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Analysis of extreme wind speed and wind gust for Hungary

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Homogenized wind speed (1975–2012) and wind gust data sets (1975–2013) were analysed in order to assess Hungarian wind climate trends, variability, frequency and intensity of extreme wind events reliably. Decreases in the annual mean wind speed were found in our former studies when using homogenised observed wind data. These results are consistent with reduced Pole to Equator temperature gradient in a warmer world. Question arises how a changing global climate affects regional and local wind extremes in Hungary.

First, 10-metre wind speed from the ERA Interim reanalysis was compared to the station observations. The comparison is quite difficult due to the fact that the observed 10-metre wind speed is a point measurement, where variables of the ERA Interim reanalysis represent larger areas, at least the size of the grid box ($0.5^\circ \times 0.5^\circ$) and are subject to the effects of a smoothly varying surface topography. Then, 0.1° horizontal resolution gridded wind speed data sets (CARPATCLIM) based on homogenized measured data series were used to estimate spatial and temporal distribution of extreme wind parameters for Hungary.

The extreme values calculated from the observed and CARPATCLIM wind data sets are presented in this study. The annual daily maxima of wind speed and wind gust were fitted to the Generalized Extreme Value distribution at every station, which were used to estimate 50- and 100-year return values. Additionally, the threshold crossing technique was applied to evaluate the frequency occurrence and the trend of moderate and strong wind days at the stations for the recent past.