PALEOMAGNETIC DATA FROM THE RINCONADA FAULT IN CENTRAL CALIFORNIA: EVIDENCE FOR OFF-FAULT DEFORMATION AND LONG-TERM CREEP ALONG THE SAN ANDREAS FAULT

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In central California, the plate boundary system is composed of three major sub-parallel faults, including the creeping segment of the San Andreas fault, which separate internally deforming fault-bound regions. Documenting the style and magnitude of deformation in these fault borderlands is difficult but important for understanding the partitioning of plate boundary deformation.

We sampled ~150 sites from the Miocene Monterey Formation adjacent to the Rinconada fault in central California to look for evidence of paleomagnetic vertical axis rotations. The sites were located within 15 km of the fault trace along a segment of the Rinconada fault that stretches from Greenfield to Paso Robles. Because this unit was deposited while the San Andreas fault system was active at this latitude, any deformation recorded by these rocks must be related to plate boundary deformation. Unlike the large (>90˚) rotations observed in the Transverse Ranges to the south, vertical axis rotations adjacent to the Rinconada fault are smaller and vary with distance from the fault as well as along strike. In the northwest and central portions of the fault, 15-25˚ clockwise rotations are observed close to the fault; these rotations decrease with distance from the fault. In the southeast portion of the fault, small (~5˚) to negligible clockwise vertical axis rotations are observed with ~15˚ counterclockwise rotations from several sites.

We suggest that spatial patterns of vertical axis rotations are controlled, in part, by the creeping segment of the San Andreas fault. Creeping behavior alters the modern velocity field, and counterclockwise rotations are predicted from the velocity field in the area that coincides with our observed counterclockwise rotations. To match the observed paleomagnetic rotations, we suggest that aseismic deformation along the creeping segment has been occurring for several million years.