

LiDAR and Field Observations of Earthquake Slip Distribution for the Central San Jacinto Fault

Barrett Salisbury, Department of Geological Sciences, San Diego State University, San Diego, California 92182

ABSTRACT

We mapped the tectonic geomorphology of 80 km of the Clark strand of the San Jacinto fault (SJF) to determine slip per event for the past several surface ruptures. We identify 203 offset features from which we make over 560 measurements using B4 LiDAR imagery, aerial photography, and field observations. Displacement estimates suggest that the most recent large event (MRE) produced an average of 2.5-2.9 m of right-lateral slip with maximum slip of nearly 4 m at Anza – potentially a Mw 7.2 to Mw 7.5 earthquake. Double-event offsets for the same 80 km section average ~5.5 m of slip, with maximum values of 3 m at Anza for the penultimate event. Cumulative displacements of 9-10 m through Anza suggest the third event was also similar in size. Paleoseismic work at Hog Lake dates the most recent surface rupture event at ca. 1790. A poorly located, large earthquake occurred on November 22, 1800, causing extensive damage (MMI VII) at the San Diego and San Juan Capistrano missions. We relocate this event to the Clark fault based on dating of the MRE at Hog Lake. We also recognize the occurrence of a younger rupture along ~15-20 km of the fault in Blackburn Canyon with ~1.25 m of average displacement. We attribute these offsets to the M6.9 April 21, 1918 event. These data argue that much or all of the Clark fault, and possibly also the Casa Loma fault fail together in large earthquakes, but that shorter sections may fail in smaller events.