Active meteorological research areas in wind energy

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Abstract:
The shift towards renewable energies is most effectively accelerated when people can earn a lot of money with it. Knowing the wind conditions on the site is necessary for building the most profitable wind farms. Turbines need to be placed in spots with the highest wind speeds but with the lowest loads on the turbines at the same time.

As of today, results from mesoscale models do not provide good enough horizontal grid resolution to describe the local wind and turbulence conditions around wind turbines accurately enough. Therefore, the wind industry is using computational fluid dynamic models (CFD) to model the wind resource at a potential wind farm site.

The presentation will explain how wind resource assessment with CFD models is done and how complex atmospheric processes get simplified to yield realistic enough wind simulations in a computationally efficient way to be applicable for wind farm design.

Many R&D projects are run within the wind industry and in collaboration with universities to understand which atmospheric processes are important for wind resource assessment and how to implement them in a modelling framework. Some of these projects will be discussed in detail in the presentation. Focus will be given to the coupling between mesoscale and CFD models, atmospheric stability, and the correction of wind speed measured with remote sensing devices with CFD simulations.