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An Examination of the Surface Rupture Gap in the Landers Earthquake between Johnson Valley and Long Canyon Faults, San Bernardino County, California

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ABSTRACT

The 85 km long surface rupture associated with the 1992 Mv7.3 Landers earthquake exhibits a 5 km gap in the surface expression from south of the Johnson Valley fault to north of the Long Canyon fault. Surface mapping of the crystalline outcrop in this region reveals deformation has occurred in the form of curvilinear faults, though undisturbed by the Landers event. A seismic gap in the hypocenter data subsequent to the Landers earthquake also underlies the curvilinear fault traces to a depth of about 3 km, suggesting seismic inactivity here may be due to these faults' oblique alignment to the main north trending stress field that triggered the 1992 event. In cross sectional profile, the surface gap contains a high density of hypocenter sites associated with the Johnson Valley fault that end abruptly along a 77 degree, north-dipping line that plunges to a depth of 12 km from the surface trace of the Pinto Mountain fault. This implies the Pinto Mountain fault under-thrusts the gap region, and contributed, in part, to the ground rupture gap by damping propagation of seismic activity southward. Field relationships and seismic data suggest the curvilinear fault system is the southern extension of the Johnson Valley fault associated with the Landers earthquake and terminates against the high-angle oblique slip of the Pinto Mountain fault. This study proposes that these curvilinear fault traces resulted from directional changes in regional stress orientation between the Pinto Mountain and the Johnson Valley faults. In combination with the Pinto Mountain fault, the curvilinear faults are likely responsible for the ground rupture and seismic hiatus of the Landers Earthquake.

BIOGRAPHY

Following completion of a Bachelors Degree in Geology at Whittier College, I conducted foundation studies for a number of engineering projects throughout the West and Southwestern U. S. and later obtained a Masters Degree in Geology from San Diego State University. Following graduation went on to work Offshore California and Sacramento Valley with Gulf Oil and the Arkoma Basin in Oklahoma. Following several near misses by tornados, came back to the San Joaquin Valley with Tenneco Oil. Hit by the down turn in oil, ventured into environmental and groundwater consulting throughout California. Hired on with AERA at its initiation and now working western central California with Chevron Oil.