O-05

Recent Earthquake history of the south-central San Andreas Fault

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Characterizing the earthquake cycle along geologically mature plate boundary faults such as the San Andreas Fault (SAF) is valuable for fundamental models of earthquake physics and for seismic hazard applications. The constant ratcheting of increased observational strategy and capability with focused science questions generates new knowledge. Progress on understanding of the south central SAF behavior has come from the availability of high resolution topographic data, access to significant ^{14}C accelerator mass spectrometry geochronology, along with strategies of extensive paleoseismic excavations, use of paleoclimate constraints on the formation of offset features, and application of quasi-static earthquake simulation. High resolution topographic data (<1 m per pixel) from the B4 project (Bevis, et al., 2005) enabled us to develop a new dataset of offset landforms along the 1857 earthquake reach of the SAF and we found offset channel groupings in multiples of about 5 m along the Carrizo reach of the fault (Zielke, et al., 2010). Evidence for paleoearthquakes in numerous trench excavations along with a refined age model from ^{14}C dates (run at the Keck Carbon Cycle AMS laboratory at University of California Irvine) of new samples as well as archived samples from the Grant and Sieh, 1994 study indicate that surface rupturing earthquakes have occurred with about century long interevent times (Akciz, et al., 2009 and 2010). A one-to-one association of the offsets and the earthquake timing implies a slip rate for the last ~600 years > ~50 mm/yr which is not consistent with numerous geodetic or millennial time scale geologic slip rates along the south central SAF of ~35 mm/yr. A tie from marine drill core records of extreme floods from the southern California Coast ranges into the Santa Barbara Channel to possible incision ages of offset channels along the SAF in the Carrizo Plain when combined with the previously mentioned earthquake ages implies that the 10 and 15 meter offset groups may represent slip accumulated in more than 2 or 3 earthquakes (Grant-Ludwig, et al., 2010; Akciz, et al., 2010). This variable slip per event can be interpreted as coming from earthquakes having a range of magnitudes locally. Large magnitude events can include large offsets and smaller offsets could come from the "tails" of events reaching the Carrizo Plain. It may also be interpreted with a bimodal magnitude assumption in which some local events represent partial ruptures of the fault surface with moderate magnitudes and Gutenberg-Richter recurrence statistics--still surface rupturing but not contributing significantly to slip accumulation--and full ruptures of the fault surface with large slip and characteristic recurrence (Zielke and Arrowsmith, 2008; Akciz, et al., 2010)

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