Geophysical Research Abstracts,
Vol. 11, EGU2009-4376-5, 2009
EGU General Assembly 2009

Testing a real-time algorithm for the detection of tsunami signals on sea-level records

L. Bressan (1), S. Tinti (1), and V. Titov (2)

(1) Università di Bologna, Dipartimento di fisica, Bologna, Italy, (2) NOAA Center for Tsunami Research, PMEL/NOAA, Seattle, USA

One of the important tasks for the implementation of a tsunami warning system in the Mediterranean Sea is to develop a real-time detection algorithm. Unlike the Mediterranean Sea situation, tsunamis happen quite often in the Pacific Ocean and they have been historically recorded with a proper sampling rate. A large database of tsunami records is therefore available for the Pacific. The Tsunami Research Team of the University of Bologna is developing a real-time detection algorithm on synthetic records. Thanks to the collaboration with NCTR of PMEL/NOAA (NOAA Center for Tsunami Research of Pacific and Marine Environmental Laboratory/National Oceanic and Atmospheric Administration), it has been possible to test this algorithm on specific events recorded by Adak Island tide-gage, in Alaska, and by DART buoys, located offshore Alaska. This work has been undertaken in the framework of the Italian national project DPC-INGV S3.

The detection algorithm has the goal to discriminate the first tsunami wave from the previous background signal. Shortly, the algorithm is built on a parameter based on the standard deviation of the signal calculated on a short time window and on its comparison with its computed prediction through a control function. The control function indicates a tsunami detection whenever it exceeds a certain threshold. The algorithm was calibrated and tested both on coastal tide-gages and on offshore buoys that measure sea-level changes. Its calibration presents different issues if the algorithm has to be implemented on an offshore buoy or on a coastal tide-gage. In particular, the algorithm parameters are site-specific for coastal sea-level signals, because sea-level changes are here mainly characterized by oscillations induced by the coastal topography.

Adak Island background signal was analyzed and the algorithm parameters were set: It was found that there is a persistent presence of seiches with periods in the tsunami range, to which the algorithm is also sensible. To safely detect a tsunami it is needed to target the algorithm only on tsunamis of bigger amplitude than seiches.

Offshore sea-level signal is mainly composed by white noise and the tide. The main issue is that the tsunami signal may not have a very large amplitude respect to noise. However, if the buoy is located near the tsunami source, the seismic signal is very large and hides completely the tsunami signal. With the calibration and the test of the algorithm, a method to distinguish a seismic signal from a tsunami one was also studied.