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Wind speeds over the Czech Republic: spatiotemporal variability and its large-scale climate drivers

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Monthly, seasonal and annual wind-speed series from 119 meteorological stations situated throughout the Czech Republic reveal largely decreasing and statistically significant trends in the 1961–2015 period, combined with shorter-term oscillations at various time scales. Statistical attribution analysis, based on multiple linear regression combined with moving-block bootstrap, was employed here to identify wind-speed components related to external climate forcings (solar irradiance, volcanic activity, anthropogenic greenhouse gases and aerosols) as well as to internally-induced climate variability (North Atlantic Oscillation, East Atlantic / Western Russia Pattern, Atlantic Multidecadal Oscillation, Southern Oscillation, Pacific Decadal Oscillation). A strong link to wind speeds was detected for the North Atlantic Oscillation Index, as well as for the closely-related Central European Zonal Index, particularly during the winter season. An influence from the East Atlantic/Western Russia Pattern was found during autumn and winter, especially in the eastern part of the Czech territory. A weaker, albeit still significant, relation to volcanic activity also emerged, although additional assessment of the local impacts of explosive volcanism is still needed to better understand the nature of this connection. Distinct geographical variations in the regression-estimated links suggest profound influence from interactions between the local features of the measuring sites and large-scale climate-forming factors, and are discussed with regard to the regional conditional circulation patterns.

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