

Session: Bridging the Observational Gap in Time: Processes Today and their Relationship to the Past.

Title: Evidence for an alternative position for the primary active strand of the San Andreas Fault along its restraining bend in southern California

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This study applies new multi-proxy data to better understand San Andreas Fault activity, past and present, in particular the study provides new observations and evidence for an alternative position for the primary active strand of the southern San Andreas Fault along its restraining bend. We combine data from LiDAR imagery, field mapping, sedimentary provenance analysis, detrital geochronology and a new burial dating technique using the ^{36}Cl -in-felspar/ ^{10}Be -in-quartz pair to show the Mission Creek fault strand, a strand that is currently mapped as inactive through the restraining bend of the San Andreas Fault, is active. Prior geologic and geomorphic studies in the region indicate that as the Mission Creek and Banning strands diverge from one another in the southern Indio Hills, the Banning strand accommodates the majority of PA-NA plate motion. In this favored kinematic model, slip along the Mission Creek strand decreases significantly to the northwest along the restraining bend. Along this restraining bend, the Mission Creek strand is considered to be inactive since the late -to-mid Quaternary (~500-100 kya) due to the transfer of plate boundary strain westward to the Banning and Garnet Hills strands, the Jacinto Fault Zone, and northeastward, to the Eastern California Shear Zone. Here an alternative interpretation of the late -to-mid Quaternary evolution, geometry, and slip rate of the southern San Andreas Fault, is presented. High resolution data from a multi-proxy approach indicate the Mission Creek strand is indeed active, that displacement on the fault is probably fast, and that the fault is the primary plate boundary structure at this latitude. Therefore, it appears that the fault kinematic model of strain partitioning, and the associated seismic risk assessment, along the southern San Andreas Fault at this latitude require a significant re-evaluation. Accordingly, continental transform plate boundaries, like the San Andreas Fault, may remain relatively stable and long-lived, and plate boundary deformation may not migrate across widely separated fault strands as rapidly as suggested by existing evolution models.