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Added value of very high resolution model simulations for the coasts of Northern Germany using the example of two case studies of extra-tropical cyclones

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This study aims to analyse a range of added values for a very high-resolution climate model simulation (RCM) which permits convection in comparison to a regional model with coarser grid resolution.

Reanalysis data were dynamically downscaled with the RCM COSMO-CLM to a much higher resolution, using in addition to the conventional forcing via the lateral boundaries the spectral nudging technique in the model domain′s interior. 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.

The hindcast was calculated for the last 67 years, from 1948 until 2014. The model area is the German Bight, including Northern Germany and parts of the Baltic Sea. This is one of the first model simulations at climate scale with a very high resolution of 2.8 km, so even small-scale effects can be detected.

With a filtering and tracking program the course of individual storms was tracked and compared with observations. The high-resolution model simulation shows precipitation areas which are not present in the coarser grid simulation, especially in summer months when the maximum of convective precipitation is reached. This leads to a higher monthly accumulated precipitation, which is more realistic in comparison to observations. Also for wind speed and gusts one can see a more realistic wind field in urban areas, which is caused by a better description of surface topography. In addition return values and percentiles of wind speed and precipitation were examined.
Two case studies were analysed, storms Xynthia (February/March 2010) and Christian (October 2013) which both moved through the model area.