



JPL's GNSS Real-Time Earthquake and Tsunami (GREAT) Alert System

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We describe recent developments to the GREAT Alert natural hazard monitoring service from JPL's Global Differential GPS (GDGPS) System. GREAT Alert provides real-time, 1 Hz positioning solutions for hundreds of GNSS tracking sites, from both global and regional networks, aiming to monitor ground motion in the immediate aftermath of earthquakes. We take advantage of the centralized data processing, which is collocated with the GNSS orbit determination operations of the GDGPS System, to combine orbit determination with large-scale point-positioning in a grand estimation scheme, and as a result realize significant improvement to the positioning accuracy compared to conventional stand-alone point positioning techniques. For example, the measured median site (over all sites) real-time horizontal positioning accuracy is 2 cm 1DRMS, and the median real-time vertical accuracy is 4 cm RMS.

The GREAT Alert positioning service is integrated with automated global earthquake notices from the United States Geodetic Survey (USGS) to support near-real-time calculations of co-seismic displacements with attendant formal errors based both short-term and long-term error analysis for each individual site. We will show the millimeter-level resolution of co-seismic displacement can be achieved by this system.

The co-seismic displacements, in turn, are fed into a JPL geodynamics and ocean models, that estimate the Earthquake magnitude and predict the potential tsunami scale.