Present-Day Deformation in Northeastern California, Northwest Nevada and Southern Oregon

Wayne Thatcher, Robert W. Simpson, Jerry L. Svarc & Michael Lisowski, U. S. Geological Survey, Menlo Park, California 94025, USA

We apply several complementary methods to analyze a 153 station GPS velocity field from NE California and adjacent areas. In this region Cascadia subduction, Mendocino fracture zone oceanic transform faulting, and San Andreas fault zone motions interact to produce a rather complex pattern of Holocene reverse, strike-slip and normal faults. Cluster analysis (Simpson et al. 2012) permits objective definition of 6 largely non-overlapping domains, each of which have similar GPS velocities. The average relative motion between clusters gives the sense and magnitude of dispacement rate across each cluster boundary which often though not invariably coincides with a mapped Holocene fault. We also compares cluster domains with subjectively assigned blocks used in a recent community earthquake hazard modeling exercise (WGCEP, 2013). Correspondence between these independent results is generally good south of the landward extension of the Mendocino escarpment (~40.5˚N) but greatly disagrees to the north. Conventional strain rate maps show several notable features, in particular areal expansion near several mapped extensional fault zones. Analysis of a spatially smoothed version of the GPS velocity field using methods described by Simpson et al (2015, in preparation) independently supports the cluster analysis and provides complementary pictures of the current deformation. In particular, a broad zone of E-W oriented right-lateral shear shows up clearly.