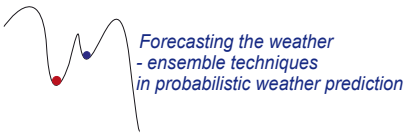
EMS Annual Meeting Abstracts
Vol. 8, EMS2011-118, 2011
11th EMS / 10th ECAM



A case study of boundary-layer height estimation from different remote-sensing instruments and model data

A. Peña (1), R. Floors (1), S.-E. Gryning (1), E. Batchvarova (1,2), and A. Hahmann (1)

(1) Wind Energy Division, Risø DTU, Roskilde, Denmark, (2) NIMH, Bulgarian Academy of Sciences, Sofia, Bulgaria

The boundary-layer height has an influence on the flow characteristics in the atmospheric boundary layer and such influence becomes larger the higher one observes above the ground. With nowadays large wind turbines, there are many atmospheric situations, particularly during stable conditions, where the boundary-layer height influences the wind profile in such a way that the predicted value of the wind shear might jump from positive to negative. Models of the wind profile which take into account the boundary-layer height, have already been developed and are in good agreement when compared to observations from tall meteorological towers and combined mast/remote-sensing data. However, there is still a lack of simultaneous wind speed, turbulence, and boundary-layer height observations for model verification and better wind speed predictions.

Here, we illustrate a case in which the boundary-layer height has been estimated from different instruments and techniques: 1) a long-range wind lidar, which measures the wind speed up to 2 km, and that can be used to estimate the boundary-layer height by analyzing the signal-to-noise ratio 2) an aerosol lidar, which measures aerosol-concentration profiles up to 15 km, that allows us to test different retrieval techniques 3) a ceilometer, which during conditions of high aerosol concentration is sensitive enough to reproduce the aerosol characteristics up to 7 km and 4) the data from WRF model simulations that can be used to derive the boundary-layer height through several modeled variables such as the Richardson number and the wind profile.