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LIDAR-BASED GEOLOGIC MAPPING AND SCARP DEGRADATION MODELING OF THE EASTERN GARLOCK FAULT, SOUTHEASTERN CALIFORNIA

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Southeastern California houses numerous faults that accommodate strain from the Pacific-North American plate boundary. One of the most notable is the Garlock fault, a 265 km long left-lateral strike-slip fault that runs E-NE from the San Andreas fault to its termination in the Avawatz Mountains. The orientation of the fault and its kinematics within the dominantly right-lateral regional strain field has left many questions about its role within the plate boundary. This study focuses on a 40-km stretch of the eastern Garlock fault, at its intersection with the Brown Mountain and Owl Lake faults. This portion of the fault is poorly studied, in part, because it lies within the bounds of the China Lake Naval Air Weapons Station and Fort Irwin installation, which have limited access, posing a challenge for field-based investigations. The goal of this study is to produce a detailed geologic map of the fault using high-resolution LiDAR (Light Detection and Ranging) and NAIP (National Agricultural Imagery Program) datasets. Major objectives of the project are to determine (1) the chronology of the surficial geologic units; (2) the geometry, kinematics, and timing of the faults; and (3) slip magnitudes and rates. The new geologic map contains 14 Quaternary alluvial and lacustrine (playa) map units, differentiated by surface roughness values (range of 0-10°, mean of 4.5°, and a standard deviation of 1.2°), color in NAIP imagery, and topographic relief. These units are cut by a complex network of EW-, E-NE-, and W-NW-striking faults. The complexity of the faults increases near the intersection of the Brown Mountain and Owl Lake faults, where both strike-slip and dip-slip (reverse) structures are developed. Left lateral displacements of 116-203 m (Qf1), 157-182 m (Qf2), 111-116 m (Qf4), and 117-122 m (Qf10) are documented. To estimate the age of fault scarps and terrace riser in the study area, fourteen elevation profiles were extracted from the LiDAR data for scarp degradation analysis in pyScarpFit. The scarps and risers range in calculated age from 2.2 ± 0.8 ka to 179 ± 54 ka. Estimated vertical slip rates are slow, ranging from 0.02 ± 0.01 mm/yr to 0.39 ± 0.34 mm/yr. In contrast, lateral slip rates are higher, ranging from 3.8 ± 3.1 mm/yr to 12.9 ± 9.6 mm/yr. To further constrain short- and long-term slip rates and narrow uncertainties, additional degradation models and new geochronology will be applied.

Session No. 107--Booth# 115

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)

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