



## **The relationship of weather types on the co-occurrence of extreme high coastal water levels with high precipitation in Northern Germany**

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As a consequence of climate change atmospheric and oceanographic extremes and their potential impacts on coastal regions are of growing interest for governmental authorities responsible for the transportation infrastructure. Highest risks for coastal shipping and dewatering low-lying land originate from combined effects of extremes of storm surges and heavy rainfall which sometimes lead to insufficient dewatering of inland waterways. The German Ministry of Transport and digital Infrastructure therefore has tasked its Network of Experts to investigate the possible evolutions of extreme threats for low lands and especially for Kiel Canal, which is an important shortcut for shipping between the North and Baltic Seas.

In this study we present an analysis from weather types in the past (from observations) and in the future in a changing climate by use of the coupled Regional Ocean-Atmosphere Climate Model, Max-Planck-Institute for Meteorology, Hamburg (MPI-OM) , relevant for co-occurrence of extreme water levels at the coast with high precipitation.

Some weather types are strongly correlated with joint appearance of high water levels with strong precipitation. In the coupled model MPI-OM under scenario RCP8.5 we detect an increase of these weather types, but also an independent growth of extreme water levels, primarily caused by sea level rise. We compare the impact of these joint and independent changes on dewatering potential for Kiel-Canal and provide an estimate on the decreasing dewatering potential for Kiel Canal until the end of the 21st century.