



Advanced Geospatial Hydrodynamic Signals Analysis for Tsunami Event Detection and Warning

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Current early tsunami warning can be issued upon the detection of a seismic event which may occur at a given location offshore. This also provides an opportunity to predict the tsunami wave propagation and run-ups at potentially affected coastal zones by selecting the best matching seismic event from a database of pre-computed tsunami scenarios. Nevertheless, it remains difficult and challenging to obtain the rupture parameters of the tsunamigenic earthquakes in real time and simulate the tsunami propagation with high accuracy. In this study, we propose a supporting approach, in which the hydrodynamic signal is systematically analysed for traces of a tsunamigenic signal.

The combination of relatively low amplitudes of a tsunami signal at deep waters and the frequent occurrence of background signals and noise contributes to a generally low signal to noise ratio for the tsunami signal; which in turn makes the detection of this signal difficult. In order to improve the accuracy and confidence of detection, a re-identification framework in which a tsunamigenic signal is detected via the scan of a network of hydrodynamic stations with water level sensing is performed. The aim is to attempt the re-identification of the same signatures as the tsunami wave spatially propagates through the hydrodynamic stations sensing network.

The re-identification of the tsunamigenic signal is technically possible since the tsunami signal at the open ocean itself conserves its birthmarks relating it to the source event. As well as supporting the initial detection and improving the confidence of detection, a re-identified signal is indicative of the spatial range of the signal, and thereby it can be used to facilitate the identification of certain background signals such as wind waves which do not have as large a spatial reach as tsunamis.

In this paper, the proposed methodology for the automatic detection of tsunamigenic signals has been achieved using open data from NOAA with a recorded tsunami event in the Pacific Ocean. The new approach will be tested in the future on other oceanic regions including the Mediterranean Sea and North East Atlantic Ocean zones.

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[1] TRIDEC IP ICT-2009.4.3 Intelligent Information Management Project Reference: 258723. <http://www.tridec-online.eu/home>