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Forecasting the weather
- ensemble techniques
in probabilistic weather prediction

Relation between wind speed and noise from wind turbines

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In the Netherlands the development of new legislation for industrial noise, specifically noise from wind turbines, resulted in an interesting application of meteorological information. The annoyance of the public by the noise from windmills caused a severe delay in the development of wind energy projects in the Netherlands. A major role in the debate was the effect of low-level jets on the noise level as experienced at ground level. Low-level jets are a well known phenomenon in boundary layer meteorology which occur typically near sunset in the early evening on sunny days when the people sit outside in the garden. The protests of the neighbours of windmills made the government aware of the importance of a distinction between noise impact during day, evening and night periods. New legislation which discriminates between noise at these periods using year averaged wind speed climatology has been developed.

Noise from windturbines differs from other industrial noise sources because the noise levels from wind turbines are strongly dependent on the wind velocity. The new legislation therefore is strongly dependent on the wind speed at the height of the rotor. For the derivation of a wind speed climatology for the Netherlands model winds from the KNMI Hirlam data archive is used. Verification of the model data against the observations from the Cabauw mast located in the centre of the Netherlands is presented. The model data are also compared to an upper air climatology as derived from the dense synoptic measurement network in the Netherlands. Data from the 10 meter masts in the Netherlands are translated to 100 meter above ground level and the differences between these two climatologies are discussed.

The effects of the new legislation are illustrated with respect to the expected sound levels and the approximate resulting required minimum distances between residential areas and wind turbines.