Extreme surge level identification and evaluation along the German North Sea coast based on atmospheric components

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In the context of global climate change, interest in the study of very severe storm surges and their impacts on the southern North Sea and more particularly in the German Bight has increased over the last decades.

Part of the research project EXTREMENESS, funded by the German Federal Ministry of Education and Research aims at identifying extreme wind fields that trigger wind surges likely to cause significant damages along the coast of the German Bight. The identification was carried out for a large number of atmospheric datasets that include observations, results of atmospheric reanalyses at global and regional scales, and of climate model simulations. We analysed over 10.000 years of atmospheric data. In addition, the model results are validated against observations in the coastal area for historical storms using the DWD archives.

The evaluation of the extreme surge levels takes following methods into account: on the one hand, a statistical wind surge model based on wind speed, wind direction and sea level pressure is optimised for extreme events that are detected in the different datasets. On the other hand, the second method consists of evaluating the so-called effective wind and its extremes. The effective wind is the result of the projection of the real wind onto that wind direction, for which the impact of the wind on the water level is most effective.

In the present study, only atmospheric information from models and observations are used to identify and evaluate the surge levels along the coast of the German Bight. An analysis of historical and future severe wind surges from climate projections is provided.