



Wettermast Hamburg: Applying Mixing Length Models at a Heterogeneous Location

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Electrical power generation by means of wind energy has become more and more important in recent years. To increase efficiency, wind turbine heights grow to orders of 100 m or more. The surroundings of deployed wind turbines are seldom "ideal" in the sense of surface layer theory, which makes yield projections with conventional methods challenging. The description of the wind speed at higher levels by means of the logarithmic wind profile is no longer sufficient. Therefore, mixing length models have been introduced in an attempt to extend the wind profile description to heights above the surface layer.

At the measurement site "Wettermast Hamburg" a large set of profile measurements is available. Continuous measurements for some variables are conducted since 1995. The measurement site is located at the easterly outskirts of Hamburg, Germany, with rural landscape to the east and urban surroundings to the west. The tower is a 300 m high radio tower equipped with meteorological instruments in nine levels (2 m to 280 m). This site provides the unique opportunity to analyze data at a location that is by no means ideal in the sense of traditional boundary layer theory but is surrounded by heterogeneous surfaces and with measurement levels reaching well into the atmospheric boundary layer.

We will present an evaluation of mixing length models for wind profiles applied at the Wettermast Hamburg site. Observations used for these investigations were obtained from October 2000 until March 2012. To reduce the influence of different surface roughnesses, the data are filtered with regards to wind direction beforehand. These comparisons are done at different atmospheric stratifications from very unstable to very stable conditions.