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Forecasting the weather
- ensemble techniques
in probabilistic weather prediction

Mixing height retrievals from automatic profiling lidars and ceilometers in view of future integrated networks in Europe

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The determination of the depth of daytime and nighttime mixing layers must be known accurately and continuously to relate boundary layer concentrations of gases or particles to upstream fluxes. Datasets of mixing height diurnal cycles with high temporal and spatial resolutions are sought by various end users. Profiling Lidars and ceilometers provide vertical profiles of aerosol backscatter. As aerosols are predominantly concentrated in the mixing layer, lidar backscatter profiles can be used to trace the depth of the mixing layer. Large numbers of automatic profiling lidars and ceilometers are deployed by Met services and other agencies in several European countries providing systems to monitor the mixing height on a temporal and spatial scale of unprecedented density.

We will present limitations and capacities of existing mixing height retrieval algorithms using different lidars and ceilometers that are commonly found in operational networks. We study three important steps in the mixing height retrieval process, namely the lidar/ceilometer pre-processing to reach sufficient signal-to-noise ratio, gradient detection techniques to find the significant aerosol gradients, and finally quality control and layer attribution to identify the actual mixing height from multiple possible layer detections. We will show examples of how mixing height retrievals from Lidars could be assisted by using ancillary information from standard meteorological stations.

We will also provide examples of coordinated mixing height retrievals across a small testbed that includes stations in France, Germany, Italy, the Netherlands, Portugal and the United Kingdom.