UC **SANTA BARBARA**

Department of Earth Science

Speakers Club

WEBB 1100 • THURSDAY May 23rd. • 2:00 PM

Near-Surface Rigidity Structure Calculation using Co-located Pressure and Seismic Stations

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Abstract: The coupling between the atmosphere and the solid Earth is strong for frequencies between 0.01 Hz and 0.05 Hz. In this frequency band, when the surface pressure is large, the atmosphere-generated seismic noise completely dominates the ocean-generated noise. We propose a novel approach to retrieve shallow elasticity structure using co-located pressure and seismic instruments for stations in the EarthScope Transportable Array by studying the atmosphere-ground interaction at low frequencies. Using a homogeneous half-space model for the solid Earth, for which analytical solutions exist, we estimate near-surface rigidity structure at 716 TA stations. The method consists of measuring the ratios between the horizontal seismic power spectral density (PSD) and the co-located pressure PSD at each station, from which we derive the near-surface rigidity. The rigidity map shows good spatial agreement with large-scale surface geological features, such as the Appalachian Mountains and the Mississippi Alluvium Plain. Our results correlate with various Vs30 models, although there are some stations that show clear differences. We believe close examinations on these differences will lead to improvements of Vs30 models, which are essential for site response and seismic hazard studies.

Joint Study of the 1952 Kern County, California Earthquake

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Our understanding of earthquakes that occurred prior to the establishment of the World-Wide Standardized Seismographic Network (WWSSN) is generally limited by the availability of high-quality geophysical observations. As a result, significant variability exists among source studies for important seismic events such as the historic 1952 Kern County earthquake.

The Kern County earthquake struck on the morning of July 21st, 1952 with an estimated surface wave magnitude of MS 7.6 [Gutenberg, 1955], making it the largest earthquake to occur in California since the great 1906 San Francisco earthquake. The main event, along with 267 aftershocks of magnitude 4.0 and greater [Richter, 1955], provides an excellent dataset for seismologists characterizing seismic hazards in Central California. Despite decades of research however, there remains unanswered questions regarding the earthquake's complex rupture sequence. Here, combining reported geodetic observations with a collection of previously unused, local seismic records, I conduct a series of inversions to constrain a slip model for the main event. Results suggest that the rupture initiates on a low-angle fault with dominant strike-slip motion (strike=49°/ dip=35°/ rake=11°) then triggers an abnormally energetic rupture on a high-angle fault plane (51°/ 75°/39°), 1.5 s later. This energetic rupture, contained within a 9×6 km patch near the hypocenter, accumulates 6–8 m of slip and has a high average static stress-drop (up to ~45 MPa). P waves excited by this powerful sub event saturate seismic records as far as Berkeley (~430 km away). The rupture continuously propagates along strike at a slow speed of ~1.5 km/s and initiates another, much larger sub event, where the majority of moment release occurs. The total rupture has a duration ~26 sec and an equivalent moment magnitude, Mw 7.3–7.4. The majority of moment release occurs within a 33 km section in the southwest portion of the White Wolf fault (assumed to be 60 km long). The weighted, average rake-angle over the southwest segment of the fault is ~60°, falling between previously published results.