



Anthropogenic climate change impact on future North Sea wave and surge conditions

Iris Grabemann, Lidia Gaslikova, Nikolaus Groll, and Ralf Weisse
Helmholtz-Zentrum Geesthacht, Institute for Coastal Research, Geesthacht, Germany

Marine related hazards such as storm surges and extreme sea states represent a major environmental threat in the North Sea area. In case of anthropogenic climate change storms and storm-related extreme sea levels (extreme storm surges and sea states) may enhance coastal risks and may endanger marine industry. Changes in North Sea wave and storm surge heights as a consequence of anthropogenically induced changes in the atmospheric forcing have been analyzed using a set of future climate change projections. The atmospheric forcing for this set of ten wave and four storm surge projections originates from regionalized global projections in which different models, initial conditions and emission scenarios were incorporated.

This set of projections displays the following general results. In the course of the 21st century severe wave and storm surge heights show variations on multi-decadal time scales which vary between the projections. These variations are superimposed on long-term changes and point to the internal variability. The spatial pattern and the magnitude of the changes towards the end of the 21st century (generally 2071-2100 in comparison to 1961-1990) vary between the different wave projections as well as between the different storm surge projections. By determining common changes it was found that the majority of the wave projections describe an increase of severe significant wave heights in the eastern parts of the North Sea and more than half of the projections show a decrease in the western parts for 2071-2100. The four storm surge projections agree in an increase of severe storm surge heights in the southeastern North Sea and in the German Bight towards the end of the 21st century. Changes of severe surge heights in other parts of the North Sea are comparably small. These results are incorporated in the North Sea Climate Change Assessment (NOSCCA). A comparison with findings from other projections mentioned in literature and NOSCCA will be presented.