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Testing a concept: Is the geologic history of the southeastern San Joaquin basin consistent with postulated Miocene rotation of the Tehachapi and San Emigdio Mountains?

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ABSTRACT

Studies of basement rocks and volcanic intervals at the southeast margin of the San Joaquin basin yield paleomagnetic data indicating up to 59 degrees of clockwise rotation. Although Goodman and Malin (1992) present a model that explains the rotation through fragmentation and extension of the basement terrane, the impact of rotation on the adjacent basin has not been explored.

The subsurface of the basin contains an abundance of evidence indicating Miocene extension. South of the Kern River, several oil fields contain numerous faults of early to middle Miocene age that generally fall on NW-SE or NE-SW trends. Fault offsets indicate a large amount of extension and correspond to the down-dropping of the floor of the Tejon embayment and break-up and collapse of the Edison high. Faults of similar age, present in fields north of the Kern River, have a NNW-SSE strike. Offsets on this latter set of faults are relatively minor and contributed in forming a wide shelf region.

Sediments deposited during the middle and late Miocene reflect different styles of structural extension. South of the Kern River, the depositional gradient was very steep, and sand bodies representing deltaic, shallow-marine and deep marine environments are very localized in extent. North of the Kern River, sands deposited on the wide shelf are laterally extensive and represent deltaic and shallow-marine environments deposited at the terminus of a large river system.

The structural and depositional styles are similar between the Edison high and Tejon embayment area, indicating that the same structural events were responsible. The structural evidence is consistent with the rotation model of Goodman and Malin (1992). However, if the Edison high block has rotated, then additional faults may be necessary to accommodate slippage against the adjacent Maricopa sub-basin block. The faulting style north of the Kern River is not consistent with rotation; thus, rotation is likely limited to south of the Bakersfield arch.