Passive and Primary Surface Ruptures along the Camp Rock Fault, Eastern California Shear Zone

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The 1992 Mw 7.3 Landers earthquake produced an ˜80-km-long rupture, which included about 10 km of the central Camp Rock fault. The Camp Rock portion of the surface rupture is interpreted to have been passive, triggered by static stresses induced by rupture of the Emerson fault to the southwest, as there were very few aftershocks along this section of fault. Our detailed geomorphic analysis of a 2-km-long stretch of the central Camp Rock fault reveals that the along-strike distribution of the 1992 vertical slip is inconsistent with that predicted from locations and heights of uplifted late Pleistocene fan surfaces. In particular, the 1992 surface rupture partly shows an opposite sense of vertical slip to that deduced from tectonic geomorphologic observations of cumulative vertical strain. By contrast, the vertical-slip distribution derived for the penultimate earthquake, as deduced from degraded fault scarps on fan surfaces of probable Holocene age, is in good agreement with the geomorphic expression of repetitive surface faulting. The unusual vertical-slip distribution of the 1992 surface rupture may be ascribed to static stress changes due to the 1992 earthquake: the earthquake induced dilatational static stresses on the central and southern parts of the Camp Rock fault, whereas the primary seismogenic ruptures on the fault should be induced by north-south regional compression. Our finding suggests that detailed geomorphic analysis, together with analysis of coseismic static stress changes, may allow isolation of passive surface ruptures from prehistoric seismic ruptures identified in paleoseismological studies.