Postseismic Deformation Following the M7.9 2002 Denali Fault Earthquake

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Figure 1. Photo of one of the continuous GPS sites, as installed after the earthquake. The monument was a 2-inch diameter invar rod, and the receiver and batteries were stored in a plastic tub wrapped in the blue tarp.

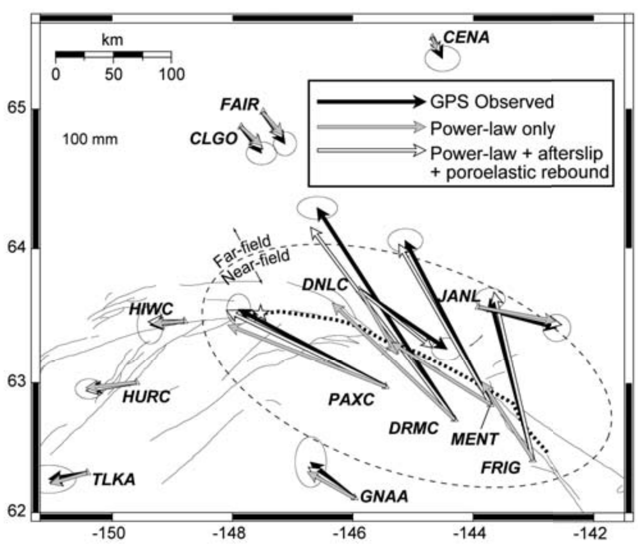

Figure 2. Total displacements over a three-year period after the earthquake, along with predictions from the best multi-mechanism model. The model also fits the time series of the displacements (not shown).

Within hours of the November 3, 2002, Denali fault earthquake in central Alaska, University of Alaska field crews were in the field surveying sites to provide coseismic displacements. Within a week of the earthquake, a UNAVCO field crew arrived to install continuous sites (Figure 1). These continuous sites used a simple design so that sites could be installed at a rate of one per day, despite having less than six hours of daylight, long driving distances, and cold weather with which to contend. Ten sites were installed in the first three weeks after the earthquake; the following summer they were upgraded to include power generation, and five additional sites were installed. The installation of these sites would have been impossible without the availability of experienced UNAVCO field engineers.

Postseismic displacements from those sites (Figure 2) indicate a spatial and temporal evolution that cannot be explained by any single postseismic deformation mechanism. Far-field sites are dominated by deformation from power-law viscoelastic flow in the mantle, consistent with laboratory measurements of olivine rheology. Near-field sites show a significant contribution from afterslip (or possibly localized viscoelastic shear in the lower crust), and a small contribution from poroelastic rebound.

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