Project Abstract

Global Positioning System (GPS) data in the vicinity of the San Bernardino Mountains are minimally existent. At 16 survey sites GPS data were gathered for a time span of twenty-four hours or more. At remotely located survey sites data were gathered for two to five continuous days. Differences in rates at the various benchmarks will be used to infer the amount of elastic strain that is accumulating due to faults in the vicinity. The measurements that have been collected are currently being processed at the University of Arizona by Rick Bennett and Joshua Spinler. When combined with prior data collected in 2005, the new data will provide the first GPS velocity vectors for many parts of the San Bernardino Mountains. In addition to collecting new GPS data, one-dimensional elastic modeling of data from SCEC's Crustal Motion Model version 3 (CMM3) was conducted along a transect through the San Bernardino Mountains from San Clemente Island to southwestern Nevada. Published Holocene to late Pleistocene slip rates (Peterson et al., 1996) for faults within the transect do not fit the GPS velocity data from CMM3. The CMM3 data are best fit by rates in the Eastern California shear zone (ESCZ) that are higher than rates estimated over geologic time scales, and by rates for the San Andreas and San Jacinto faults that are lower than published geologic rates. Locking depths of13-18 km were used in the modeling (Peterson et al., 1996). Slip rates that fit the CMM data well are as follows: the Eastern California shear zone, 20 mm/yr; San Andreas fault, 11 mm/yr; San Jacinto fault, 6mm/yr; the Elsinore fault, 5 mm/yr; the NIFZ, 2 mm/yr, and the Palos Verde fault, 3 mm/yr. The discrepancy between geologically and geodetically estimated slip rates for the San Andreas and San Jacinto faults and for the ESCZ could be a result of variations in strain accumulation rates at different stages of the earthquake cycle (for a viscoelastic medium). The low rate of geodetically measured strain accumulation on the San Andreas fault could be because it is in the late stage of the earthquake cycle. The high rate of strain accumulation modeled in the ECSZ could be a result of recent activity--the Landers and Hector Mine earthquakes. An alternative hypothesis could simply be that the San Andreas fault is no longer the primary fault in the vicinity, but movement has been shifted to the ECSZ within the last few decades.