



## **Analysis of the variability of extra-tropical cyclones at the regional scale for the coasts of Northern Germany and investigation of their coastal impacts**

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The evaluation of long-term changes in wind speeds is very important for the coastal areas and the protection measures. Therefore the wind variability at the regional scale for the coast of Northern Germany shall be analysed. In order to derive changes in storminess it is essential to analyse long, homogeneous meteorological time series. Wind measurements often suffer from inconsistencies which arise from changes in instrumentation, observation method, or station location. Reanalysis data take into account such inhomogeneities of observation data and convert these measurements into a consistent, gridded data set with the same grid spacing and time intervals. This leads to a smooth, homogeneous data set, but with relatively low resolution (about 210 km for the longest reanalysis data set, the NCEP reanalysis starting in 1948).

Therefore a high-resolution regional atmospheric model will be used to bring these reanalyses to a higher resolution, using in addition to a dynamical downscaling approach the spectral nudging technique. This method 'nudges' the large spatial scales of the regional climate model towards the reanalysis, while the smaller spatial scales are left unchanged. It was applied successfully in a number of applications, leading to realistic atmospheric weather descriptions of the past.

With the regional climate model COSMO-CLM a very high-resolution data set was calculated for the last 67 years, the period from 1948 until now. The model area is North Germany with the coastal area of the North sea and parts of the Baltic sea. This is one of the first model simulations on climate scale with a very high resolution of 2.8 km, so even small scale effects can be detected.

With this hindcast-simulation there are numerous options of evaluation. One can create wind climatologies for regional areas such as for the metropolitan region of Hamburg. Otherwise one can investigate individual storms in a case study. With a filtering and tracking program the course of individual storms can be tracked and compared with observations. Also statistical studies can be done and one can calculate percentiles, return periods and other different extreme value statistic variables. Later, with a further nesting simulation, the resolution can be reduced to 1 km for individual areas of interest to analyse small islands (as Foehr or Amrum) and their effects on the atmospheric flow more closely.