



Profiling of the Atmospheric Boundary Layer at European Scale

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- **Session 04:**

- **Synergistic use of**

- **multiple instruments and techniques, networks and campaigns**

- **Tuesday; 12:00 UTC**

- **Presentation Number:**
P14

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COST is **an intergovernmental framework**, for European Cooperation in Science and Technology

- funding organization for research and innovation networks
- coordination of nationally-funded research
- **COST Actions:** bottom-up networks that boost research, innovation and careers (Early Career!!)

PROfiling the atmospheric
Boundary layer at
European scale

19/10/2019 – 18/10/2023

Visit us online at: probe-cost.eu

Participants from 30 European and 7 non-EU countries

- 20 Universities (Physics, Atmospheric science, Meteorology dep.)
- 16 NWS and EUMETNET E-PROFILE
- 8 National Research institutions
- 1 European RTD organization (ECMWF)
- 3 Instrument manufacturers
- 200+ end-users
- WMO endorsement

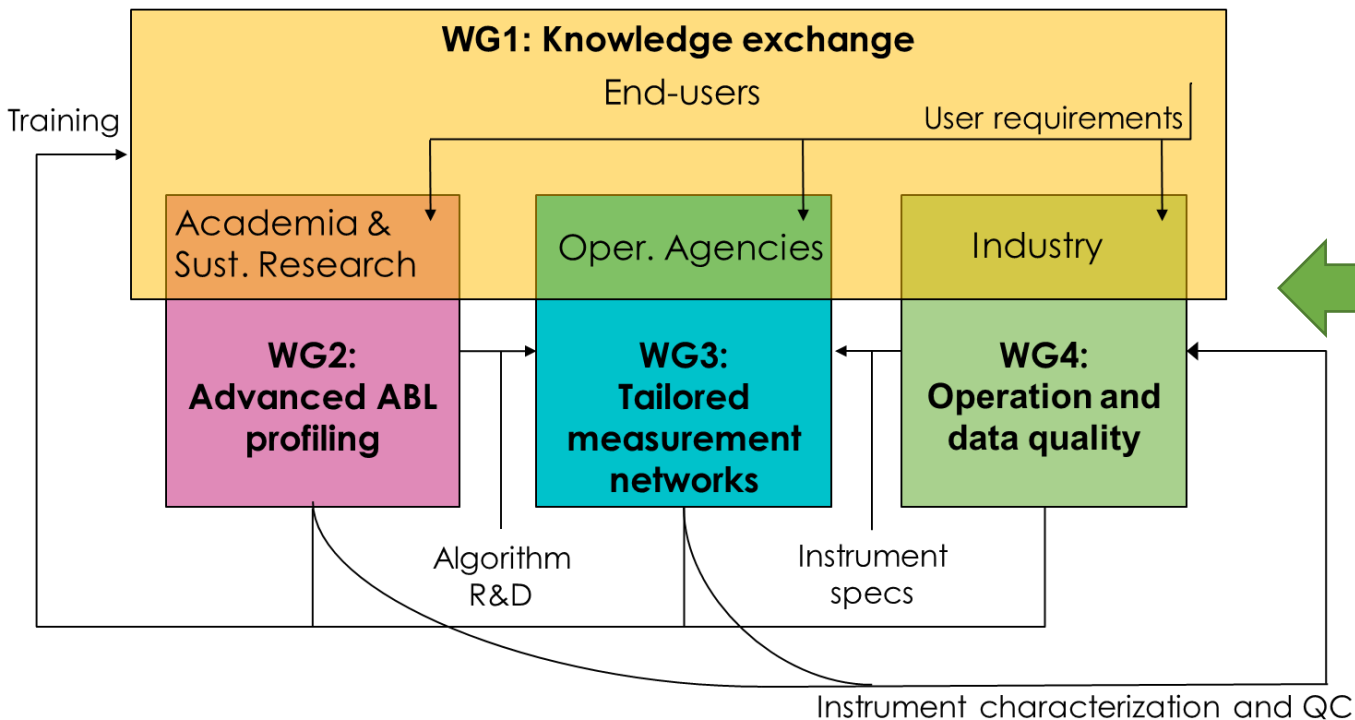
MC Chair: Martial Haeffelin
MC Vice-chair: DomeNico Cimini

- 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.

- **To improve overall capacity, quality and use of ABL profiling at EU scale**
- Preliminary results includes new technology, quality control and assurance measures, studies on NWP data assimilation, regional impact and the role of the network configuration.

Work Plan

Instruments



- Automated lidar ceilometers (ALC)
- Doppler wind lidars (DWL)
- Microwave radiometers (MWR)
- Cloud Radars (CR)
- Emerging technologies (DIAL, drones,...)

Example- work in WG2- Advanced ABL profiling

User Interests

PROBE WG2- Advanced ABL profiling” - Deliverable 2.1

D2.1: Reports, white and review papers on key ABL parameters, their applications, and the end-user requirements.

Project start date	10/2020
Project end date	04/2021
Project title (acronym)	Deliverable 2.1
Authors	Document preparation conducted by P. Marinier and E. O'Connor Authors (by alphabetical order): J.-A. Bravo Aranda, J. Buermann, D. Cimini, M. José Granados Muñoz, M. Haeffelin, S. Kottaus, E. O'Connor, P. Marinier, H. Ricketts, T. Rouffaud, R. Ruelens, with additional contribution from PROBE WG2 members

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Instrument and Geophysical parameters

Clouds & precipitation

Aerosols, (volcanic ash, pollen, Forest fires)

Wind
Turbulence
Gust

Temperature
Humidity

Level3 products

Forecast indices

PBL characterisation :
- PBL height
- PBL classification

Inversion strength & position

Alerts

Air quality (volcanic ash, Dust, smokes)

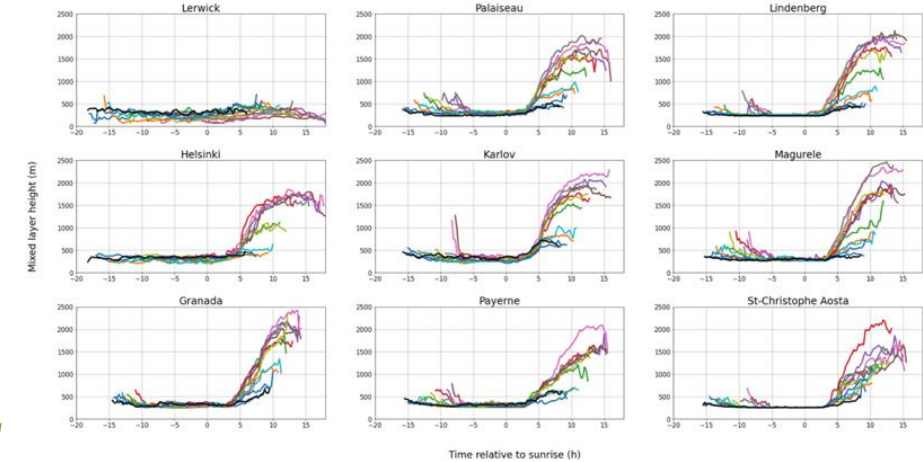
Fog

Icing

Severe convection

Gust, wind shear

Kottaus et al. 2021



New products tested during 2022 Paris urban field experiments:

- Nowcasting of severe heat, convection and pollution events
- Advanced ABL height, temperature, humidity, LWC & wind profile retrievals

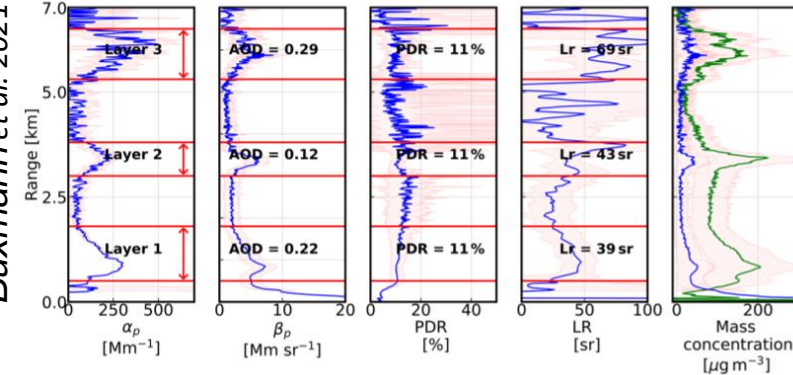
Improved aerosol profiling from multi-instrument synergy:

- Aerosol mass concentration (Lidar + sunphotometer)
- Size distribution and fall velocity

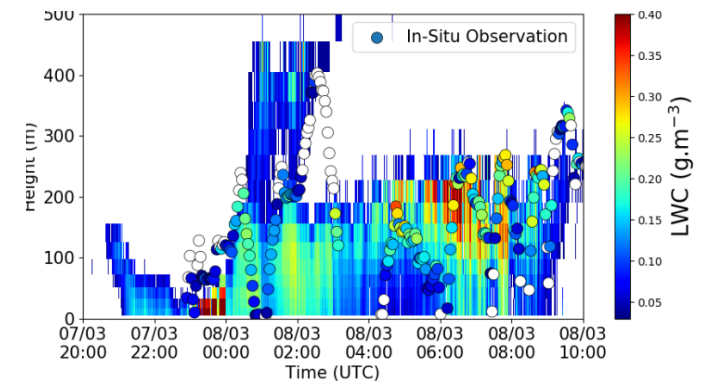
Improved fog forecasts and fog understanding:

- Data assimilation, fog LWC retrievals
- Real-time alerts based on observations

Buxmann et al. 2021



Bell et al. 2021



Summary



PROBE
COST
ACTION



Complex terrain



Urban environments

Knowledge exchange



Network overview

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Automatic lidars and ceilometers (ALC)

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Doppler wind lidar (DL)

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Doppler cloud radar (DCR)

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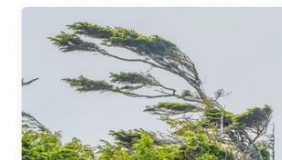
Networks and data quality



Clouds and precipitation

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Wind, turbulence, gust including gust/wind-shear alerts

subgroup chair: Ewan O'Connor
(Finland)

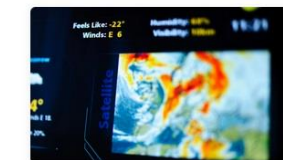
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Temperature and Humidity profiling, inversion strength and position

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Forecast Indices

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Fog alerts

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Icing alert

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Aerosols, including volcanic ash, pollen, forest fires and air quality alerts

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ABL characterisation

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Advanced profiling

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- <https://probe-cost-action.slack.com>
- <http://doi.org/10.1007/s42865-020-00003-8>

