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Tsunami hazard maps of spanish coast at national scale from seismic sources

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Tsunamis are a moderately frequent phenomenon in the NEAM (North East Atlantic and Mediterranean) region, and consequently in Spain, as historic and recent events have affected this area. I.e., the 1755 earthquake and tsunami affected the Spanish Atlantic coasts of Huelva and Cadiz and the 2003 Boumerdés earthquake triggered a tsunami that reached Balearic island coast in less than 45 minutes. The risk in Spain is real and, its population and tourism rate makes it vulnerable to this kind of catastrophic events. The Indian Ocean tsunami in 2004 and the tsunami in Japan in 2011 launched the worldwide development and application of tsunami risk reduction measures that have been taken as a priority in this field.

On November 20th 2015 the directive of the Spanish civil protection agency on planning under the emergency of tsunami was presented. As part of the Spanish National Security strategy, this document specifies the structure of the action plans at different levels: National, regional and local. In this sense, the first step is the proper evaluation of the tsunami hazard at National scale. This work deals with the assessment of the tsunami hazard in Spain, by means of numerical simulations, focused on the elaboration of tsunami hazard maps at National scale.

To get this, following a deterministic approach, the seismic structures whose earthquakes could generate the worst tsunamis affecting the coast of Spain have been compiled and characterized. These worst sources have been propagated numerically along a reconstructed bathymetry, built from the best resolution available data. This high-resolution bathymetry was joined with a 25-m resolution DTM, to generate continuous offshore-onshore space, allowing the calculation of the flooded areas prompted by each selected source. The numerical model applied for the calculation of the tsunami propagations was COMCOT.

The maps resulting from the numerical simulations show not only the tsunami amplitude at coastal areas but also the run-up and inundation length from the coastline. The run-up has been calculated with numerical model, complemented with an alternative method, based on interpolation on a tsunami run-up database created ad hoc.
These estimated variables allow the identification of the most affected areas in case of tsunami and they are also the base for the local authorities to evaluate the necessity of new higher resolution studies at local scale on specific areas.