



Long term variability of wind energy resources in Hungary

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Hungary is targeting to double green its energy capacity by 2020. Currently, the total capacity of 172 wind turbines in Hungary is 329 MW, which is less than 1.5% of total energy consumption of the country. Different scenarios suggest that the capacity for the wind energy will increase to around 1000 MW by 2030, which highlights the importance of projecting the potential changes of the available wind energy. For this purpose, simulated wind climate variability is evaluated for the future periods of 2021–2050 and 2071–2100 relative to the 1961–1990 reference period. The research is using the following main steps. (1) Since projected wind speed is highly overestimated by the simulation of the regional climate model RegCM for the reference period (1961–1990), a bias correction is necessary to apply to the raw simulated wind data using CARPATCLIM as a reference database. The bias correction method is based on fitting the empirical cumulative density functions of simulated daily time series to the observations for each gridcell using monthly multiplicative correction factors. (2) Thus, for the evaluation of the projected climate change, bias-corrected RegCM outputs are used. Projected monthly wind speed changes in the median and the 90th percentile are relatively small (below 0.4 m/s and 0.6 m/s, respectively) for both future periods (2021–2050 and 2071–2100), however, estimated monthly changes of the 99th percentile may reach 2 m/s in several regions in the country. Differences of the medians do not exceed 0.4 m/s. (3) In order to estimate the available wind energy in the country, changes of the third power of daily wind speed at 100 meter averaged for northwestern gridcells (where most of the wind parks are installed) are calculated for the future periods of 2021–2050 and 2071–2100 relative to the 1961–1990 reference period.

Based on the RegCM regional climate model simulations for the Hungary, as a consequence of warming climatic conditions, the available wind energy potential is projected to increase (decrease) in summer (winter), namely, small wind speed is likely to decrease (increase), whereas the number of days with higher wind speed will increase (decrease).