Mean profiles of wind at CCT: similarity laws and the boundary layer height

Christian Lanconelli [1], Angelo Lupi [1], Marion Maturilli [2] , Mauro Mazzola [1], Armando Pelliccioni [1,3], Francesco Tampieri [1], Angelo P. Viola [1]

[1] CNR ISAC, Bologna and Roma, Italy

[2] Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, Potsdam, Germany

[3] INAIL, Roma, Italy

From the wind velocity and mean temperature profiles measured at Climate Change Tower CCT since 2009 (at heights of 33, 10, 5 and 3 m) a selection of well controlled cases has been studied in order to determine seasonal variations of the roughness length and to test surface layer profiles expressed as function of z/L, being L the Obukhov length determined from the turbulent fluxes measured by a sonic anemometer placed at 7.5 m height.

This approach corresponds to the widely used Monin-Obukhov Similarity Theory (MOST).

The dependence of the roughness length on the snow coverage and on the wind direction has been retrieved using almost neutral profiles. Moreover, the shape of the similarity function for wind has been evaluated in different stability conditions.

For selected time periods, vertical profiles of wind and temperature have been taken using a tethered balloon sounding system. The system is made by six meteorological sondes, equally spaced along the tethered line, up to about 800 m. The balloon was operated nearby the tower.

Merging tower and balloon data allows us to investigate the structure of the entire boundary layer and possibly the atmosphere aloft.

Keywords: similarity function, atmospheric profiles, roughness length

Topics : Flagship programs and Implementation of Ny-Ålesund monitoring activities