



Evaluation of tsunami run-up on coastal areas at regional scale

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Tsunami hazard assessment is commonly tackled by means of numerical model simulations, giving as a result, the areas that are flooded by the tsunami wave inland. To achieve this, some input data is required, i.e. the high resolution topobathymetry of the study area, the earthquake focal mechanism parameters, etc. The computational cost of these kinds of simulation are still excessive. Besides, an important restriction for the elaboration of large scale maps at National or regional scale is the reconstruction of high resolution topobathymetry on the coastal zone. An alternative and traditional method consists of the application of empirical-analytical formulations to calculate the run-up at several coastal profiles (i.e. Synolakis, 1987), combined with numerical simulations offshore without including coastal inundation. In this case, the numerical simulations are faster but some limitations are added as the coastal bathymetric profiles are very simply idealized.

In this work, we propose an extension of these second method, including the consideration of realistic profiles and the numerical simulation of tsunami events. To get this, hundreds of worldwide topobathymetric profiles have been parameterized, using 5 parameters (2 depths and 3 slopes). In addition, tsunami waves have been also parameterized by their height and period. The coastal parameterized coastal profiles and tsunami waves have been combined to build a populated database of run-up calculations. The combination was tackled by means of numerical simulations in a numerical flume formed by 2 models that were coupled ad hoc for this work: a non-linear shallow water equations model (NLSWE) for the offshore part of the propagation and a Volume of Fluid model (VOF) for the areas near the coast and inland, applying each numerical scheme where they better reproduce the tsunami wave.

The result is a tsunami run-up database that considers real profiles shape, realistic tsunami waves, and optimized numerical simulations. This database allows the calculation of the run-up of any new tsunami wave by interpolation on the database, in a short period of time, based on the tsunami wave characteristics provided as an output of the NLSWE model along the coast at a large scale domain (regional or National scale).