



Timing of wind gust maxima within a 100 m layer above the ground

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The trend in the increasing size of wind turbines, their height and the area swept by their blades have revised the needs for understanding the vertical structure of turbulence and wind gusts. Information on gusts is needed not only from a single height but for the whole profile. In this study, the vertical structure of wind gusts was investigated using turbulence measurements from a 100 m high meteorological mast at the Danish National Test Station for Large Wind Turbines located in Høvsøre in northwest Denmark. The site represents flat, homogeneous grassland with an average gust factor of 1.4 at 10 m and 1.2 at 100 m level. A new technique to study the timing of the maxima at different levels relative to the maximum gust at some level was developed. Results showed that a 10 m level maximum gust was typically preceded by maxima at higher levels, and vice versa, a 100 m level gust was usually followed by maxima at lower levels. The time differences between the maxima were about 5 – 22 s per 100 m for the 10 m level maximum gusts and about 9 – 26 s per 100 m for the 100 m level gusts. These numbers corresponded to horizontal distances of about 68 – 266 m and 102 – 272 m, respectively.