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Plate Boundary Observatory Strainmeter Recordings of The M6.0 August 24, 2014 South Napa Earthquake

Kathleen Hodgkinson, David Mencin, David Phillips, Glen Mattioli, and Charles Meertens
UNAVCO, 6350 Nautilus Drive, Boulder, CO 80301-5394, United States (hodgkinson@unavco.org)

The 2014 Mw6.0 South Napa earthquake nucleated at 11 km depth near the West Napa fault, one of a complex system of sub-parallel major right lateral faults north of San Francisco that together accommodate much of the relative motion between the Pacific and North American tectonic plates. The South Napa event was the largest to have shaken the San Francisco Bay Area (SFBA) in almost 25 years. A major goal of the NSF-funded EarthScope Plate Boundary Observatory (PBO), installed and maintained by UNAVCO, was to enable researchers to study the interaction between the faults that form a plate boundary zone, and in particular, to investigate the role that aseismic transients contribute to strain accumulation and release. To realize this goal, PBO includes borehole tensor strainmeters (BSMs) installed in several targeted regions, including on to the north and east of San Francisco.

Two PBO BSMs have been operating in the SFBA since 2008: B057, north of San Francisco and 30 km from the epicenter, and B054, 3 km from the Hayward Fault and 40 km from the epicenter. We find the coseismic strains recorded by B057 are close to those predicted using elastic half-space dislocation theory and the seismically determined focal mechanism, while a more complicated variable slip model may be required for observations from B054. Months after the event, B057 continued to record a significant postseismic signal. In this presentation we document the coseismic signals recorded by the PBO BSMs and characterize the temporal behavior of the postseismic signal at B057.

The PBO network includes over 1100 GPS, 75 BSMs, 79 seismometers and arrays of tiltmeters, pore pressure sensors and meteorological instrumentation. UNAVCO generates an Earthscope Level 2 processed strain time-series combined into areal and shear strains for the PBO BSM network; the raw data are available from the IRIS DMC in mSEED format. For events of interest, such as the South Napa earthquake, UNAVCO generates a 1-sps processed strain time series that also includes tilt data, pore pressure and high-rate meteorological measurements if available. Site information, data quality measurements, current strain plots and strain time-series for all PBO strain instruments can be obtained from the UNAVCO PBO web page (http://www.unavco.org/data/strain-seismic/strain-seismic.html).