Ground-based atmospheric boundary layer profiling and data assimilation experiments within the EU COST Action PROBE

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Abstract

The atmospheric boundary layer (ABL) remains the most relevant under-sampled part of the atmosphere. Surface sensor networks, radiosonde soundings as well as satellite observations do not provide sufficient information on the high temporal variability and strong vertical gradients occurring in the ABL. This observational gap currently hampers our ability to improve weather forecasts, air quality prediction, and climate model parameterizations. Measurement systems which have the potential to close this gap are enhanced commercial aircraft observations, operational UAS (Uncrewed Aircraft Systems) as well as ground-based remote sensing.

On the one hand, already existing state-of-the-art ground-based remote sensing instruments with the ability to provide ABL profiles (such as those of temperature, humidity, wind, aerosol, cloud) are currently deployed at numerous sites in Europe, but the harmonization of data and procedures is still under development, limiting their effective use and societal benefits. On the other hand, the use of automated UAS for profiling the ABL is currently experiencing significant advancements.

This presentation describes PROBE (2019-2023), a European cooperation initiative funded by COST (www.cost.eu) aiming at filling the ABL observational gap, discussing the challenges, objectives, and the implementation plan. Preliminary results are presented including

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new technology, quality control and assurance measures, studies on NWP data assimilation, regional impact, and the role of the network configuration.