

Investigating the Effects of the Owl Lake Fault on the Eastern Garlock Fault Slip Rate through Geologic Mapping

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Abstract

The intricate fault networks of southeastern California are responsible for accommodating strain from Pacific-North American plate convergence. Branching off from the Big Bend of the San Andreas fault, the left-lateral Garlock fault extends 265 km E-NE and terminates in the east in the Avawatz Mountains. This study focuses on a 30-km stretch of the eastern Garlock fault at its intersection with the Owl Lake fault. The goal of this research is to determine if the presence of the Owl Lake fault affects the Garlock fault's slip rate and to calculate slip rates for both faults accordingly. To achieve this, we are using both high-resolution light detection and ranging (LiDAR) data and National Agricultural Imagery Program (NAIP) imagery to map the faults and establish the chronology of alluvial fans. Because much of the study area is inaccessible due to civilian access restrictions from both the China Lake Naval Weapons Center and Fort Irwin Military Reservation, this stretch of the eastern Garlock fault is poorly studied and the use of remote sensing data and aerial imagery are the most suitable techniques for geologic mapping. We are using a variety of surface analysis products, including slope, aspect, curvature, surface roughness, and hill-shade maps. We have documented a minimum of six Quaternary geologic units throughout the study area. The mapping shows that the eastern Garlock fault, a dominantly single-stranded fault in the east, becomes increasingly multistranded as it approaches its intersection with the left-lateral, strike-slip Owl Lake fault. The Owl Lake fault behaves similarly at its intersection with the Garlock fault. Near the intersection of these faults, both strike-slip and dip-slip structures are documented. The fault strikes NE but its orientation shifts to E-W as it approaches the Garlock fault. The resulting geologic map will be used to identify sites for fault scarp and terrace riser degradation analysis and Quaternary geochronology. This will in turn be used to establish slip rates for the eastern Garlock and Owl Lake faults that can be compared to published rates for the central and western Garlock fault and faults of the Eastern California shear zone.

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