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Towards an extreme wind climatology for The Netherlands based on downscaling ERA-Interim with the HARMONIE-AROME high-resolution model

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A new wind climatology of the Netherlands is being developed by KNMI and Deltares, in support of the safety assessment of Water Defences. Based on model simulations that are validated by wind measurements, it will answer the need for a proper description of extreme storms.

Since millions of people in the Netherlands live and work in areas protected from flooding by dikes, extreme winds in the Netherlands have been the object of intensive study. So far, these studies have been based on station observations and interpolation methods that account for differences in surface roughness. However, these methods face limitations when extrapolating from land locations to water. Also, the requirements on the wind climate have changed. Future assessments of Dutch Water Defences will consider not only the strength of a storm, but also its extension and characteristics in space and time.

High-resolution models of sufficient quality can represent extreme winds and answer these requirements. The basis for our simulations is the ERA-Interim re-analysis of ECMWF for the period 1979-2012. ERA-Interim has a T255 resolution that is too coarse for our purposes. For down-scaling ERA-Interim to a resolution of 2.5km we use the HARMONIE-AROME model that has been developed by Météo France and the Aladin-Hirlam model consortium.

We use an approach where short HARMONIE runs are initiated from ERA-Interim analysis fields. We discuss the choices we have made with regard to domain size and model spin-up time. Comparison with observations from a test set of 17 storms shows that the down-scaled wind fields adequately represent extreme wind fields over the Netherlands. In particular, we pay attention to the wind field near the coast, stability effects, and the formulation of the drag over water surfaces in the model. Once validation is complete, the model will be used to simulate all storms over The Netherlands in the period 1979-2012, and this data set will form the basis of the extreme wind climatology.