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An emerging European Doppler lidar network for meteorological applications

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Doppler lidars are capable of providing winds and turbulent parameters, such as dissipation rate 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 low-level jets and gusts, together with boundary layer mixing and height.

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.

Here, we provide an overview of the results produced during TOPROF. These include: in-depth characterisation of instrument performance, together with post-processing routines to improve sensitivity and uncertainty analysis; designing suitable scanning strategies to optimise retrievals of winds and turbulence for multiple purposes; flexibility for different scan selections in different locations. The harmonisation of data from different instrument types and scanning sequences then permits unified retrievals such as boundary layer type classification and low-level jet detection to be applied across the network.