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High-resolution multi-model projections of extreme wind events over Denmark: How to select regional climate scenarios for impact modelling studies?

Jian Su, Ole Bøssing Christensen, and Kristine Skovgaard Madsen
Danish Meteorological Institute, Copenhagen, Denmark (jis@dmi.dk)

We present a detailed assessment of the annual maximum wind speed (AMWS) over Denmark, based on the EURO-CORDEX database of high-resolution regional climate model (RCM) simulations. The Danish Meteorological Institute is developing a product within 'Climate Atlas' project. The aim is to facilitate climate change adaptation planning based on climate model results. The storm surge along the Danish coast is one of the special focuses. A high resolution regional ocean model (HBM) and a high resolution regional climate model (HARMONIE-Climate) will be further employed in this project for the impact studies. However, such impact studies cannot afford using the full number of CORDEX simulations. Hence, a subset should be selected. Until now such subsets were often chosen based on their mean status of model simulations (e.g. mean temperature and wind change) or hand-picking methods. However, the climate change impact studies often focus on extreme weathers. By using more specific information about extreme events as guidance for the clustering of simulations, the subset fits the purpose of climate change impact research more appropriately.
The ensemble of climate simulations used in this study consists of 23 GCM-RCM combinations from the EURO-CORDEX initiative with a grid spacing of 0.11 x 0.11 degree. We applied the extreme value analysis to cluster the CORDEX simulations. The generalized extreme value (GEV) distribution is used to fit the AMWS and the clustering methods are based on the fitting parameters (shape, location, scale). The spatial patterns of the fitting parameters displayed large sub-regional heterogeneity. Subsequently, we investigated the future changes of fitting parameter of the AMWS throughout the twenty-first century, considering mid- and end-century periods, and two emission scenarios (RCP4.5 and RCP8.5).