Geophysical Research Abstracts
Vol. 18, EGU2016-9916, 2016
EGU General Assembly 2016

Comparing source inversion techniques for GPS-based tsunami early warning: a case study 2014 Pisagua M8.1 earthquake, northern Chile

Andrey Babeyko and Kejie Chen

GFZ German Research Centre for Geosciences, Potsdam, Germany (babeyko@gfz-potsdam.de)

Real-time GPS is nowadays considered as a valuable component of next-generation near-field tsunami early warning systems. A fast and reliable source inversion technique, whose function is to convert co-seismic displacements into seismic source parameters for subsequent tsunami modeling and forecasting, plays a central role in the entire warning chain. To date, there have been suggested various inversion approaches and, not surprisingly, different methods yield different inversion results even for the same input information. Differences in source parameters are then propagated to the coast by means of wave simulation and thus contribute to the total forecast uncertainty. The northern Chile April 2014 Mw8.1 Pisagua earthquake and aftermath tsunami were extensively recorded by a large number of land- and ocean-based sensors including real-time GPS. We take the opportunity and consider the 2014 Pisagua event as a case study to explore possible sources and magnitudes of forecast uncertainty related to the GPS-based source inversion. In particular, we test uncertainties related to different inversion approaches: fastCMT (centroid moment tensor); unconstrained inversion into a single Okada fault; distributed slip along curved plate interface. The three different source models provide very different far-field tsunami forecasts but show surprisingly similar predictions in the near-field. The predictions are also consistent with coastal tide gauge observations. In addition, we demonstrate how incorporation of real-time GPS-observations reduces forecast uncertainty imminent to the classical, epicentre/magnitude tsunami early warning scheme.