**Coupling numerical modeling and joint extreme analysis of wave height and storm surge for calculating coastal hazards along the shoreline of Normandy (France)**

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**Abstract**

In the context of global climate change, most of researchers claim that the water level variability and the increase of the frequency and the intensity of extreme events are considered as potential threats facing several low-lying coastal and estuarine communities. Hence, many efforts have been devoted to better understand the natural processes driving the multiscale variability of the hydrodynamics to produce a more accurate estimation of their fluctuations and ensuring reliable coastal risk assessments. In this context, and in the framework of the Normandy coastal risk management, a simulation of waves and sea level propagation over the English Channel is proposed. The aim is studying the evolution of waves and the generation of surges from deep water through the basin and when they approach to Normandy coasts by constructing a climate database on shallow waters. An unstructured grid has been used for these simulations considering the surrounding area of the Channel in order to obtain a better definition of this evolution. Open boundaries of the grid are defined by the Bay of Biscay on the South, by the Atlantic Ocean on the East and by the Irish Sea and the North Sea on the North.

The model used has been Delft3D Flexible Mesh Suite. Delft3D FM Suite is a numerical model developed by the Deltares institute and can simulate storm surges, water levels and waves among others, and is capable of handling the interactions between these processes. The model has been forced with time series of different variables: Wind and pressure data from ERA5, wave data obtained from the MetOffice and tides from FES2014. Buoy 62305, in a central location on the English Channel (50.4º N, 0º E), and different tide gauges, along the British and French coasts, have been used for validation and assimilation for obtaining the 40 years database. With the set-up of the model validated, a joint extreme analysis of wave height and storm surge has been done for calculating the combinations of extreme events of both variables associated to the standard return periods. After propagating these results till nearshore using the same set-up in the numerical model, a hazard curve has been constructed for each location of interest on the Normandy coasts.