Storm surge modelling in the Mediterranean Sea with focus on the Italian coast

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This study examines the interactions between tide, wave and surge in determining the total water level in the Mediterranean Sea, by using a high resolution finite element tide-wave-surge model. The model system consists in a finite element hydrodynamic model, including a tidal model, and in a third generation finite element spectral wave model. The finite element method permitted to follow the details of bathymetry and morphology in the coastal zone, describing the areas of special interest with higher resolution. The numerical computation has been carried out on a spatial domain that represents the Mediterranean Sea through an unstructured grid which consists of about 120,000 triangular elements with a resolution that varies from 15-20 km in the open sea to 5 km in the coastal area and to 1.5 km along the Italian coast. Model performance has been evaluated comparing the simulated water level and wave characteristics against an observation database of 3 years. Tidal harmonic analysis has been performed on both modeled and observed water level in order to validate the model for both the tidal and the storm signals. The hindcast results show that the run with tide and with wave is more accurate than the conventional method (surge plus tide independently) in predicting the total water level along the Italian coast. A high resolution storm surge forecasting system for the Mediterranean Sea will be next developed coupling our model framework with a high resolution meteorological model.