DKT Abstracts
DKT-10-11, 2015
10. Deutsche Klimatagung

Variability of daily winter wind speed distribution over Northern Europe during the past millennium in regional and global climate simulations.

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We analyse the variability of the probability distribution of daily wind speed in wintertime over Northern and Central Europe in a series of global and regional climate simulations covering the last centuries, and reanalysis products covering approximately the last 60 years. The focus of the study lies in identifying the link between the variations in the wind speed distribution to the regional near-surface temperature, to the meridional temperature gradient and to the North Atlantic Oscillation.
The climate simulations comprise three simulations, each conducted with a global climate model that includes a different version of the atmospheric model ECHAM. Two of these global simulations have been regionalised with the regional climate models MM5 and CCLM. The reanalysis products are the global NCEP/NCAR meteorological reanalysis version 1 and a regional reanalysis conducted with a regional atmospheric model driven at its domain boundaries by the NCEP/NCAR reanalysis.
Our main result is that the link between the daily wind distribution and the regional climate drivers is strongly model dependent. The global models tend to behave similarly, although they show some discrepancies. The two regional models also tend to behave similarly to each other, but surprisingly the results derived from each regional model strongly deviates from the results derived from its driving global model. The links between wind speed and large-scale drivers derived from the reanalysis data sets overall tend to resemble those of the global models.
In addition, considering multi-centennial time scales, we find in two global simulations a long term tendency for the probability distribution of daily wind speed to widen through the last centuries. The cause for this widening is likely the effect of the deforestation prescribed in these simulations.
We conclude that no clear systematic relationship between the mean temperature, the temperature gradient and/or the North Atlantic Oscillation, with the daily wind speed statistics can be inferred from these simulations. The understanding of past and future changes in the distribution of wind speeds, and thus of wind speed extremes, will require a detailed analysis of the representation of the interaction between large-scale and small-scale dynamics.