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Recent achievements of the “PROBE” COST Action: Towards profiling of the atmospheric boundary layer at European scale

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Meteorological and air quality surface sensor networks sample atmospheric variables close to the ground while satellite observations provide global spatial coverage of the upper atmosphere. There is however, an observation gap on the temporal variability and vertical structure of atmospheric parameters in the atmospheric boundary layer (ABL). The ABL is the lowest 2 – 3 km of atmosphere above ground where the vertical structure is driven by surface-atmosphere exchanges, ABL-to-free-troposphere exchanges, in addition to larger-scale processes. Most human activities take place in the ABL, it is hence very important to improve our ability to characterize those processes that affect weather conditions, air quality, transport and energy provision systems, and longer-term issues such as climate change adaptation and mitigation, of particular importance in urban settings.

Motivated by the overarching objective to support the efficient exploitation of ABL data and to maximize their societal impact, the PROBE COST action is creating a cooperation hub where a wide range of stakeholders from Academia, Research structures, Industry, Operational agencies, and general end-users can share advances and expertise on ABL profiling.

In the first two years of the action, the PROBE partners were able to attract a diverse community of more than 200 users that share information through webinars (on instruments, networks, and high-quality observations) and working group meetings (on ABL profiling in complex terrain and urban environments), and engage the community in a wide range of activities through efficient multi-media communication (<http://www.probe-cost.eu/>, newsletters, videos, social channels). No less than 5 working groups on thermodynamics, clouds, ABL height, wind and turbulence, and aerosol profiling reported on key ABL parameters, their applications and end-user requirements. A comprehensive document is being compiled that gives insights on “overview, access and benefits” of existing ABL profiling networks (e.g. E-PROFILE, ACTRIS, ICOS, ...). Also less known (“hidden”) networks were identified. 5 specific instrument task groups (on microwave radiometers, cloud radars, doppler lidars, automatic lidars and ceilometers, and drones) are developing recommendations for configuration, operation, calibration, and quality control procedures.

Over the remaining period of the PROBE COST action (until fall 2023), the partners will continue to develop a solid literature (technical reports and scientific publications) on the topic of ABL profiling, improving content through short term scientific visits (either in person or virtual) and focused working groups (mostly virtual). Some partners will participate in a large international effort to better characterize the ABL in urban environments through an intensive measurement campaign to be held in the Paris region (France) in summer 2022 while others are involved in the TEAMx collaboration initiative observing the mountain boundary layer. Finally, the PROBE community is launching an inter-journal special issue, offering an opportunity for the advances in ABL profile observations and applications to gain visibility. For example, a very detailed review paper on ABL height retrievals from ground-based remote sensing was just submitted, resulting from several years of intense review work.

The presentation will provide an overview of recent achievements and upcoming activities.

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