Potential contributions of SCEC near-fault observatory to ground motion modeling and seismic hazard analysis: Workshop Oct. 27 9:30-11:00 Pacific time

Conveners: Gail Atkinson and Jamie Steidl

Agenda:

Introductory Convenor Remarks with purpose of session (see Background below) (5 min)

Invited Presentations and Remarks (45 min)
Ken Hudnut – Zipper Arrays
Greg Lavrentiadis - Overview of Non-ergodic Ground-motion Modeling with Emphasis on Gaussian Process Regression
Norm Abrahamson - Informal remarks
Annemarie Baltay – Informal remarks
Albert Kottke – Informal remarks

Discussion on provided questions (listed below): notes will be taken (35 min)

Key takeaways and summary (5 min)

Discussion Questions
- What are the key science questions that are not, or not adequately answered today?
- What observations (type and timeline) are required to address these questions?
  Additionally, justification for the geometry, scale, spacing etc. for the choices made - or identify if modeling is still needed
- What will you learn prior to a large rupture (or with only small and moderate earthquakes)? (interseismic period?
- How does your topic / observation evolve as a major fault system is preparing for a large earthquake?
- What is directly derived from collecting these data (at least annually) to address your science focus / question?
- How will efforts in this topical area contribute to / encourage/ enable training the next generation of technologists and researchers?

Background: This zoom workshop will discuss potential contributions of the near-fault observatory proposal, being shaped by SCEC and collaborators, to ground motion modeling and seismic hazard analysis. Geophysical data collected within and around rupture zones of significant earthquakes are essential for testing and developing further models of earthquake processes. Focusing on in-situ observations in the immediate vicinity of fault zones where rocks suffer permanent deformation during faulting events could transform the understanding of earthquake physics, improve ground motion prediction estimates, and contribute to structural engineering efforts to mitigate earthquake impacts. This breakout session is one in a series of sessions intended to gather input from the broader earthquake science community on key research areas, science questions, and the data and experiments needed to address them in the near-fault zone. We focus this workshop on defining research questions in ground motion modeling and seismic hazard analysis that could be answered by the data gathered in this initiative.

As illustrated in the figures below, the NFO would provide extensive recording arrays across selected fault strands to gather near-fault ground motion records, which would be integrated with the regional array data at greater distances. This would fill in the near-fault ground motion data distribution – which is critical for ground motion modeling and hazard analysis, but currently sparse within 10 km of faults.

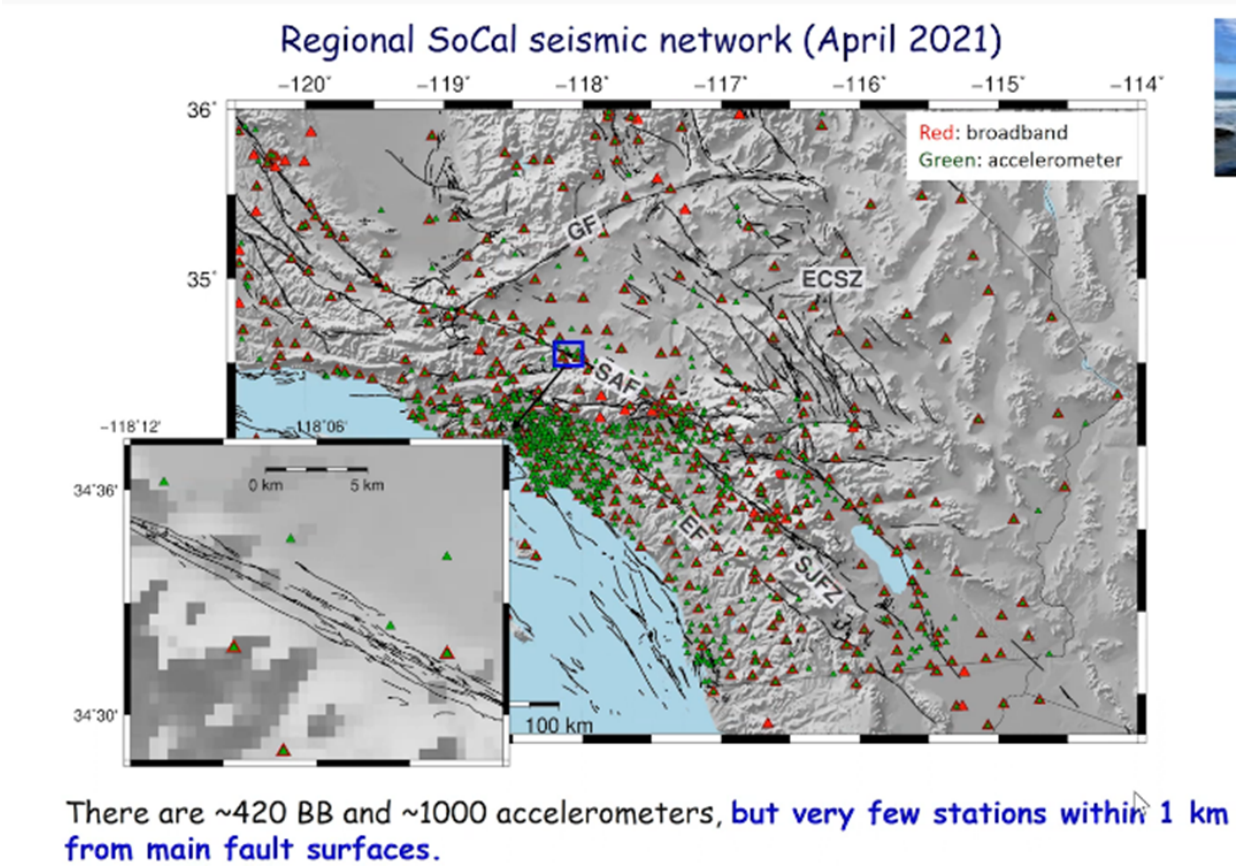

Figure 1 – Overall ground motion recording network in southern California as of 2021 (Ben-Zion, 2022)

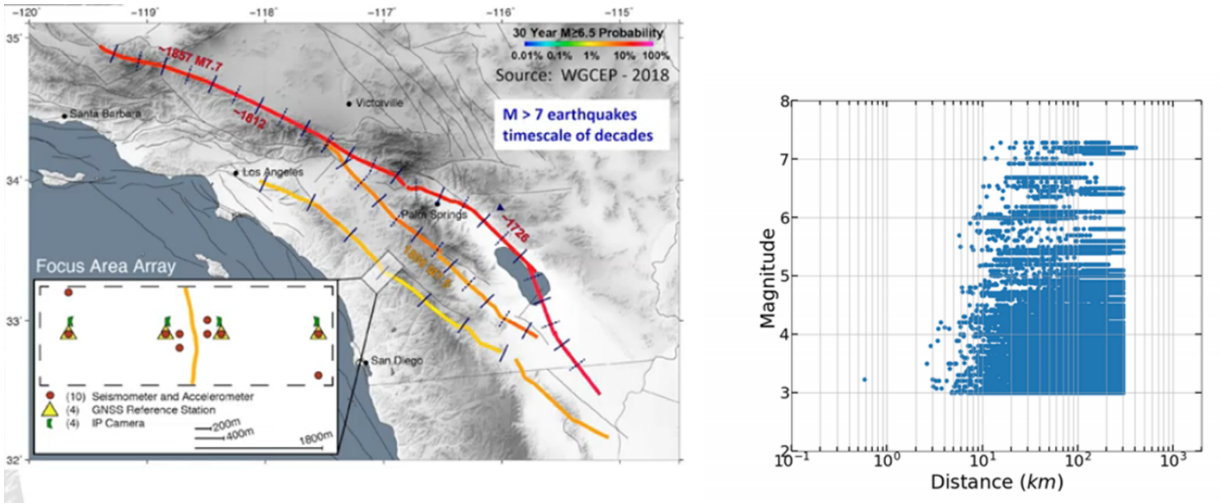

Figure 2 – Left: Schematic of potential locations of dense linear arrays to be placed across key fault strands (Ben-Zion, 2022). Right: Distribution of ground motion records in magnitude-distance space available (2021) for NGA-W3 (Lavrendiadis et al., 2022); note sparse distribution at <10km.

Critical research questions that could be addressed with these data include the following topics:

- ground motion processes and how they scale with magnitude near the source
- attenuation and shaking intensity at close distances (note: near-fault shaking intensity for moderate events has significant implications for induced seismicity hazards)
- site-specific ground motion distributions near faults
- single-station sigma for near-fault settings
- analytical models of site response including nonlinearity
- spatial coherence of ground motions
- potential of small earthquakes in earthquake forecasting and time-dependent hazard
- Evolution of co-seismic fault displacement through dense co-located geodetic and seismic instruments

Please join us (registration link below) on Oct. 27 to share your ideas and start the planning process for the exciting ground motion and hazard research that can be undertaken using the records of the proposed near-fault observatory.

Links/Information

- Link for registering for the meeting (ensure you use the same email that you have for your Zoom account, authentication is required for security): https://zoom.us/meeting/register/tJAsc-GtqzwiHdNXqYCSnBwtlYyzs3Jj2h-l
- For background on the community near-fault observatory concept, please watch this presentation (<15 minutes): https://www.youtube.com/watch?v=wkS7SdSYqrs.
- For more information and future events, please go to the website: https://www.iris.edu/hq/initiatives/near_fault
- DropBox for Back-Up Presentation Materials (optional for speakers, helps if something goes wrong with A/V): https://www.dropbox.com/request/POu9aREKNMfa6JnpAjhE