



First steps towards a European Doppler lidar network for meteorological applications

Ewan J. O'Connor (1,2) and Anne Hirsikko (1)

(1) Finnish Meteorological Institute, Helsinki, Finland (ewan.oconnor@fmi.fi), (2) Department of Meteorology, University of Reading, UK

Doppler lidars are capable of providing winds and turbulent parameters, such as dissipation rate or relative turbulent intensity, at high spatial and temporal resolution. The implications for boundary-layer retrieval are very exciting as this will allow the diagnosis of various aspects of the dynamical boundary layer, such as boundary layer type and height, multiple internal layers or regions of mixing and their specific properties. It is also possible to identify the source of mixing, whether it is surface or cloud-top driven, or a product of wind shear or changes in surface roughness.

Within the EU Cost Action TOPROF (Towards operational ground based profiling with ceilometers, Doppler lidars and microwave radiometers for improving weather forecasts), the Working Group on Doppler lidar has advanced the objective of creating a European Doppler lidar network for meteorological applications, through coordinating the Doppler lidars performing meteorological research in Europe. This group is tasked with assessing the performance of the various instruments in use, and establishing operational procedures for the provision of quality-controlled products for a wide variety of end-users, including operational evaluation and assimilation of winds and BL classification in NWP models.

The capabilities of Doppler lidars vary with measurement technique (continuous wave or pulsed), range and scanning ability. Maximum measurement ranges from 150 m (continuous wave) to capturing the entire boundary layer and beyond. Some Doppler lidars are capable of full hemispheric scanning, some have limited or pre-set scanning capabilities, and others are vertically-pointing only. In addition, the atmospheric environment (e.g. aerosol load) sets limitations on a suitable scanning strategy. A full assessment of calibration, azimuth/elevation, radial velocity measurements and uncertainties, scan selection, is being undertaken.

Here, we provide an overview of the current activities in wind and turbulent retrievals, discuss briefly how these methods may be utilised, combined and/or evaluated using other instruments and methods, and provide an outlook on the potential for observing the dynamics of the boundary-layer.