



## Wind profiles for large wind turbines

C. B. Hasager, A. Peña, S.-E. Gryning, T. Mikkelsen, and M. Courtney

Risø National Laboratory for Sustainable Energy - DTU, Wind Energy, Roskilde, Denmark (charlotte.hasager@risoe.dk, +45 4677 5970)

The 12MW project aimed to describe wind profiles and turbulence at levels high in the atmosphere where large wind turbines operate. During the project observations up to 180 m above sea level were collected using mast and lidar offshore in the North Sea at the Horns Rev wind farm in 2006. Later also land-based observations were collected at the coastal station Høvsøre at the North Sea coast of Jutland, Denmark. The most recent observations include wind profiles up to 300 m above ground. In addition, ceilometers observations were collected. Based on the observations results have been obtained and published. Some of the interesting findings are that the atmospheric planetary boundary layer (PBL) often is rather shallow, and as the logarithmic wind profile is only valid in the lower 10% of the PBL, other scaling parameters than roughness is needed. It has been shown that the height of the PBL is an important scaling parameter. Other results include variations in the wind profile as a function of stability, and in particular, for stable stratification the results deviate much from the simple profile equation. The observations and the new profile equations and the results will be presented. Part of the work in the 12MW project has been to compare mast observations to lidar observations, and the results are good indeed. This has given a basis to merge the observations into profiles using mast data at the lower levels and lidar data at the higher levels, thus extending the wind profiles up to high levels in the atmosphere.