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The NEWA probabilistic wind atlas: Providing uncertainty information based on a multi-physics ensemble

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The New European Wind Atlas (NEWA) project aims to develop a new reference method for wind resource assessment and wind turbine site suitability based on a mesoscale to microscale model-chain. This new approach will produce a more reliable wind characterisation than current models leading, through a probabilistic and model evaluation approach, to a better estimation of uncertainties on wind energy production and wind conditions that affect the design of wind turbines.

The mesoscale wind atlas will be based on simulations with the Weather Research and Forecasting Model (WRF). For the preparation of the production runs numerous sensitivity studies with regard to physical and numerical parameter settings have been performed. Based on the outcome of the sensitivity studies a final setup for the 30 year production runs of the mesoscale wind atlas has been chosen. In the first part of our presentation we briefly summarize the results of the sensitivity studies and present the mesoscale wind atlas setup.

NEWA will furthermore include a probabilistic wind atlas based on a multi-physics ensemble of WRF simulations with different setups. First, a rather large ensemble of 30-50 members is calculated for a small region. In a second step the ensemble members giving the highest spread are chosen and a reduced ensemble of 10-15 members is calculated for all 10 regions of the wind atlas, covering the complete EU and Turkey plus large offshore areas. Due to the huge computational costs only one year of ensemble data can be generated. Taking the mesoscale wind atlas setup as base we vary several parameters as e.g. the forcing by different reanalysis datasets (including ERA-5), different boundary layer parameterisations, land surface models and roughness modifications. The output of the ensemble simulations, i.e. ensemble mean and spread, is used to create a map showing the uncertainty in the wind resource estimate at each geographical location. The probabilistic wind atlas will be validated against data from meteorological masts. We present the setups and results of the multi-physics ensemble as well as preliminary validation results.