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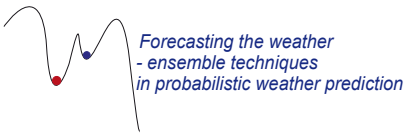

Forest edge experiment and modeling

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The placement of wind turbines in forested areas has become more common due to increased turbine height and robustness. Forests are characterized by their large aerodynamic roughness with associated high turbulence level and wind shear. Another characteristic of forested areas is large-scale heterogeneities in the form of clear-cuts or lakes and mires.
In order to improve flow modeling in the heterogeneous forested landscape, a meteorological experiment with two masts and two ZephIR wind lidars (LIght Detection And Ranging, Natural Power, UK) was performed at a forest edge of the Tromnæs beech forest in 2008. We present data from this field campaign and compare the measurements with modeling results from the SCADIS flow model (Sogachev et al., 2006).
The measurements from the horizontal lidar showed a minimum in the mean wind speed just before the forest, when the wind direction was towards the forest, and a speed-up of the flow over the forest edge. When the mean wind direction was towards the grass field away from the forest, the lidar measurements showed a fast increase in mean horizontal wind speed as the distance to the forest edge increased. The mean wind speeds from the sonic anemometers are in agreement with the results from the lidar. These sonic anemometer measurements also showed an increase in turbulence (turbulent kinetic energy as well as friction velocity) after the edge, and a local turbulence maximum was measured at 20m on the mast outside the forest. Spectral characteristics of the flow outside, above and within the forest are also presented.

References:

Sogachev and Panferov, 2006: Modification of two-equation models to account for plant drag, Boundary Layer Meteorol. 121, 229-266.