

The E-PROFILE network for operational wind, aerosol and cloud observations

ICAP 6th Technical Working Group Meeting
NWP Applications to Aerosol Forecast and Satellite Verification

Boulder, 21-24 October 2014

Alexander Haefele*, Maxime Hervo*, Giovanni Martucci*, E-PROFILE team

**Federal office of meteorology and climatology, MeteoSwiss, Switzerland*

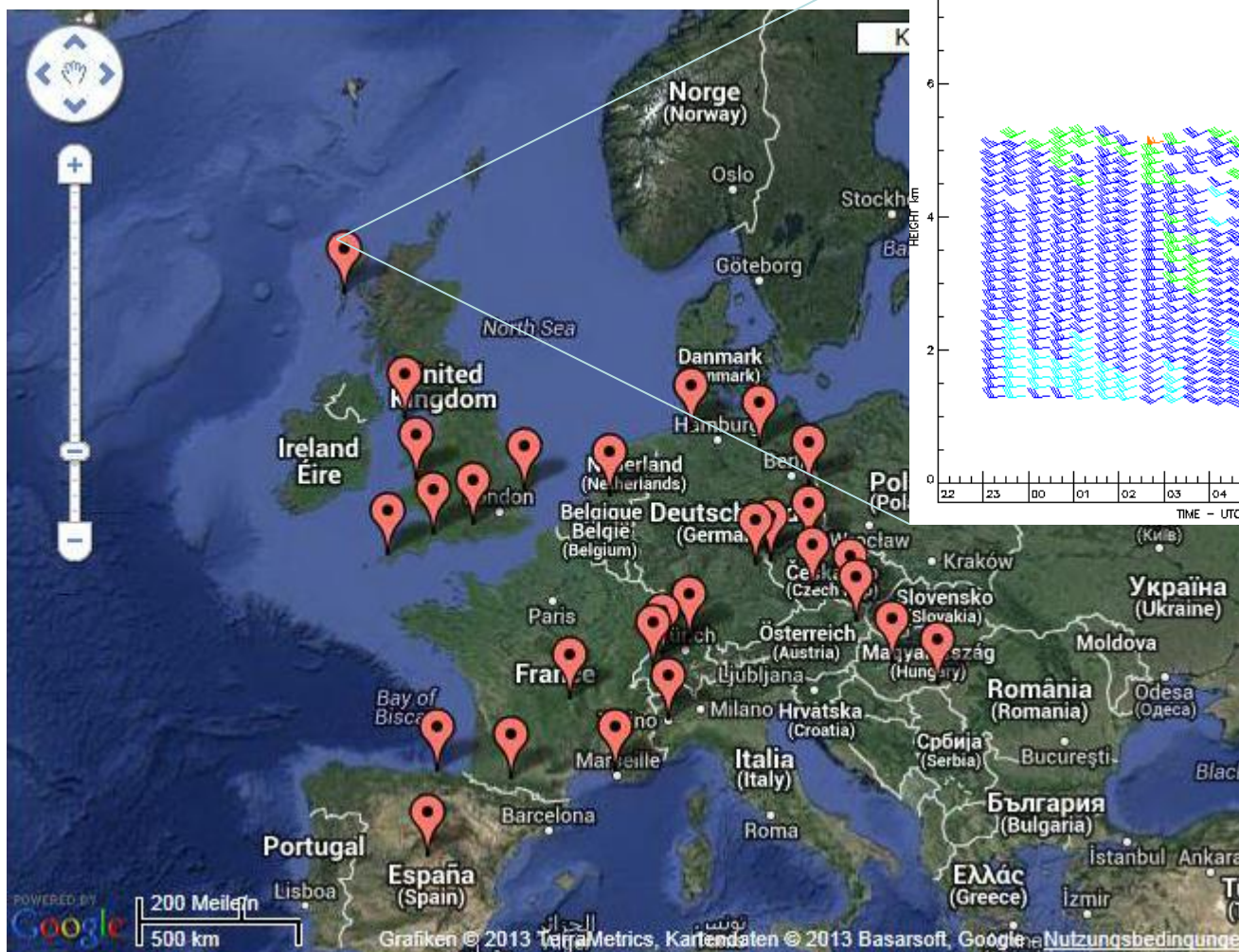
Some facts on E-PROFILE

A network for vertical profiling of wind, aerosols and clouds

- It is a EUMETNET programme
- Coordinated by MeteoSwiss
- 18 member states
- 1.1.2013 until 31.12.2017
- Operational network of radar wind profilers
- Integration of ceilometers and lidars

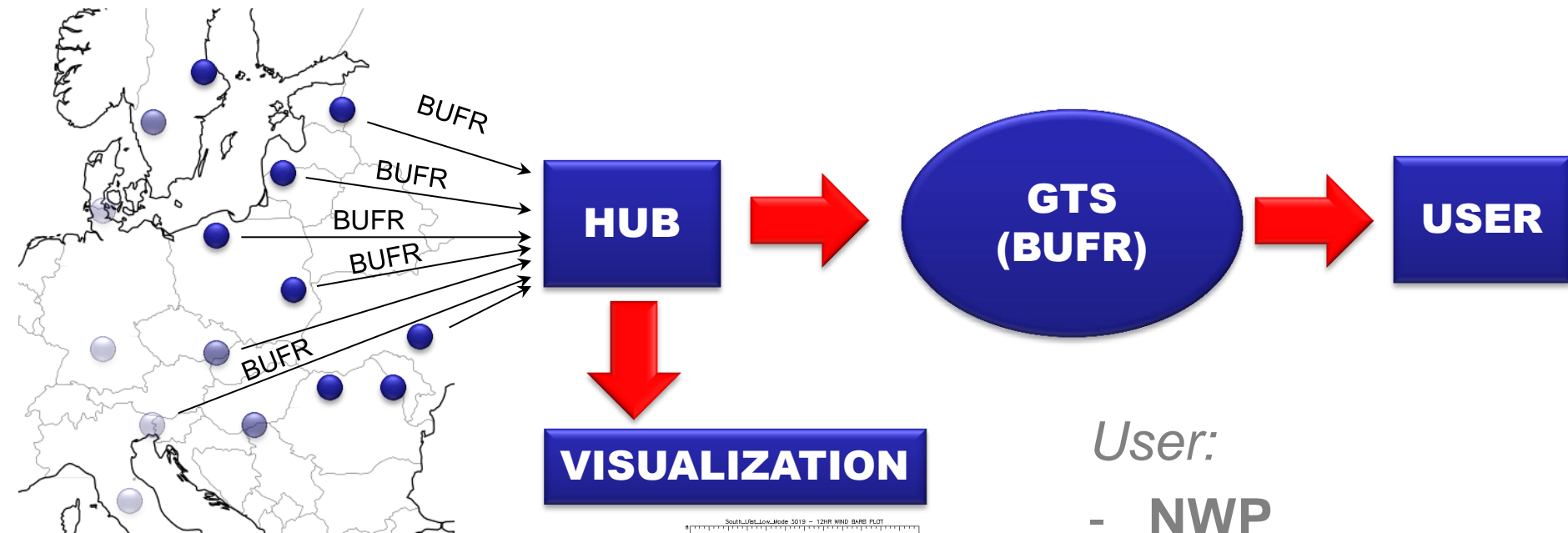
www.eumetnet.eu/e-profile

A network for vertical wind profiling



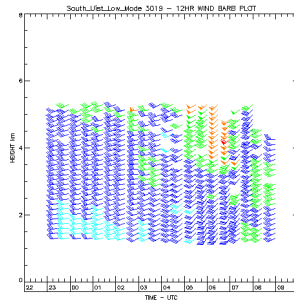
- 28 stations
- L-band to VHF
- [Map](#)

A network for vertical wind profiling



Operational performance:

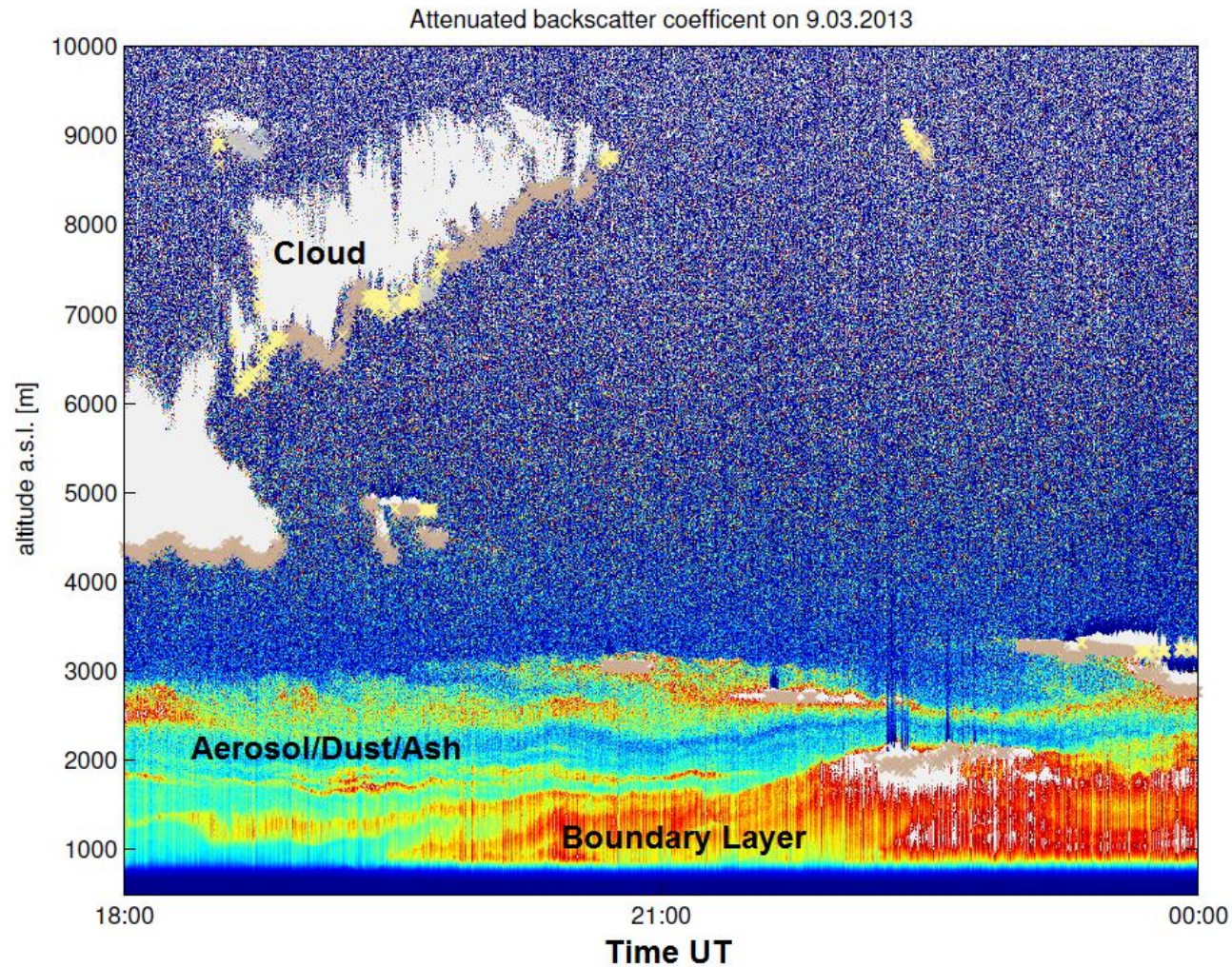
- Availability 95%
- Timeliness 15 min



User:

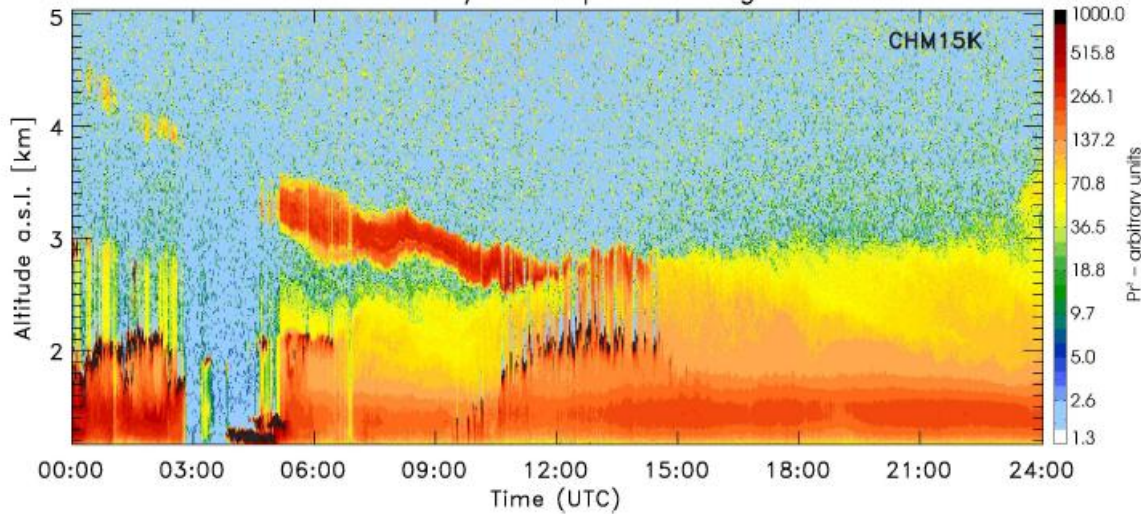
- NWP
- Nowcasting
- Climate
- Windpower

Ceilometers for vertical profiling



Ceilometers for vertical profiling

Backscatter Intensity Hohenpeissenberg 17.04.2010

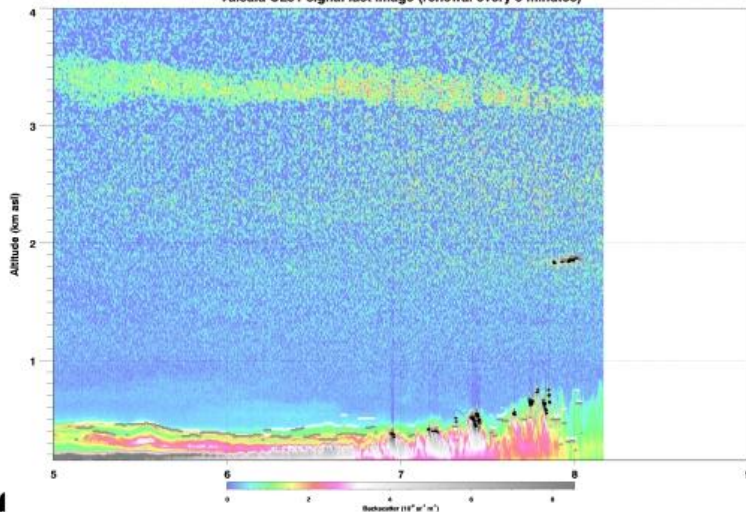


17 April 2010

Volcanic ash observed above Hohenpeissenberg, Germany

[Flentje et al. 2010]

Vaisala CL51 signal last image (renewal every 5 minutes)



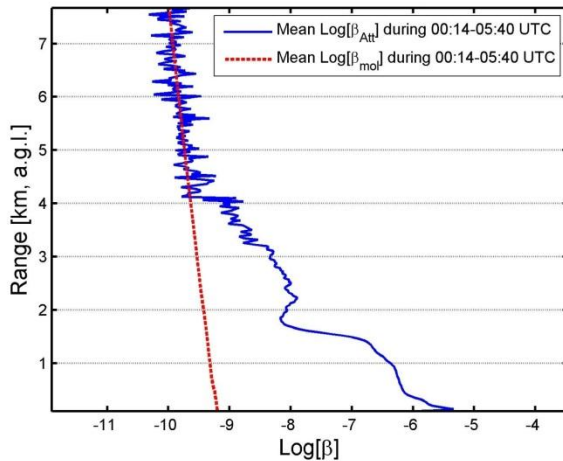
26 June 2013

Smoke from Canadian forest fires observed above Uccle, Belgium.

Courtesy of Royal Meteorological Institute.

Ceilometer calibration (coll. TO-PROF)

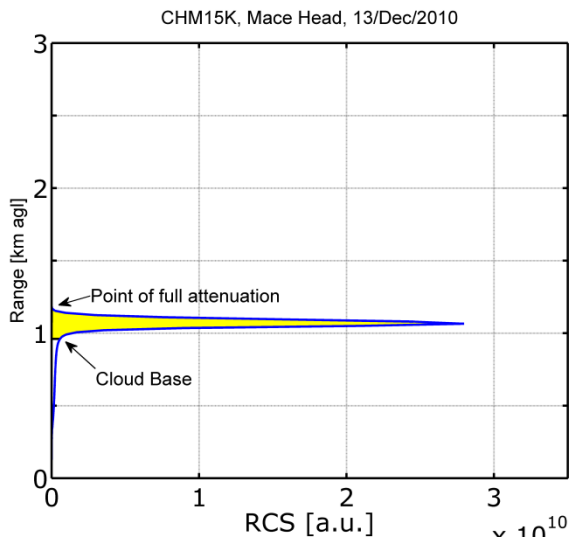
Attenuated and molecular ALC backscatter



1. Molecular calibration

$$C_L = \frac{\tilde{P}(r)}{\beta(r)} e^{2 \int_0^r \alpha(r') dr'}$$

[Wiegner and Geiß, 2012]

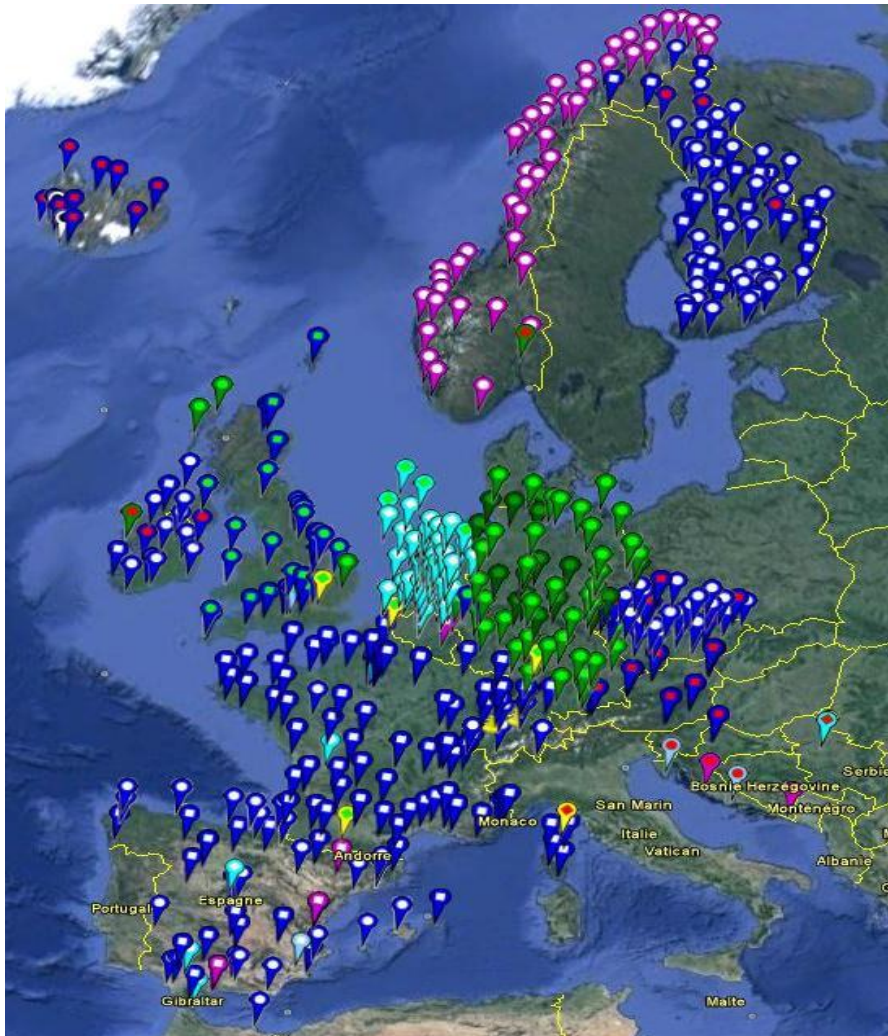


2. Liquid cloud calibration

$$C_L = \frac{1}{B * 2\eta S}$$

[O'Connor et al., 2004]

Inventory of ceilometer infrastructure



- Only E-PROFILE members
- ~700 ceilometer and automatic lidars

User Requirements for ALC network

User communities: VAAC, NWP, EPA, Nowcasting

Information

- Cloud base height
- Attenuated Backscatter coefficient
- Backscatter/Extinction coefficient
- Geographic location of the plume
- Lower and upper boundaries of the plume
- Mass concentration within the plume

Network design

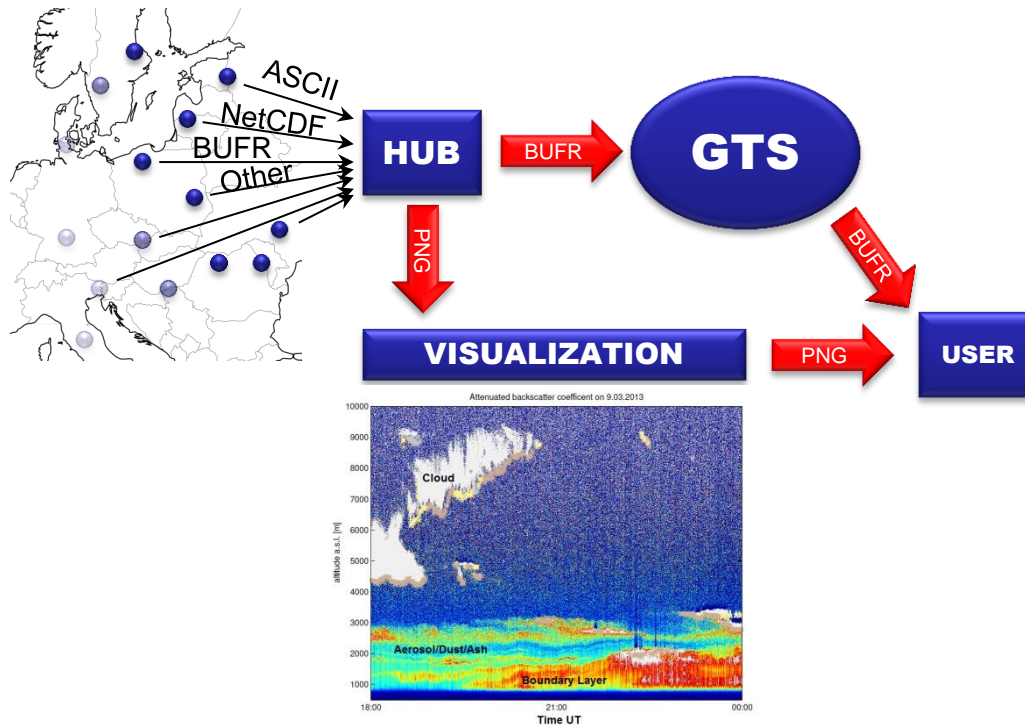
- $50 \leq H_{\text{res}} \leq 100$ km
- Temporal resolution: $\Delta t = 10$ minutes
- Timeliness: $T = 10$ minutes

Data access

- Real time data provision and visualization

E-PROFILE objectives

E-PROFILE services: Data hub



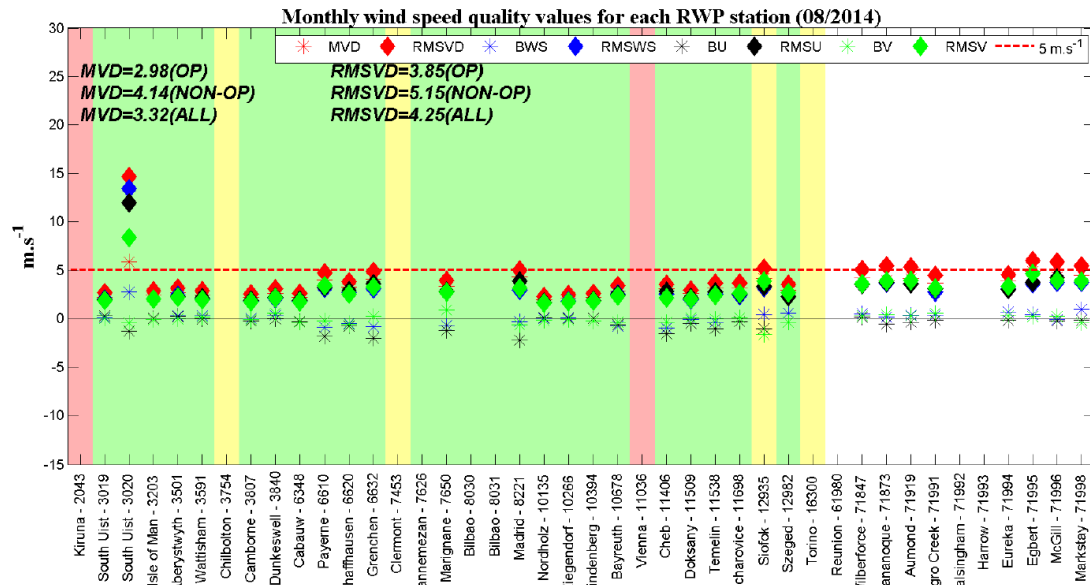
Data hub services:

- Collection
- Calibration
- Formatting
- Blocking
- Visualization
- Archiving

E-PROFILE services: Quality control

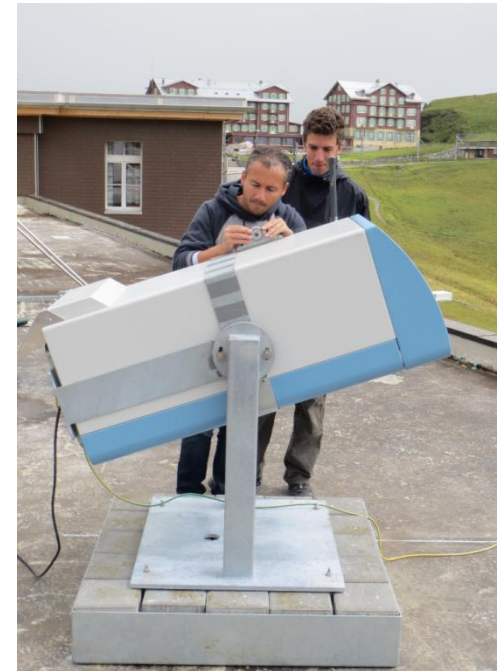
- Automatic stage: availability and timeliness
- Manual stage: quality
- Daily message on network status
- Monthly report
- Validation against research lidars

Missing:
automatic stage for quality



E-PROFILE services: Technical support

- Definition and guidelines of regular maintenance
- Definition and guidelines for intervention procedures,
- Organization of a technical workshop in relation to the ALC hardware.
- Review and exchange of relevant technical and scientific information.



The way forward

2014

- Acceptance of ALC business case

2015-2016

- Implementation phase
- Pre-operational acceptance

2017

- Operational acceptance

Conclusions

- E-PROFILE is a network for vertical profiling of wind and aerosols.
- State of the art ceilometers have the capacity to provide valuable information on the vertical aerosol distribution.
- Suitable calibration methods have been developed to provide quantitative information.
- E-PROFILE will provide quantitative aerosol information on a operational basis meeting NWP requirements.

Contact Details

Alexander Haefele
E-PROFILE Programme Manager
GIE/EIG EUMETNET

E-PROFILE Programme Manager

MeteoSwiss
Chemin de l'Aérologie
1530 Payerne

Tel: + 41 26 662 63 41
Fax: +41 26 662 62 12
Email: alexander.haefele@meteoswiss.ch
Web: www.meteoswiss.ch

GIE EUMETNET Secretariat
c/o L'Institut Royal Météorologique
de Belgique
Avenue Circulaire 3
1180 Bruxelles, Belgique

Tel: +32 (0)2 373 05 18
Fax: +32 (0)2 890 98 58
Email: info@eumetnet.eu
Web: www.eumetnet.eu