Geophysical Research Abstracts
Vol. 12, EGU2010-7231-1, 2010
EGU General Assembly 2010

Fast performance tool for Tsunami Flood Hazard Assessment and Early Warning, Banda Aceh (2004) and American Samoan case (2009)

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Recent tsunami flood disasters in the American Samoa and in 2004 in the Indian Ocean region have shown the need for obtaining a quick estimate on the flooding extent caused by a tsunamigenic earthquakes. An overview of the flooding is crucial to help plan the first relief operation and damage estimate. An estimate of tsunami height along the coast using a relatively coarse grid numerical model and assumed tsunami source based on earthquake parameters could, theoretically, be performed shortly after an earthquake event. Inundation models, however, requires very high resolution numerical models which still needs large amount of computation time.

Based on a Digital Terrain Model (DTM) and an empirical relation (derived from numerical experiments and analytical expressions from well known publications), a fast 2D tsunami flooding and run-up estimation tool has been built that can produce sufficiently accurate overall run-up and flooding estimate caused by the tsunami. The accuracy of the tool depends on the quality of the underlying DTM and tsunami heights fed to the tool. Because of its speed, this tool may even be used in near real time / early warning system to obtain a good indication of the area under threat in case of an approaching tsunami. The tool may also be used to produce flood (hazard/vulnerability) maps that may occur in future. The model has been tested for the 2004 tsunami event in Banda Aceh and 2009 tsunami event in American Samoa. The inundation and run-up maps for Banda Aceh event were compared to numerical model results (Delft3D) as well as survey data. The American Samoa event were compared to numerical model run by URS and preliminary survey data from USGS.