Geophysical Research Abstracts,
Vol. 10, EGU2008-A-11373, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-11373
EGU General Assembly 2008

Using GNSS solutions in Tsunami Early Warning Systems

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Geodetic observations can play a crucial role in TEWS (Tsunami Early Warning Systems). Particularly, if GNSS (Global Navigation Satellite Systems) data are available just after the occurrence of an earthquake, they can be used to model the earthquakes and thus initialize parameters for tsunami modelling. With the disposal of networks of Continuously Operating GNSS stations (CORS) close to quake-susceptible regions, real-time analysis of the GNSS observations over such networks can help to develop methods to effectively reduce the warning time and to improve its reliability.

This paper highlights issues related with the utilization of GNSS data in the development of Tsunami Warning Systems. This research is carried out in the framework of Tsunami Risk and Strategies for the European Union (TRANSFER) project, where the authors are currently associated in the analysis of instrumental signals and networks for development of TEWS.

A major advantage of GNSS-based solutions is that they measure displacements directly. Consequently, GNSS systems are quite adequate to accurately model very large earthquakes, in particular close to the event source (where seismic instruments are prone to saturate). However, when the displacements are quite small, it is extremely difficult to separate what is signal from what is noise due to different error sources.

Therefore, we focus on the methodologies to improve the signal detection, namely data processing issues and the proper quantification of the uncertainties associated with the solutions. Other aspects to be discussed are the timely data transfer and dissemination (integration) of the GNSS solutions.