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EXPLORING THE TECTONIC SIGNIFICANCE OF THE OWL LAKE FAULT THROUGH GEOLOGIC MAPPING AND ANALYSIS OF FAULTED LANDFORMS, SOUTHEASTERN CALIFORNIA

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The Owl Lake fault is an ~20-km-long, left-lateral strike-slip fault that intersects the Garlock fault at its southern end. The numerous scarps and left-laterally offset features along the length of the fault suggest that the fault is active; however, reported slip rates have a wide range, from 0.5-7.8 mm/yr. The wide range in slip rates allows different interpretations for the kinematic significance of the fault, from accommodating all of the eastern Garlock fault's slip to being a negligible structure. The goal of this study is to better constrain the kinematic role of the Owl Lake fault within this region. To do this, we focus on detailed (1:10,000 scale) geologic mapping of a ~20 km^2 area of the northern Owl Lake fault, taking advantage of LiDAR (Light Detection and Ranging) and NAIP (National Agriculture Imagery Program datasets across the study area. The primary objectives of the study are to better distinguish the Quaternary geologic units; determine the geometry, kinematics, and timing of faults; and further constrain slip magnitudes and rates. To assist in mapping the geologic units and faults, we use a range of standard surface analysis techniques to derive hillshade, slope, aspect, curvature, and surface roughness maps. Preliminary mapping indicates that there are approximately 10 Quaternary alluvial units in the map area, recognized from inset relationships among the units and differences in LiDAR-based surface roughness. In the northern part of the map area, a series of EW-striking faults cut the oldest Quaternary alluvial unit (Qa1). In central part of the map area, the Owl Lake fault is made up of a series of subparallel, E-NE-striking faults that cut some of the youngest channels in the map area (Qa10). However, to the south, the fault's strike changes to NE and appears to be dominantly dip slip. Offsets of the topography and alluvial and fluvial landforms allow for estimation of lateral and vertical displacements. The vertical displacements across strands of the fault range from ~0.5 m to 3 m, while lateral displacements range from ~6 m to 74 m. Degradation modeling of fault scarps and terrace risers suggests a range in lateral slip rates, from 0.8 ± 0.3 mm/yr to 2.3 ± 1.1 mm/yr, and vertical slip rates, from 0.04 ± 0.03 mm/yr to 0.15 ± 0.09 mm/yr, for the southern part of the map area. These rates will be further refined through additional degradation modeling and new geochronology.

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T51. Earth Surface Processes in Tectonically Active and Unstable Regions (Posters)
Monday, 23 September 2024: 8:00 AM-5:30 PM

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