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The impacts of long term climate change on wind energy resources in Hungary

Csilla Peline Nemeth (1), Judit Bartholy (2), Rita Pongracz (2), and Kornelia Radics (3)

(1) Geoinformation Service of HDF, Budapest, Hungary (pelinenemeth.csilla@mhtehi.gov.hu), (2) Department of Meteorology, Eötvös Loránd University, Budapest, Hungary (bartholy@caesar.elte.hu; prita@nimbus.elte.hu), (3) Hungarian Meteorological Service, Budapest, Hungary (radics.k@met.hu)

Renewable energy sources are currently investigated worldwide and corresponding technologies undergo rapid developments. Climate change, environmental impact and shrinking non-renewable, fossil energy resources are driving plenty of scientific research. These basic and applied studies are needed to deeply understand technologies and better integrate them with power systems.
Hungary is targeting to double its green energy capacity by 2020. 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 available wind energy. Therefore, we aimed to evaluate simulated wind climate variability for the future periods of 2021–2050 and 2071–2100 relative to the 1961–1990 reference period using bias-corrected RegCM regional climate model outputs. The bias correction is necessary to apply to the raw simulated wind data (using CARPATCLIM as a reference database) since projected wind speed is highly overestimated by the simulation of the regional climate model RegCM for the reference period (1961–1990). 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.
Our extreme statistical analysis includes the estimation of return periods and several wind related climate indices, which can help to evaluate global climate change influences on wind field characteristics. On the basis of the results, wind climate indices associated with higher daily average wind speed are projected to decrease in winter, and increase in the other seasons, especially, in summer. Moreover, higher return periods are estimated in the future simulation periods compared to the simulation of recent past.