



Tsunami Generation Modelling for Early Warning Systems

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In the frame of a collaboration between the European Commission Joint Research Centre and the Institute of Meteorology in Portugal, a complete analytical tool to support Early Warning Systems is being developed. The tool will be part of the Portuguese National Early Warning System and will be used also in the frame of the UNESCO North Atlantic Section of the Tsunami Early Warning System.

The system called Tsunami Analysis Tool (TAT) includes a worldwide scenario database that has been pre-calculated using the SWAN-JRC code (Annunziato, 2007). This code uses a simplified fault generation mechanism and the hydraulic model is based on the SWAN code (Mader, 1988). In addition to the pre-defined scenario, a system of computers is always ready to start a new calculation whenever a new earthquake is detected by the seismic networks (such as USGS or EMSC) and is judged capable to generate a Tsunami. The calculation is performed using minimal parameters (epicentre and the magnitude of the earthquake): the programme calculates the rupture length and rupture width by using empirical relationship proposed by Ward (2002).

The database calculations, as well the newly generated calculations with the current conditions are therefore available to TAT where the real online analysis is performed. The system allows to analyze also sea level measurements available worldwide in order to compare them and decide if a tsunami is really occurring or not.

Although TAT, connected with the scenario database and the online calculation system, is at the moment the only software that can support the tsunami analysis on a global scale, we are convinced that the fault generation mechanism is too simplified to give a correct tsunami prediction. Furthermore short tsunami arrival times especially require a possible earthquake source parameters data on tectonic features of the faults like strike, dip, rake and slip in order to minimize real time uncertainty of rupture parameters. Indeed the earthquake parameters available right after an earthquake are preliminary and could be inaccurate. Determining which earthquake source parameters would affect the initial height and time series of tsunamis will show the sensitivity of the tsunami time series to seismic source details. Therefore a new fault generation model will be adopted, according to the seismotectonics properties of the different regions, and finally included in the calculation scheme.

In order to do this, within the collaboration framework of Portuguese authorities, a new model is being defined, starting from the seismic sources in the North Atlantic, Caribbean and Gulf of Cadiz. As earthquakes occurring in North Atlantic and Caribbean sources may affect Portugal mainland, the Azores and Madeira archipelagos also these sources will be included in the analysis. Firstly we have started to examine the geometries of those sources that spawn tsunamis to understand the effect of fault geometry and depths of earthquakes.

References:

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