EMS Annual Meeting Abstracts
Vol. 20, EMS2023-640, 2023, updated on 20 May 2024
https://doi.org/10.5194/ems2023-640
EMS Annual Meeting 2023


# Using mesoscale and microscale models for wind resource assessment

**Rogier Floors** and Bjarke Tobias Olsen
Department of Wind and Energy Systems, Technical University of Denmark (DTU), Roskilde, Denmark

Prior to installation of wind farms, the wind resource has be to assessed with the greatest possible accuracy, which is often achieved using a combination of mesoscale and microscale flow modelling. Mesoscale models are generally run at horizontal grid spacings of 1--3 km and therefore lack the resolution to model the wind resource at so-called microscales (10-100 m) that are required for wind resource assessments. Therefore a variety of models (i.e. linearized, CFD) is applied to model the wind speed at these finer scales. Generally, it has been difficult to show added value of microscale modelling, partially due to the lack of measurements that quantify the variability at scales of 10 to 100 m.

We use the mesoscale model outputs from the new european wind atlas, which uses WRF v3.8.1 at 61 vertical levels and 3 km horizontal grid spacing. For the microscale modelling, we use the latest version of PyWAsP, that contains a python interface to submodules for orographic, roughness and stability effects.

We show examples of combining long-term simulations (1989-2018) of the WRF model and its wind distributions and other model outputs in combination with high-resolution roughness and elevation maps. This model chain is applied to mast and lidar measurements at sites which are characterized by a high variability on the microscale. We quantify contributions of the orographic, roughness and stability submodules to the microscale variability and discuss how the model chain can be improved. Finally, some of the applications of a mesoscale to microscale model chain are presented.