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RESEARCH ARTICLE | MARCH 01, 1957

SAN ANDREAS FAULT ZONE IN SAN GORGONIO PASS, SOUTHERN CALIFORNIA

CLARENCE R ALLEN

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Abstract

Unusual features of the San Andreas fault in the San Gorgonio Pass area of Southern California are the absence of rift topography, absence of lateral stream offsets, an abrupt change in trend of the fault trace, seismic evidence for the predominance of thrusting over strike-slip faulting, and a lack of great earthquakes in historic time.

Rocks of the San Gorgonio igneous-metamorphic complex crop out over most of the map area and constitute a metamorphic terrane of intermediate to basic composition that has been intimately intruded and partially reconstituted by Mesozoic(?) quartz monzonite. Flaser gneiss, greenschist, and piedmontite-bearing gneiss are distinctive rock types in the otherwise rather uniform migmatitic gneisses. Most of the younger rocks of the pass area are sedimentary and reflect a history of recurrent deformation and deposition; they range in age from upper Miocene(?) to Quaternary, and nearly all are of alluvial-fan or flood-plain origin.

Quaternary alluvial fans that once buried a former rugged topography are now being dissected along the north side of the pass, leaving numerous surfaces of low relief and associated stream terraces. Warping of these surfaces suggests Quaternary arching of the mountain range along a north-south axis.

Within San Gorgonio Pass, the San Andreas fault curves abruptly southward from its normal southeast trend and butts into the eastward-trending Banning fault at 45°. The Banning fault is a major tectonic feature that delineates the north side of the pass and forms the southern limit of the Transverse Ranges in this region. Thrust and reverse movements of at least 5000 feet have taken place on this fault in Quaternary time, and, although there is little evidence of Recent lateral displacements, late Pliocene and Pleistocene right-hand strike-slip movements totaling at least 5 miles are suggested. The Mill Creek and Mission Creek faults are major branches of the San Andreas fault that diverge northward; both evince considerable late Cenozoic vertical displacement, but possible lateral movements are unknown.

This study neither proves nor disproves the existence of lateral displacements amounting to perhaps hundreds of miles along the San Andreas fault zone as a whole. But if large lateral displacements have taken place, they must have been followed by deformation and disruption of the fault traces then existent, because lateral movements of even 1 mile are difficult to reconcile with the complex surface geometry of faults within the pass area. Faults previously considered branches of the San Andreas, particularly the Mission Creek and San Jacinto faults, may have absorbed much of the lateral strain, and the Banning fault may represent an ancestral San Andreas fault—now deformed into a Transverse Range fault. The deformation and disruption of former breaks appear to represent a pattern that is typical of the entire eastern half of the Transverse Ranges, where elements of San Andreas and Transverse Range structure have been vying for control; evidently one set has alternated with the other in attaining temporary dominance.

Southeast of San Gorgonio Pass it is not clear which, if any, fault trace deserves the name of San Andreas, and it is suggested that the entire area between the Elsinore fault on the west and the east side of the Salton depression on the east be termed the San Andreas fault zone.

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