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Lidar observations of PBL dynamics in the Arctic

Luca Di Liberto (1), Francesco Cairo (1), Marcel Snels (1), Guido Di Donfrancesco (2), Angelo Viola (1), Ilaria Pietroni (1), Stefania Argentini (1), Federico Angelini (1), Marion Maturilli (3), and Roland Neuber (3)

(1) Institute for Atmospheric Sciences and Climate, Consiglio Nazionale delle Ricerche, Rome, Italy, (2) ENEA UTMEA TER, Santa Maria di Galeria (RM), Italy, (3) Alfred Wegener Institute for Polar and Marine Research, Potsdam, Germany

There is no region on Earth where the climate is changing faster than in the Arctic. A proper characterization of the Polar Boundary Layer processes, affecting the exchange of momentum, heat, moisture and chemical species between the surface and the free troposphere, is needed for a better understanding which forcings drive the changes going on in these region. Research interest in this polar region is notably increasing at the moment, with many stations engaged in different activities in the Arctic. Among these, Ny Alesund (79°N, 12°E), Svalbard Norway, represents a unique site where a large international cooperation allows the deployment of an ample set of instruments for monitoring a large number of key parameters of the arctic system.

In the frame work of the Climate Change Tower – Integrated Project (CCT-IP), an instrumented meteo tower (32 m) has been deployed in Ny Alesund complemented by a number of other in situ and remote sensing devices for the characterization of the arctic surface and lower troposphere. A small-sized, portable and automated micro-LIDAR (LIght Detection And Ranging), MULID, has been installed at the AWI Koldewey station and has provided high resolution profiles of the aerosol vertical distribution and optical properties since March 2010 . The system is a Rayleigh lidar operating at one wavelength (532nm) looking upward from the ground to about 3000 m and detects also the volume depolarization. The system capability to work unattended for long periods has allowed continuous operation (24/24) in special observing periods, like in the springtime, when vertical profiles of meteorological parameters were simultaneously obtained by using different sondes operated from a tethered balloon by AWI.

In this work we will present some case studies for determining the height of the PBL both using the aerosol as a tracer and the meteorological measurements obtained from a tethered balloon. A comparison between the mixing layer height estimated by Lidar data and that computed by a zero order one dimensional model (proposed by Batcharova and Gryning) using as input the surface turbulence data, will be shown