DRAFT

Testing the role of transtension in the opening of the Gulf of California

Award: 07-38723, 07-39017 (January 2008)

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Field relations in coastal Sonora, Mexico record the history of faulting leading up to continental rupture in the Gulf of California ca. 6 Ma. From these relationsips we seek to determine whether late Miocene transtension in the proto-Gulf of California preceded localization of rifting. To this end we have applied structural mapping, geochronology, and basin analysis to determine the relationship of rift basins to major Gulf of California transform fault systems exposed onshore in coastal Sonora. Results obtained thus far indicate that transtension is largely a modern-Gulf phenomena. Structural mapping in coastal Sonora reveals a set of highly extended basins that appear cross-cut by later dextral faults. In some areas these basin sediments have been rotated clockwise about a vertical axis, an indicator of dextral transtension. Using paleomagnetism, we have found that both 12.5 Ma and 6.4 Ma ignimbrite marker units have similar rotations when compared with unrotated reference sites in stable Baja California (see figure). This finding suggests that dextral shear commenced with the transition to localized rifting in the Gulf axis. Additional geochronology and stratigraphic analysis, in progress, will further constrain the timing of basin formation and the relationship of these basins to strike-slip faulting. Future work will also investigate field relationships and paleomagnetism on nearby Tiburon island, where additional rift basins and major transform faults are exposed onshore.

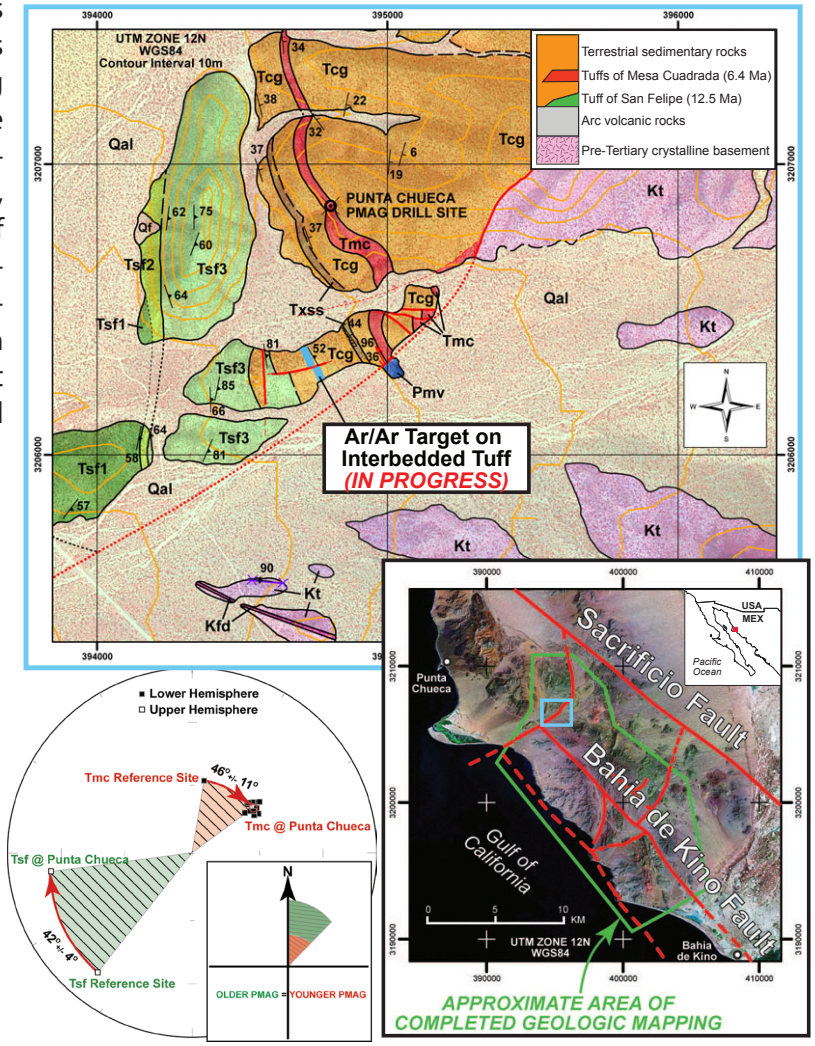

Figure: Dextral transform faults and rift basins exposed in coastal Sonora, Mexico (upper left), preserve a record of faulting leading up to continental rupture in the Gulf of California. Detailed geologic mapping (example at center) reveals a well-exposed structural and stratigraphic record of proto-Gulf (12.5-6Ma) faulting and basin subsidence. Fault kinematic data (right) record the history of the proto-Gulf extension direction. Analysis of this data is in progress. Paleomagnetic data from isotopically-dated volcanic marker units (left) records similar vertical axis rotations in 12.5 Ma and 6.4 Ma tuffs. This preliminary result supports that little significant dextral shear pre-dates localization of rifting into the Gulf axis.

Bennett, S., Oskin, M., 2007: Dextral Shear as a Catalyst for Lithospheric Rupture in the Northern Gulf of California: Kinematic and Paleomagnetic Evidence from Coastal Sonora, Mexico, Geological Society of America Abstracts with Programs, v. 39, no. 6.