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Rapid inundation estimates using coastal amplification laws in the Western Mediterranean basin

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Numerical tsunami propagation and inundation models are well developed and have now reached an impressive level of accuracy, especially in locations such as harbors where the tsunami waves are mostly amplified.
In the framework of tsunami warning under real-time operational conditions, the main obstacle for the routine use of such numerical simulations remains the slowness of the numerical computation, which is strengthened when detailed grids are required for the precise modeling of the coastline response of an individual harbor. Thus only tsunami offshore propagation modeling tools using a single sparse bathymetric computation grid are presently included within the French Tsunami Warning Center (CENALT), providing rapid estimation of tsunami impact at Western Mediterranean and NE Atlantic basins scale.
We present here a work that performs quick estimates of the coastal impact at individual harbors from these high sea forecasting tsunami simulations.
The method involves an empirical correction based on the Green's theoretical amplification law. The main limitation is that its application to a given coastal area would require a large database of previous observations, in order to define the empirical parameters of the correction equation. As no tide gage records of significant tsunamis are available for the Western Mediterranean French coasts, we use a set of points of interest distributed along these coasts, where maximum water heights are calculated for both fake events and well-known historical tsunamigenic earthquakes in the area. This synthetic dataset is obtained through accurate numerical tsunami propagation and inundation modeling by using several nested bathymetric grids of increasingly fine resolution close to the shores.
Non linear shallow water tsunami modeling performed on a single 2' coarse bathymetric grid are compared to the values given by time-consuming nested grids simulations, in order to check to which extent the simple approach based on the amplification law can explain the data. The aim is to validate a fit between tsunami data and numerical modeling carried out without any refined coastal bathymetry/topography. The results show standard errors of generally less than a factor of 2, which is in accordance with results provided worldwide with other tsunami forecast tools for rapid height estimates.
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