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# Mesoscale modelling of the spatio-temporal variability in wind and solar time series for power and energy system applications

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Renewable energy generation variability impacts several areas in power and energy systems, such as optimal energy system planning, power system vulnerability to storm shutdowns, and available voltage stability support. For this reason, meteorological data able to represent fluctuation in solar irradiance and wind speed is crucial. For such studies, it is a requirement that time series provided by weather models are capable of simulating temporal dependencies, such as autocorrelations, but also temporal correlations among locations. However, most weather model developments for wind energy studies seem to focus their validations on the mean values of solar and wind variables or the skill of numerical weather prediction forecasts.

In this context, this work aims to contribute to modelling the spatio-temporal variability in solar and wind time series over Northern Europe by addressing the following questions: How does the interaction between the mesoscale model and its forcing impact the quality of generated time series for power and energy system purposes? How do model initialisations affect the temporal dependencies? The Weather Research and Forecasting (WRF) model generates the simulated time series for various sites with available measurements. Different model configurations are tested, such as domain size, placing and nesting, and the impact of abrupt versus smooth initialisation.