Geophysical Research Abstracts
Vol. 20, EGU2018-18737, 2018
EGU General Assembly 2018

A Pan-European storm surge forecasting system

Tomas Fernandez-Montblanc (1), Paolo Ciavola (2), and Michalis Vousdoukas (3)

(1) University of Ferrara, Ferrara, Italy (frntms@unife.it), (2) University of Ferrara, Ferrara, Italy (cvp@unife.it), (3) Joint Research Centre, Ispra, Italy (Michail.VOUSDOUKAS@ec.europa.eu)

Coastal floods are a major global hazard with high social, economic and environmental impacts. Storm surges in particular, are considered the main drivers of coastal flooding. In Europe, the storm surge is deemed as a main natural hazard for European coasts where flooding predominantly occurs in low-lying zones under the conjunction of a large storm surge and a high spring tide. Therefore, it is essential to develop a robust tool to forecast the storm surge hazard, able to provide information about where, when, and for how long the hazardous conditions will occur and to support real time coordination of the storm surge-flooding emergency. Given the several recent coastal flooding events, such tool could be essential for disaster risk reduction and is not yet available at European scale.

In the present contribution we are reporting on the development of a Pan-European Storm Surge Forecasting System in the context of the project EC-HORIZON2020-PR700099-ANYWHERE. We are using the circulation model SCHISM (Semi-implicit Cross-scale Hydroscience Integrated System Model); which model solves the full Navier-Stokes equations over an unstructured grid. SCHISM is configured in its 2D-barotropic mode and accounts for atmospheric pressure, wind and astronomical tide and water level time series are provided as output with a 3-hour time resolution and a 10 km spatial resolution along the whole European coastline. The model validation was performed comparing a six-year hindcast with sea level measurement in 208 tidal stations covering the all parts of the European coastline. The storm surge model performance was evaluated in terms of root mean squared error (RMSE), relative root mean squared error (%RMSE) and correlation coefficient (r). The model performance to reproduce the tidal signal was evaluated in terms of absolute and relative error of phase and amplitude, as well as vectorial differences of the main tidal constituents. Moreover the sensitivity of the model to the resolution of atmospheric forcing and the non-linear interactions between tides and storm surge was investigated.

The validation results showed a satisfactory model performance in terms of accuracy and efficiency, improving the performance of the model presented by Vousdoukas et al. (2016) . The RMSE was lower than 12.5 cm in the 85 % of the tidal gauge stations; the %RMSE was less than 12.5% in most of the tidal stations (65% of the tidal gauges). The r coefficient showed values larger than 0.7 in 79.6% of the tidal gauges considered for the surge validation. Results showed that resolving tide-surge interaction can improve substantially model performance along areas characterized by the combination of high storm surge levels and tidal range (e.g. North Sea and North Atlantic). Along semi-enclosed basins (e.g. Black Sea, Baltic, Adriatic, and Mediterranean Sea) the atmospheric forcing resolution appears to apply a strong control on the accuracy of the storm surge prediction.

REFERENCES

Vousdoukas, M.I., Voukouvalas, E., Annunziato, A., Giardino, A., Feyen, L., 2016. Projections of extreme storm surge levels along Europe. Clim. Dyn. 47, 3171–3190.