



Wind speed and wind energy potentials in EURO-CORDEX ensemble simulations: evaluation, bias-correction and future changes

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The EURO-CORDEX initiative aims at dynamically downscaling the CMIP5 global climate projections to provide an ensemble of high-resolution regional climate change scenarios for Europe. We analyse a multi-model ensemble of recent EURO-CORDEX simulations at 12km resolution focussing on wind speed and wind energy potentials. The analysis is based on 3-hourly 10m wind speeds from 9 different GCM-RCM-chains. For validation, the historical 10m wind speeds are compared to ERA-Interim driven evaluation runs for the same RCMs. This comparison uncovered some substantial biases for wind speeds, which result both from the choice of GCM and RCM. Since these biases may influence the climate change signal, the 10m wind speeds from the historical and the scenario runs are bias corrected. With this aim, a probability mapping is carried out to adjust the simulated wind speeds to the evaluation runs. In a next step, the corrected 10m wind speeds are extrapolated to the average hub height of a wind turbine (here 100m). For this purpose, different approximations for the power law exponent and their influence on the wind speed distribution in 100m were investigated. Finally, gridded wind energy output (Eout) is calculated for two operational wind turbines by taking the specific characteristics of the turbines into account. With this methodology, future changes of wind characteristics relevant for the wind energy production are estimated, including mean changes in annual and seasonal wind energy production, changes in variability and extreme events like long-lasting calm periods.