan Premus (Géoazur Laboratory) *Friction driven seismic and postseismic slip of the 2014 South Napa earthquake*

Nicola D'Agostino (INGV) *Space-time distribution of afterslip following the 2009 L'Aquila earthquake*

Ziyadin Cakir (Istanbul Technical University) *Surface creep along the East Anatolian Fault (Turkey) and the Mw 6.8 February 24, 2020 Elazığ Earthquake*

Celeste Hofstetter (UC Riverside) *Did creep stop the 2023 Mw7.8 Pazarcik earthquake rupture?*

Rob Churchill (Guy Carpenter) *Aseismic Afterslip: an important, but not universal, driver of Aftershock Sequences*

Discussion: 30 min

Moderator: **Junle Jiang** (University of Oklahoma), **Kathryn Materna** (University of Colorado)

11:15 a.m.-12:15 p.m. **Break**

12:15-2:15 p.m. **When earthquakes come in twos and fours: the 2023 Turkiye and 2023 Afghanistan earthquakes**

Speakers [15 min each]:

Nadine Reitman (USGS) *The 2023 Türkiye Earthquakes: Response, surface rupture, and hazard implications*

Richard Walker (University of Oxford) *Seismotectonic and societal aspects of the 2023 7-15th October Herat, Afghanistan, earthquake sequence*

Jeanne Hardebeck (USGS) *Stress Shadows: Insights into the Physics of Earthquake Triggering*

Annemarie Baltay (USGS) *Mistaken (ground motion) identity: doublets vs. aftershocks*

Robert Graves (USGS) *Broadband Ground Motion Simulations for Scenario Earthquakes on the Hayward and Calaveras Faults*

Jessica Velasquez (Moody's RMS) *The Risky Business of Clustered Events: Navigating the complexities of damage attribution, hours clauses, and progressive damage*

Discussion: 30 min

Moderators: **Noha Farghal** (Moody's RMS), **Kevin Milner** (USGS)

2:15-2:30 p.m. **Break**

2:30-4:00 p.m. **One earthquake = One critical lesson learned**

Speakers [10 min each]:

David Wald (USGS) *The 100th Anniversary of the Great Kanto (Tokyo) Earthquake and Fire*

Bob McPherson (Cal Poly Humboldt) *A diverse aftershock response for the 1992 M = 7.2 Cape Mendocino earthquake*

Sue Hough (USGS) *The 1994 Northridge Earthquake: A Watershed Event for Instrumental Seismology and Macroseismology*

David Schwartz (USGS) *1974 Trans Alaska Pipeline Design vs 2002 M7.9 Denali Fault Surface Rupture: And the Lesson Learned Is...*

Anne Wein and **Sara McBride** (USGS) *Canterbury Earthquake Sequence: Preparing for long term communication about aftershocks*

David Shelly (USGS) *Subduction zone fault systems intertwined: How the intraslab 2022 M 6.4 Ferndale earthquake triggered postseismic slip on the subduction interface*

Jon Stewart (UCLA) *Benefits and Impacts of Post-Event Reconnaissance*

Discussion: 20 min

Moderator: **Laurie Johnson** (Laurie Johnson Consulting), **Michael Oskin** (UC Davis)

4:00 p.m. **Concluding Remarks**

4:15 p.m. **Adjourn**

Thunder Talks I

Arben Pitarka (LLNL) *5Hz Ground Motion Simulations of the 1989 Loma Prieta Earthquake Using a Deterministic Approach*

Michael Barall (USGS) *Non-Linear Radiation Damping Applied to Hayward Dynamic Rupture Simulations*

Domniki Asimaki (Caltech) *Data-Driven Nonlinear Site Response for Regional-Scale Ground Motion Simulations*

Irene Liou (UC Davis) *Characterizing aleatory variability and epistemic uncertainty in 3D simulations*

Albert Kottke (PG&E) *Probabilistic earthquake scenarios of ground shaking and ground deformation in the SF Bay Region*

Evan Reis (Safehub) *Real time earthquake damage notifications using low cost instrumentation in the Bay Area*

Mike Greenfield (Greenfield Geotechnical) *A remarkable absence of liquefaction: Data-driven lessons from the 2014 South Napa Earthquake*

Kenneth Hudson (Hudson Geotechnics, Inc. & UCLA) *Next Generation Liquefaction Probabilistic Triggering and Manifestation Models*

Emrah Yenier (Haley & Aldrich) *Mean Period of Ground Motions for Cascadia Subduction Earthquakes*

John Downes (UW) *Tracking Perceptions and Attitudes in Washington, Oregon and California about the Earthquake Early Warning System for the United States of America*

Max Schneider (USGS) *Translating user needs into new maps and visualizations for aftershock forecasts*

Zahraa Saiyed (Scyma Consulting/World Bank) *Equity and social vulnerability in earthquake and wildfire risk mitigation policy*

Thunder Talks II

Clifford Thurber (UW Madison) *Development and validation of a 3D tomographic seismic velocity model for the San Francisco Bay area*

Arthur Rodgers (LLNL) *Adjoint Waveform Tomography of the Greater San Francisco Bay Area*

Eric Matzel (LLNL) *Fault imaging using virtual seismometers*

Guoliang Li (USC) *Multi-scale seismic imaging of fault-zone structures in Southern California with full-waveform inversions of regional and dense array data*

Weiqiang Zhu (UC Berkeley) *PhaseNet+: A Multi-task Deep Learning Model for Seismic Arrival Time and Polarity Picking and Source Parameter Prediction*

Rob Skoumal (USGS) *SKHASH: A Python Package for Computing Earthquake Focal Mechanisms*

Yifang Cheng (UC Berkeley) *Stress map of California: Interaction between fault and stress along the transform boundary in California inferred from focal mechanisms of small earthquakes*

Felix Waldhauser (Columbia University) *Towards real-time monitoring of repeating earthquakes in northern CA*

Scott Marshall (Appalachian State University) *The SCEC Community Fault Model in Northern California*

Scott Callaghan (SCEC) *Updates on CyberShake in Northern California*

Mark Benthien (SCEC/USC) *HayWired Scenario Exercise Toolkit: New Topics and Training Opportunities*

Thunder Talks III

Christie Rowe (McGill University) *How wide are faults and when does it matter?*

Dana Marino (McGill University) *Exploring the Geomorphic Expression of the Northern Calaveras Fault*

Chris Bloszies (LCI) *Paleoseismic Investigation of the Lafayette fault and the Contra Costa Shear Zone: an uncharacterized and potential transfer structure within the East Bay Hills, Contra Costa County, CA*

Kim Blisniuk (SJSU) *Updated slip rates and field observations on faults of the northern San Andreas Fault: implications on kinematic models and earthquake probability models for California*

Tyler Ladinsky (CGS) *Updated Alquist-Priolo Fault Zoning for the southern Rodgers Creek Fault*

Ben Melosh (USGS) *The geometry of fault reactivation and uplift along the central part of the Maacama fault zone, northern California Coast Ranges*

Don Hoirup (CADWR) *NWLSZ, Grizzly Valley Fault, trench findings*

Allyson Carroll (Cal Poly Humboldt) *Earthquake indicators in coast redwood tree rings along the North Coast San Andreas Fault*

Stephen DeLong (USGS) *Tectonic Geomorphology at the Mendocino Triple Junction*

Clara Yoon (USGS) *Distinct yet adjacent earthquake sequences near the Mendocino Triple Junction: 20 December 2021 Mw 6.1 and 6.0 Petrolia, and 20 December 2022 Mw 6.4 Ferndale*

Danielle Lindsay (UC Berkeley) *Slow moving landslide response to large earthquakes in Northern California*

John Eidinger (G&E Engineering Systems) *Lifeline impacts of the 2023 Ferndale earthquake*

Lori Dengler (Cal Poly Humboldt) *All new edition of Living on Shaky Ground, the Northern California earthquake tsunami preparedness magazine*