New paleoseismological constraints on the behavior of the San Andreas Fault in the Carrizo Plain.

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Paleoseismological investigations of the San Andreas Fault in the Carrizo Plain have greatly influenced models of fault behavior and seismic hazard. Early geomorphic analysis of channel offsets near Wallace Creek led to development of a hypothesis that the Carrizo Plain segment is unusually strong and produces only large earthquakes (>7.8 M) every 240 to 450 years (Sieh and Jahns, 1984) unlike the segments that bound it to the north and south. ^{14}C dates of mainly detrital charcoal samples from the Bidart Fan site, approximately 5 km southeast of Wallace Creek in the Carrizo Plain, have provided some of the best timing constraints on these large surface rupturing events (Grant and Sieh, 1994; and our work in progress). The Bidart site has good, reliably datable stratigraphy for discriminating individual earthquakes. Earlier results based on 14 ^{14}C analyses have suggested that five large earthquakes have occurred since 1218 AD, indicating that large earthquakes in the Carrizo Plain are more frequent than previously thought. Paleoseismological evidence for four surface rupturing earthquakes from three new fault perpendicular trenches excavated in 2005 and 2006 include a well-preserved sag pond, buried mole tracks, fissure infills, and upward terminating fractures. Analyses of new ^{14}C data from these new trenches, in addition to the incorporation of new ^{14}C analyses on charcoal samples collected from three earlier trenches reveal that the last four of these earthquakes occurred since 1475 +or- 50 AD, confirming the possibility of a much shorter recurrence interval, at least during the time period between circa 1400 AD and 1857 AD. Whether all of these events were similar in magnitude to the M7.9 1857 Fort Tejon earthquake or were smaller remains to be determined. We currently do not have slip per event data from the Bidart Fan site to address this problem. Our future work will focus on replicating these short recurrence interval data as well as trying to get slip measurements associated with each of these events. Our continuing efforts of extending the paleoseismological record to 10+ events will also enable us to determine how "characteristic" these shorter recurrence intervals are in the late Holocene history of the San Andreas Fault in the Carrizo Plain as these preliminary results have major implications for the San Andreas and general fault behavior.

References:

Sieh, K. E., and Jahns, R.H., 1984. Holocene activity of the San Andreas Fault at Wallace Creek, California: Geological Society of America Bulletin, v. 95, p. 883-896.

Grant, L. B. and Sieh, K. E., 1994. Paleoseismic evidence of clustered earthquakes on the San Andreas Fault in the Carrizo Plain, California: Journal of Geophysical Research, v. 99, p. 6,819-6,841.