

FIELD EVIDENCE FOR EARLY MIOCENE SYNVOLCANIC EXTENSION NORTH OF THE SAN ANDREAS AND GARLOCK FAULTS, WESTERN TEHACHAPI MTNS. AND EASTERN SAN EMIGDIO MTNS.

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Abstract

New 1:6000 scale mapping of mid-Tertiary rocks exposed semicontinuously in a 30km EW transect that straddles the junction of the San Andreas and Garlock faults provides insights into the timing, magnitude, and spatial extent of polyphase Neogene deformation. Previously unrecognized erosional unconformities in the nonmarine, coarse clastic Oligocene-early Miocene Tecuya Fm (Ttc) and interbedded bimodal 21-25Ma volcanic rocks (Tv) provide timing constraints. Ttc can be divided into three units, pre-, syn-, and post-volcanic, that are bounded by erosional unconformities with 10-50m of relief, and that show statistically distinct compositions and paleocurrents in interbedded coarse clastics. Early Miocene deformation is best preserved in the Tunis half-graben where the Plio-Quaternary contractional overprint is minimal and structures and strata are overlain with $\geq 20^\circ$ angular discordance by ≤ 17 Ma coarse clastics. Orientation of synvolcanic faults, a basaltic dike, and phreatomagmatic silicic fissures in the Tunis half-graben suggest the direction of extension was 057 ± 2 in current coordinates. For at least 30km along this trend 1) NW-trending, east dipping, high-angle faults bound km-scale half-grabens filled with 200-700m of syndeformational volcanic and sedimentary rocks, 2) faults with 1-150m of normal separation cut pre- and synvolcanic strata and are overlain by undeformed early-mid Miocene syn- and postvolcanic strata, and 3) dips decrease upsection in early Miocene strata. Broad open folds with axes parallel to normal faults are found in synvolcanic strata but not in overlying units and may have formed as hanging wall synclines or reflect a previously unrecognized mid-Miocene NE-SW contractional event. Exposures in Salt Creek show many of the synvolcanic growth fault characteristics of the Tunis half-graben but the post early-Miocene contractional overprint is more pronounced. We interpret the NNE-trending, high angle Salt Creek fault to have originally formed as an early Miocene east-dipping synvolcanic normal fault. It was then rotated and reactivated, possibly multiple times, as an oblique lateral ramp in a previously unmapped mid-Miocene or younger, NE-vergent system of anastomosing reverse and thrust faults, 100-200m wide in map view, that shows variable stratigraphic throw to 1km.