ALC at Aosta

Automatic lidars and ceilometers (ALC) – collaborations with other networks

CCRES Workshop – Tuesday 21st October 2021

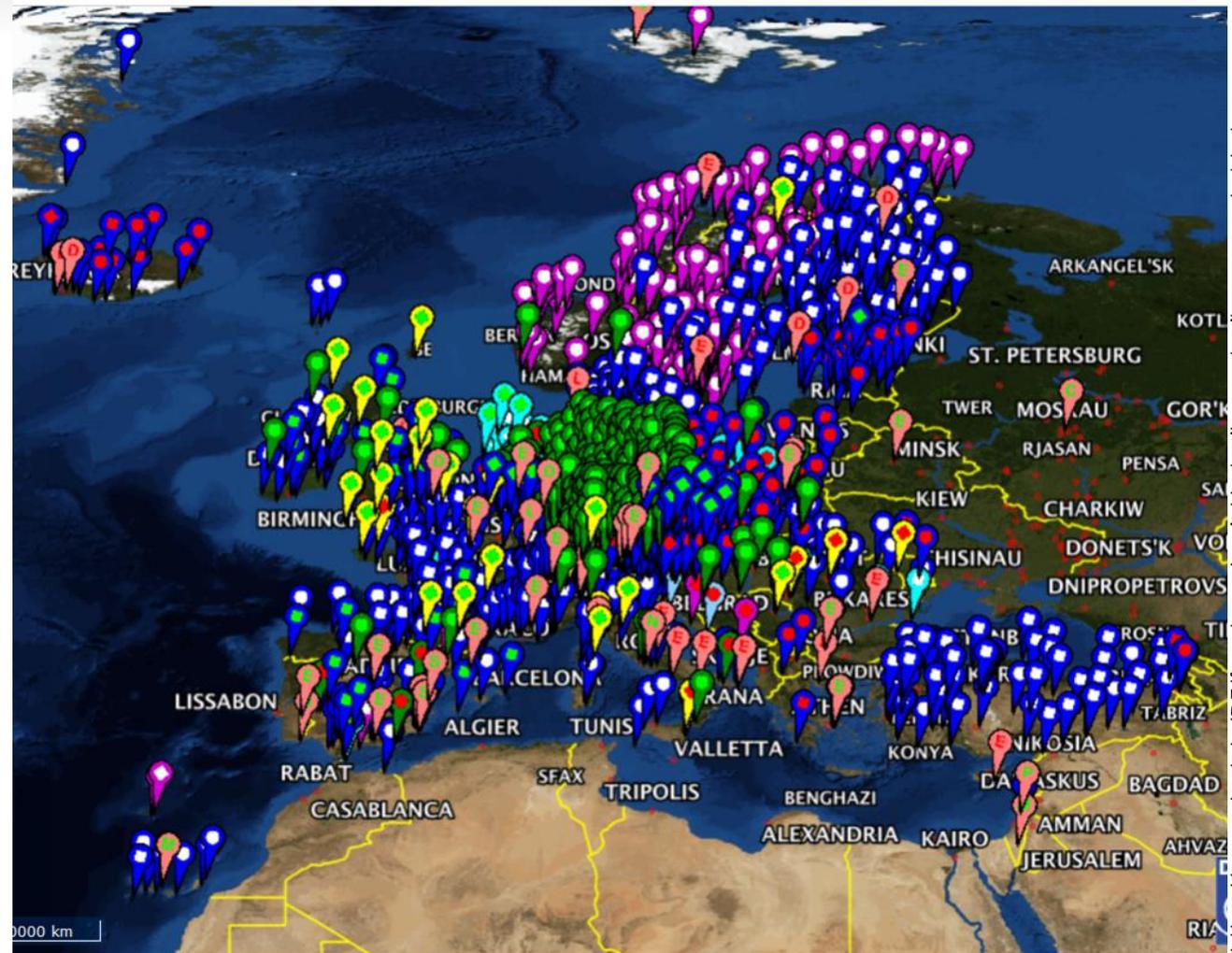## Automatic lidars & ceilometers (ALC)

- Continuous operation

- Low maintenance

- Diversity in manufacturers and models

ALC in ACTRIS

CCRES   used for detection of liquid water layers and ABL heights

CLU   harmonised cloud base height retrieval is implemented

CARS   variables of interest: aerosol backscatter and ABL heights

https://www.dwd.de/DE/forschung/projekte/ceilomap/ceilomap_node.html

ALC operations in Europe

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ALC in ACTRIS

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Vaisala
CT25k
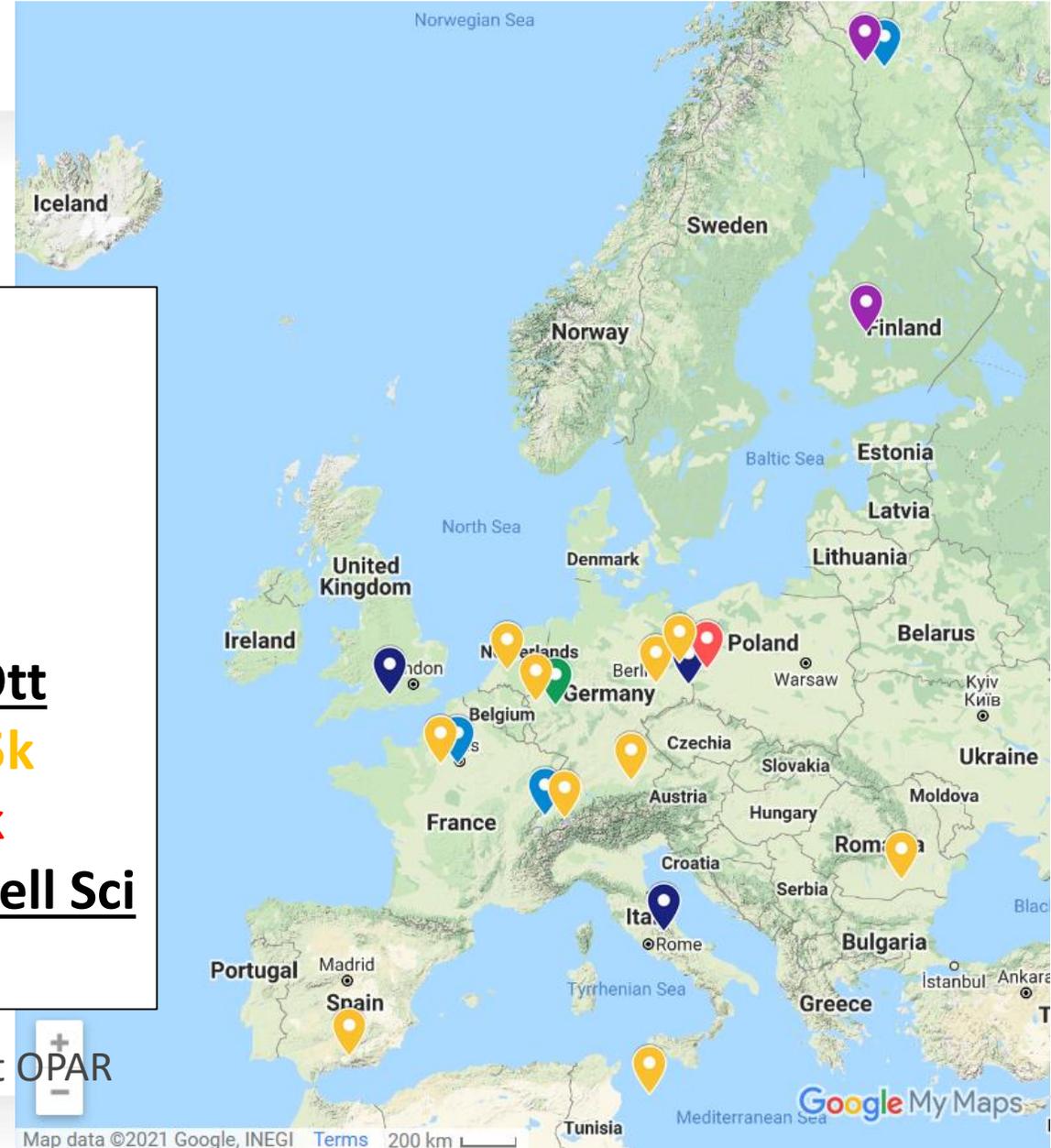**CL31**
CL51
CL61
Lufft/Ott
CHM15k
CHM8k
Campbell Sci
CS135

*CS135 at OPAR

EU COST action PROBE

- Support communication between manufacturers and instrument operators
- Coordinate standard operating procedures (SOPs) between networks
- Identify instrument-related artefacts

ICOS

- Increasingly operating ALC at measurement sites
- Interested in atmospheric boundary layer heights for
  → Interpretation of observations
  → Inverse carbon modelling

EUMETNET E-PROFILE

- Collected data in real-time, ~ 350 ALC
- Standardized netcdf format and quick-looks
- Priorities:

  FIRST: aerosol products,

  SECOND: ABL heights

There is considerable overlap between stations contributing to ACTRIS, ICOS and E-PROFILE

Common interests

- Scientific collaborations and stakeholder engagement, e.g.
  - H2020 Greendeal projects RI-URBANS (ACTRIS) and PAUL (ICOS) overlap in choice of case study cities
  - ACTRIS-CARS and E-PROFILE overlap in their interest of aerosol profiling
  - ACTRIS-CCRES and E-PROFILE overlap in their interest of cloud and fog detection, ABL dynamics

- Improving standardised data formats
- Improving standardised operating procedures
- Development of tools for data handling, calibration, correction procedures and advanced products

ALC Standard Operating Procedures (SOPs)

- Instrument operators require clear guidelines: SOP

- SOPs need to be coordinated between networks to avoid contradiction

- CCRES and E-PROFILE have formulated SOPs

- PROBE is coordinating between networks and manufacturers

- System requirements are likely higher for aerosol profiling (CARS & E-PROFILE)

- Discussion ongoing between CCRES and CARS

Actions required to improve ALC data formats

raw2L1: tool developed by COST action Toprof

- Converting any native ALC format into standardized netcdf
- Currently accepting: Vaisala text files (CLview), Lufft netCDF, Campbell Sci text files, MiniMPL netCDF, licel raw file

To do

- Include vertical visibility reading from Vaisala output in case of low level clouds below set threshold
- Fix bug of internal temperature reported by Lufft CHM15k
- Accept new variable names in Lufft output from firmware > 1.05
- Better processing of the error message from Lufft

Which other aspects should be coordinated between networks? e.g. data upload procedures?

Actions required to improve ALC data quality

Vaisala

- Absolute calibration of attenuated backscatter
  - code developed by COST action ToPROF (liquid cloud method)
  - now application and operational implementation required
- Correction of instrument-related background and near-range artefacts
  - Code developed by COST action ToPROF (Kotthaus et al. 2016)
  - Implemented by AERIS/ESPRI
  - Need to evaluate relation to absolute calibration
- CL51 signal discontinuity at 500 m range
  - New correction procedure needs to be developed

Lufft

- Absolute calibration of attenuated backscatter
  - code developed by COST action ToPROF (Rayleigh method)
  - What causes seasonal variation of calibration coefficient?
  - now application and operational implementation required
- Dynamic model for optical overlap correction (Hervo et al. 2016)
  - code developed by COST action ToPROF (Rayleigh method)
  - Needs to be adapted for 10 m range resolution
  - now application and operational implementation required

Detailed assessment of observations from other manufacturers is required

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