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Wind Induced Storm Surge Risk in the German Bight: Present Day Climate and GHG Scenario

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Storm surges are a major hazard affecting the German North Sea coast. As these events can lead to high socio-economic impacts or even casualties, possible changes of storm surge intensity and frequency are of crucial interest. Contributions to storm surge risk could come from sea-level rise and/or changing wind climate, where only the latter factor is considered here.

This project aims at investigating possible impacts due to changed storminess over the North Sea region. The atmospheric contribution to the risk is investigated solely and oceanographic components and the astronomical tide are not taken into account so far.

The work in this project can be divided into three steps. In a first phase, the relationship between the effective wind speed (projected wind speed to 295°) over the German Bight and the wind surge height at Cuxhaven was analysed.

Secondly, for not overestimating short and local wind speed maxima over this small region, it was tried to assign historic storm surge events to large-scale wind storms. These wind storm events are identified using an objective wind storm identification algorithm, based on the exceedance of the local 98th percentile for wind speed in 10 meters height. After successful assignment of historical storm surges to identified wind storm events, characteristics of these events were analysed. It turned out that the combination of identified large-scale wind storm events over the North Sea with strong effective wind speeds over the German Bight, is a suitable approach to select potential storm surge events.

In a third step, the validated methodology is used to detect exceptional events in ECHAM5/MPI-OM model data for recent (20C) climate conditions at the end of the last century and a possible future climate (A1B) at the end of the present century. Comparing the results for 20C and A1B shows an increase of potential wind storm events. The dependency of the signal on storm intensity is discussed.