Geophysical Research Abstracts
Vol. 16, EGU2014-11021, 2014
EGU General Assembly 2014

The vertical structure of turbulence in the atmospheric boundary layer: observations at Ny Alesund and preliminary analyses

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An extensive set of measurements taken on a 32 m high tower located at Ny Alesund, Svalbard Islands, allows to investigate some features of the vertical structure of the planetary boundary layer at high latitudes.

The main sensors are 3 sonic anemometers and 4 low frequency termometers and anemometers. Radiation and other complementary measurements are available. The time series covers the period from June to November 2013, with about one quarter of stable and three quarters of unstable conditions.

Using the data at different levels, the vertical structure of the boundary layer has been investigated.

In the unstable cases, the surface layer similarity relationships for mean wind velocity, vertical velocity and temperature variances and skewness are discussed, and compared with the Kader and Yaglom (1990) scalings.

In the stable cases, the second order moments (and the third order moment of the vertical velocity) are used to put into evidence the 'traditional' and 'upside-down' cases, according to the classification by Mahrt and Vickers (2002). Note that these cases appear with approximately the same frequency. Moreover, the Richardson number dependence of some parameters (relevant for parameterisations), as for instance τ/TKE, $< wt > /\sqrt{\mathrm{TKE}\ < t^2 >}$ and the Prandtl number, are investigated, in the light of the theoretical model by Zilitinkevich et al. (2013).