A Strainmeter Cluster in the Eastern California Shear Zone

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The occurrence of the 1992 Landers and 1999 Hector earthquakes has tended, reasonably, to increase interest in the region in which they took place, the Eastern California Shear Zone (ECSZ)—though though in the vicinity of these earthquakes it could perhaps better be described as the Central Mojave Seismic Belt. One result of the increased interest in this region was a number of paleoseismic investigations of faults in this area; these investigations tended to show that past earthquakes in this area were clustered in time, with long intervals between the clusters.

Two aspects of these recent earthquakes suggest as well that this is an area in which separated faults interact. The first is, of course, the occurrence of the Hector shock 7 years after Landers: while the usual Coulomb models do not predict triggering, it is difficult to believe that something like this was not involved. The second, and more intriguing, is that both Landers and Hector triggered "aftershock" clusters at locations well removed from the main rupture — in the case of Landers, 30 km away, near Barstow (Figure 1, clusters labelled LT and HT).

This kind of clustering suggests a relatively high likelihood of fault interaction, some of which might be related to transient stress changes. We therefore suggest that the Central Mojave is one of the more promising places (after the creeping parts of the San Andreas, and the Salton Trough) to look for transient deformations, and therefore propose that it be the site of a cluster of strainmeters as part of PBO. Admittedly this is, as elsewhere, rather a speculative venture, but we think one worth trying. Should we be fortunate enough to have yet another large earthquake happen in the area (admittedly not likely) we would have gotten a unique record of strain changes between large events. And if we do not see any transients at all, we also will have demonstrated something: that whatever is the source of the clustering, it is not short-term deformations (less than a year).

Because the target signals are poorly defined, both in spatial distribution and in temporal signature, it will be difficult to use any kind of stacking of data, and we will need to have low-noise measurements over the broadest frequency range possible. For the lowest frequencies, continuous GPS will be the tool of choice; we assume some deployment at a reasonable density will occur in this area in any case, but if not, looking for transients is an additional reason to have one. As a check on the GPS data at periods of a year and less, we propose that two single-component long-base strainmeters be established in this area. Because of the low population density we do not expect any difficulty in finding possible sites for a long-base sensor, though it will need to avoid regions of groundwater pumping along the Mojave River basins.

Such a pair of long-base instruments, with GPS, will be the best way to monitor for the gradual changes that are most likely. In addition, we would suggest a modest deployment of borehole strainmeters close to the ends of the active zones, to look for possible

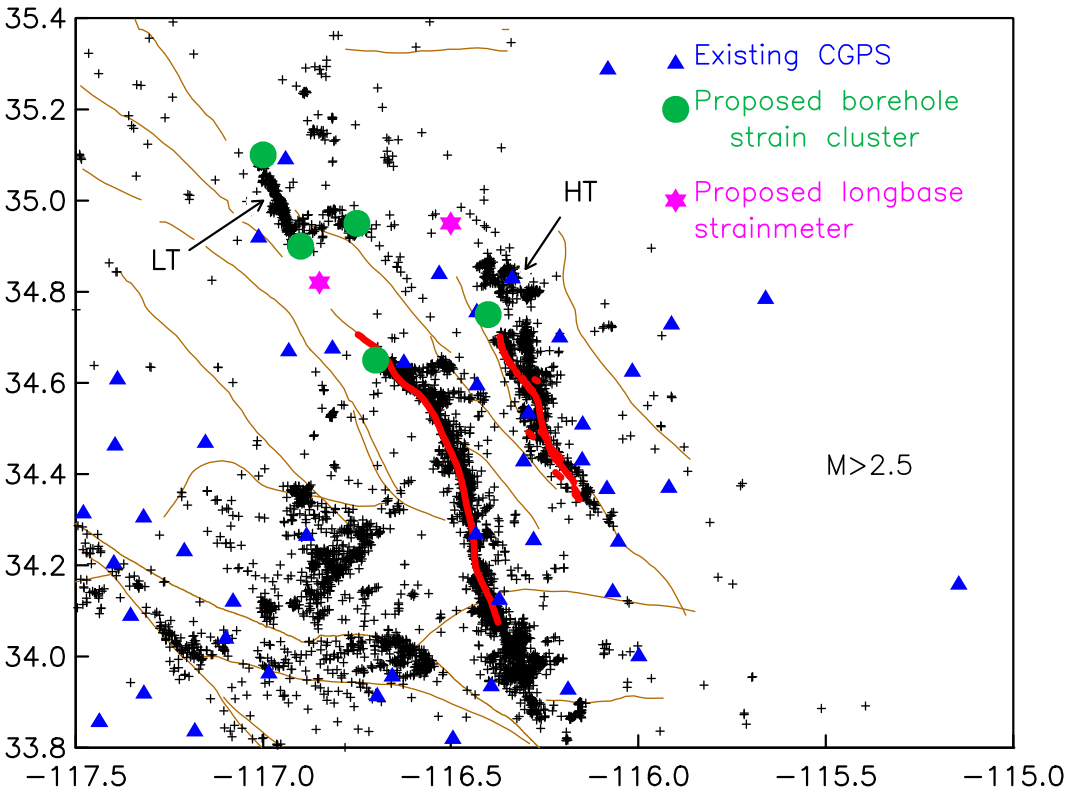

Figure 1

transients related to slip at these points. With installations of three instruments each at the north end of the Landers rupture, both ends of the Barstow zone, and one end of the Hector zone, we would have a monitoring capability to test for the long-term slip on these seismically active segments.