GSA Connects 2024 Meeting in Anaheim, California

Paper No. 107-7
Presentation Time: 8:00 AM-5:30 PM

EXPLORING THE KINEMATIC ROLE OF THE OWL LAKE FAULT ON THE SLIP HISTORY OF THE EASTERN GARLOCK FAULT

NUNO GUTIERREZ, Ricardo[1], RODRIGUEZ, Johnathan[1], ALTUNTAS, Gozde[2], POLUN, Sean[2], GOMEZ, Francisco[2] and BIDGOLI, Tandis S.[1], (1)Department of Geological Sciences, California State University San Bernardino, 5500 University Parkway, San Bernardino, CA 92407, (2)Department of Geological Sciences, University of Missouri - Columbia, Office 101 Geological Sciences, Columbia, MO 65211

Southern California is renowned for its seismic activity, primarily due to the San Andreas transform boundary, yet slip-rate data for many important faults in the region remains limited. The Owl Lake fault (OLF) is a left-lateral strike-slip fault that extends -20 km from its intersection with the Garlock fault, at the southeastern margin of Quail Mountains, to its termination in the southern Owlshead Mountains. Located within the transition between the Basin & Range province and the Mojave Desert, the OLF could be the key to resolving the Garlock fault's role within the plate boundary. This study aims to better constrain the kinematics of the OLF and its relationship with the Garlock fault. The main objectives are to differentiate the Quaternary geologic units; determine the geometry, kinematics, and timing of faults; and establish slip magnitudes and rates. To achieve these objectives, we combine analysis of LiDAR (Light Detection and Ranging) topographic data and NAIP (National Agriculture Imagery Program) imagery to create a detailed (1:10,000-scale) geologic map of an -20 km 2 area of the southern OLF. Surface analysis products like hillshade, slope, aspect, curvature, and surface roughness maps were constructed to aid in mapping units and faults. Preliminary mapping indicates there are -10 Quaternary alluvial units in the study area. These units are cut by the OLF, which is well expressed in the landscape, with numerous scarps and offset landforms that suggest Holocene activity. The fault has a dominant strike of N56°E, however, its strike changes from NE to E-NE near its intersection with the Garlock fault. Here, the OLF is a left-lateral strike-slip fault for -12 km NE of this intersection zone. Beyond, the fault transitions into a series of parallel northwest-dipping normal faults. To estimate lateral and vertical displacements, we measured a variety of offset landforms. The scarp-related displacements range from -0.6 m to 1.2 m, while lateral displacements range from -6 m to 200 m. To determine slip rates, we performed degradation modeling of fault scarps and terrace risers using pyScarpFit. Resulting vertical slip rates range from 0.05 ± 0.03 mm/yr to 0.09 ± 0.05 mm/yr, while lateral slip rates range from 0.8 ± 0.3 mm/yr to 1.3 ± 0.5 mm/yr. These preliminary analyses and rates will be further refined through additional modeling and new terrestrial cosmogenic nuclide ages.

Session No. 107--Booth# 113

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

Hall D (Anaheim Convention Center)

Geological Society of America *Abstracts with Programs.* Vol. 56, No. 5
doi: 10.1130/abs/2024AM-405600