

E-Profile

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E-PROFILE networks

Wind

- Radar wind profilers
- Weather radar wind profilers
- Doppler lidar wind profilers



Ash, Aerosols and clouds

- Ceilometers
- Automatic lidars

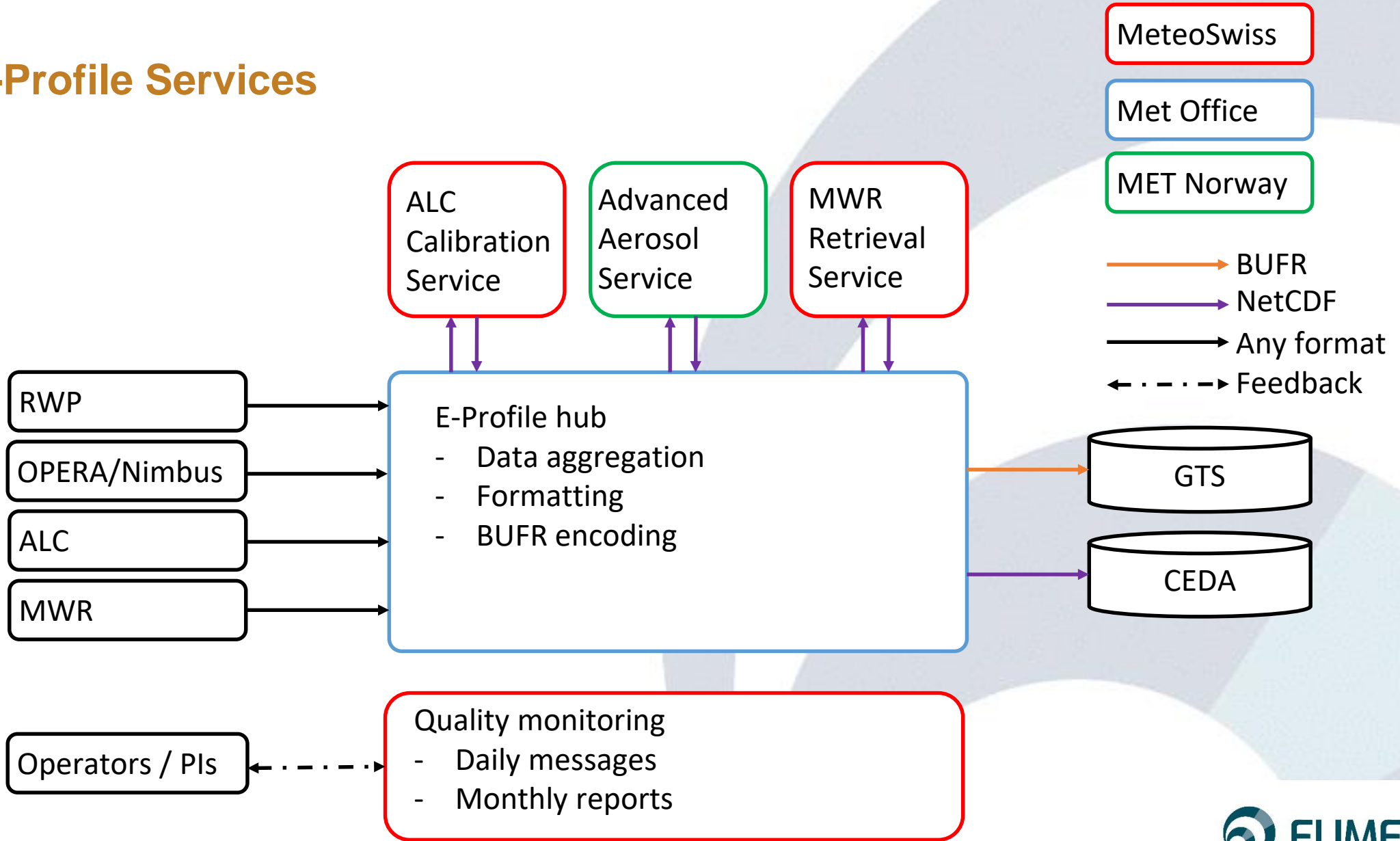


Upcoming: ABL temperature profiles and humidity

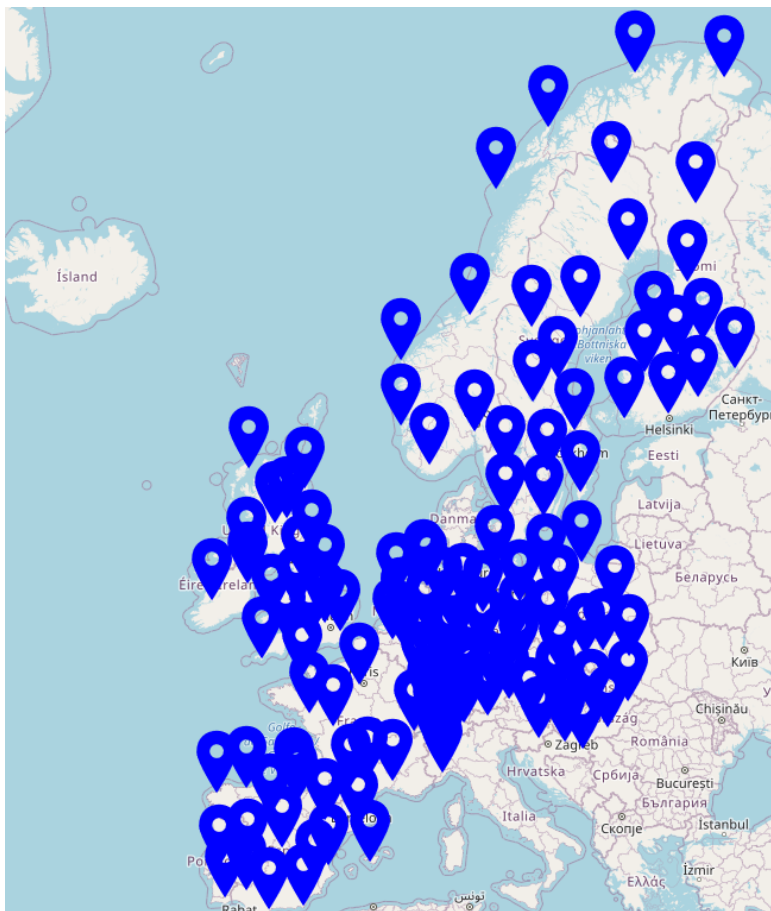
- Microwave radiometers






E-Profile Services



The Wind network



-  • radar wind profilers WP Europe, Australia, Canada
-  • precipitation radars WRWP starting from 2025 central wind retrieval
-  • upcoming: Doppler lidars



Radar Wind Profiler

Products

- Horizontal wind (u,v)
- Vertical wind speed
- SNR
- Spectral moments, Cn2

Operating frequencies:

- VHF -> Troposphere / Stratosphere
- UHF -> Troposphere / lower Strat.
- L-Band -> Lower Troposphere

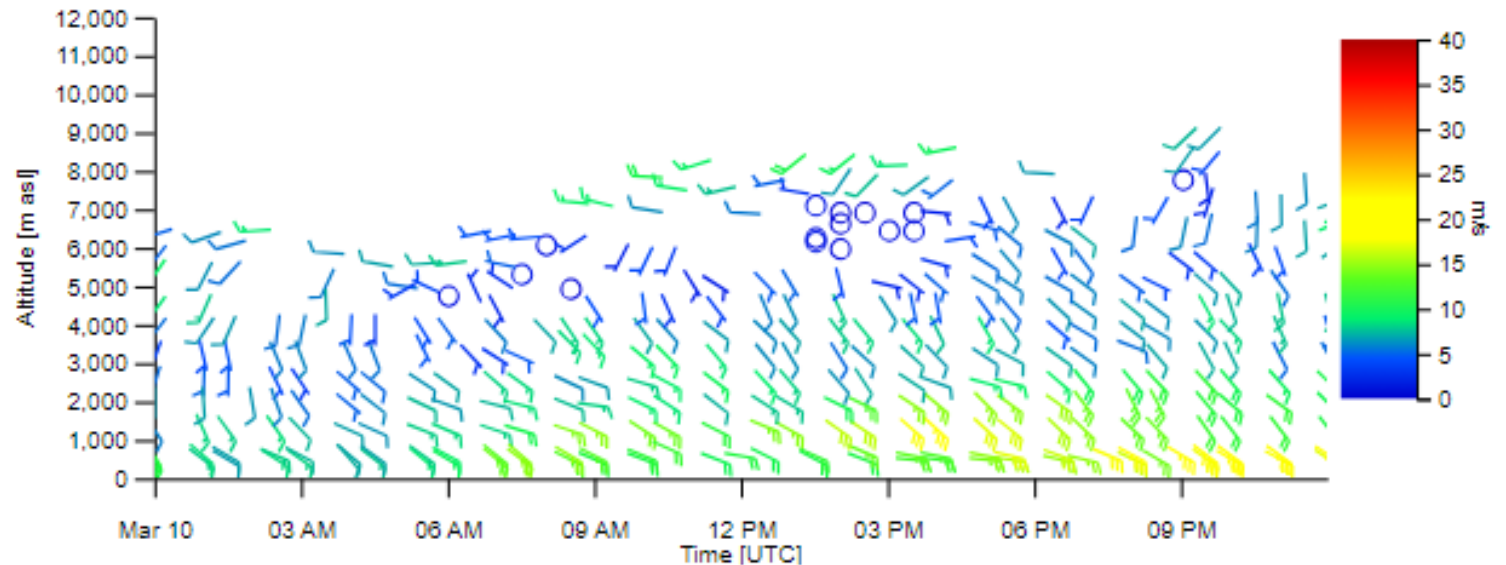
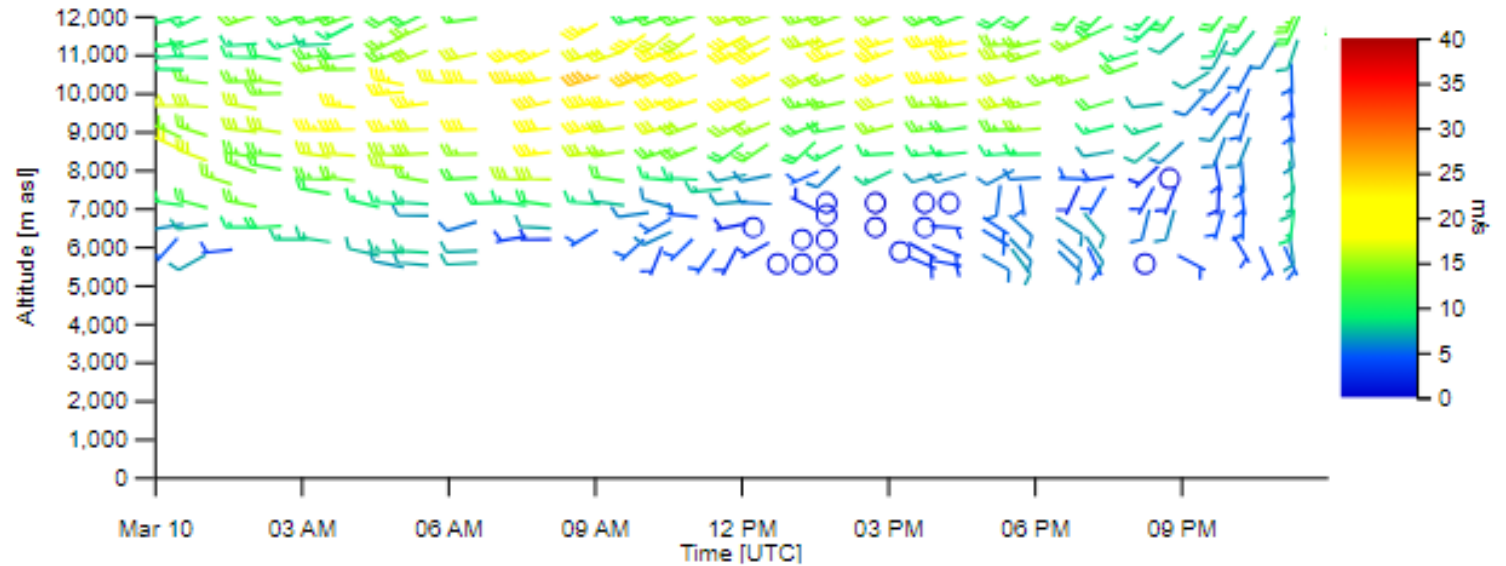
Operating conditions

- All weather incl. Clear air (Bragg)

Applications

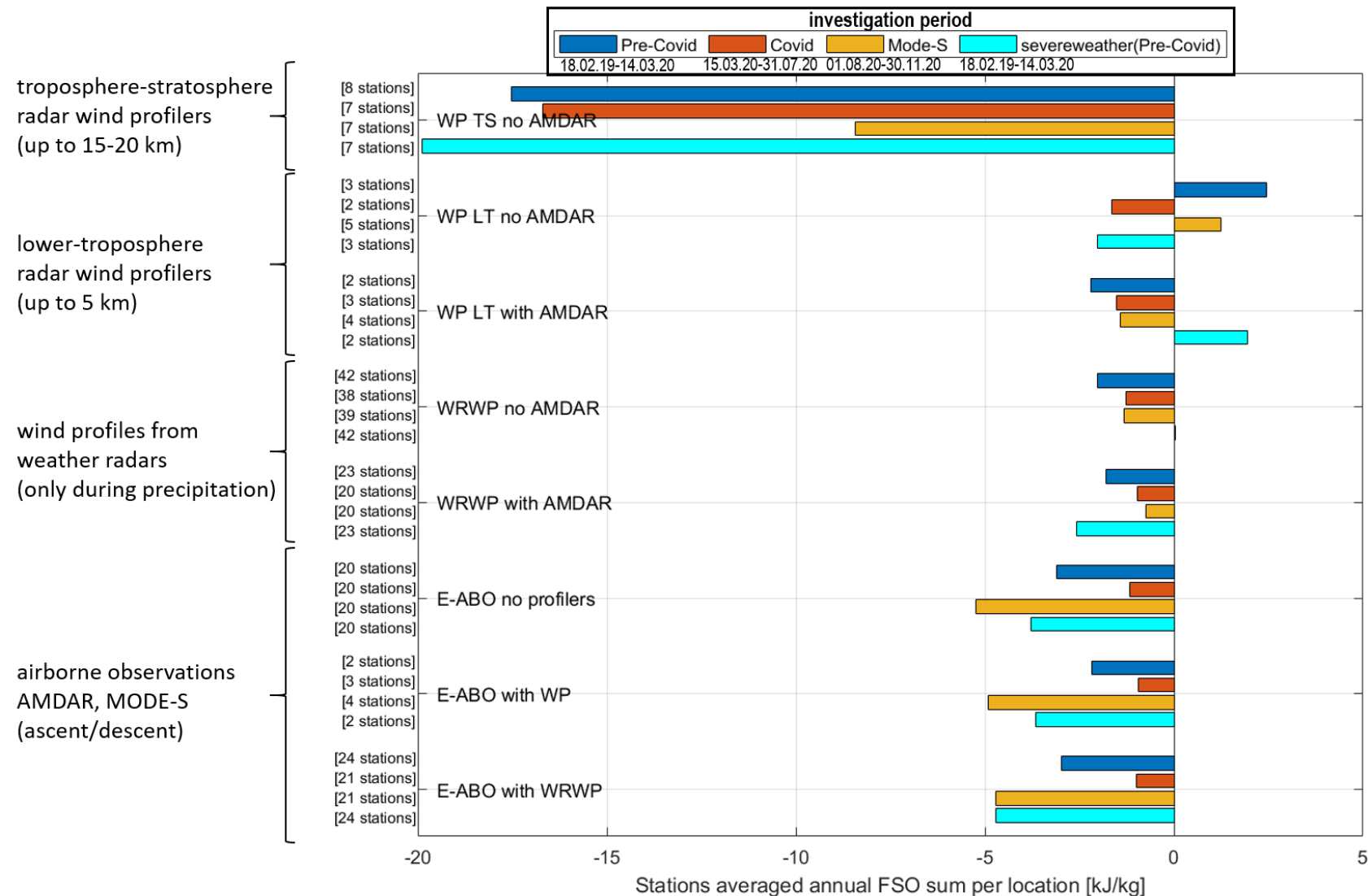
- NWP
- Cal/Val
- Research

Lindenberg, 476 MHz



Wind profiler impact studies (FSO at ECMWF)

internship by Cyril Soulié



- different situations
 - pre-Covid normal
 - missing airborne (Covid)
 - Mode-S assimilated
 - severe weather

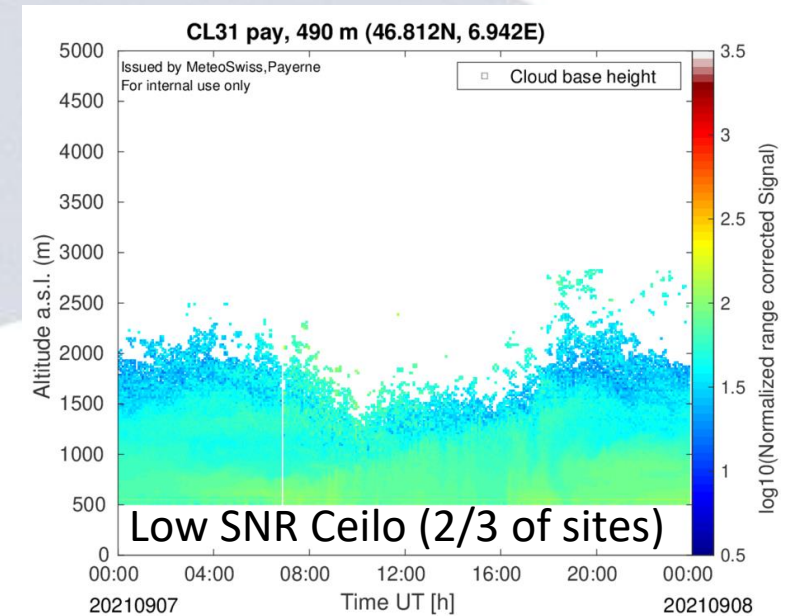
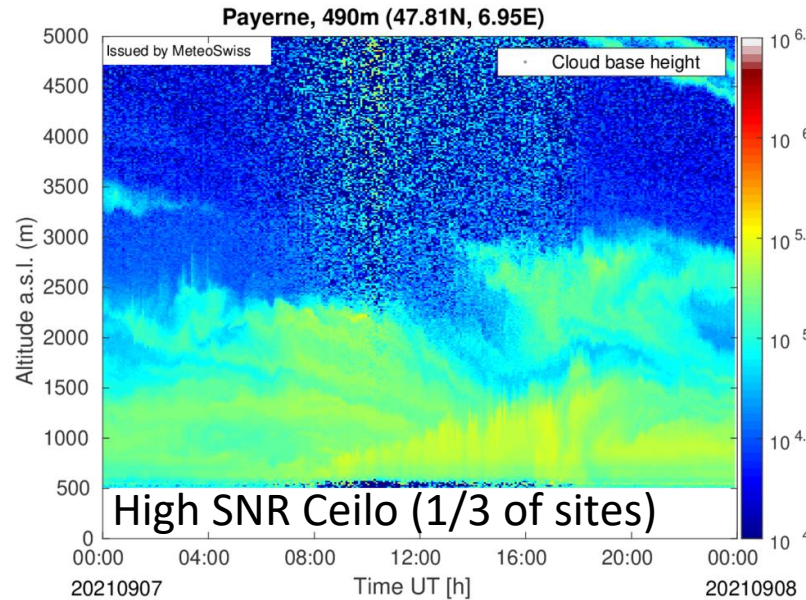
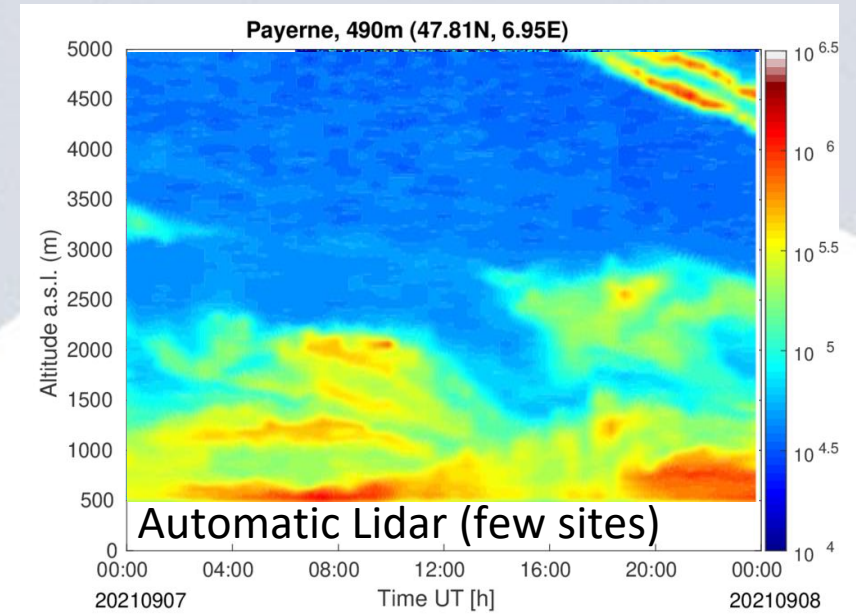
→ confirmed value of WP in comparison with other observation techniques

The Aerosol and Cloud Network



Standard product:

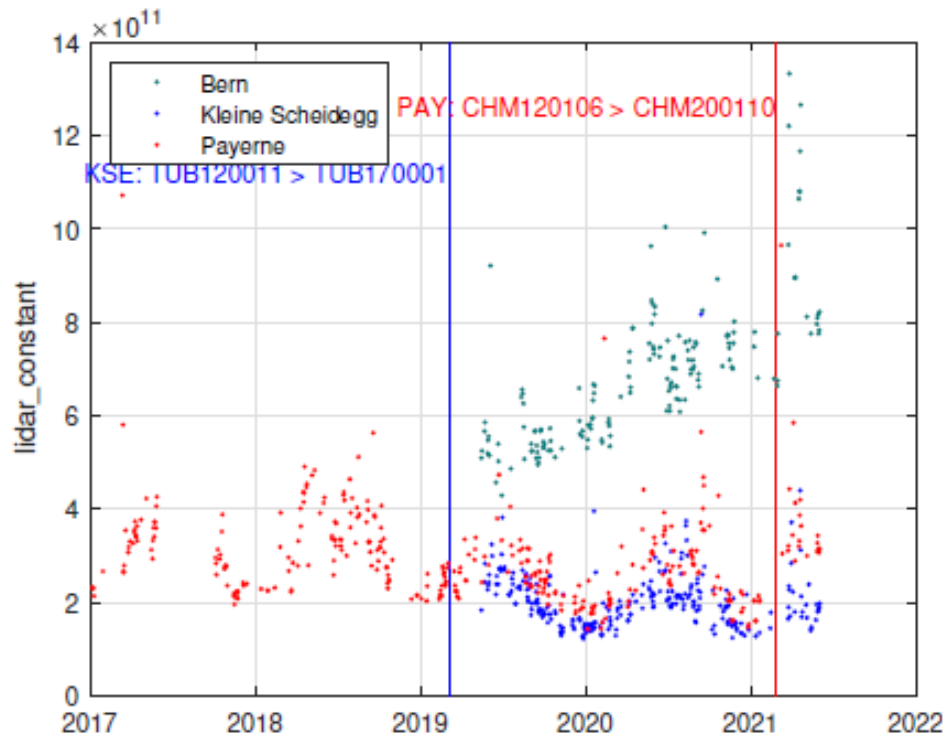
- Attenuated backscatter coefficient
- automatic atmospheric calibration



Calibration

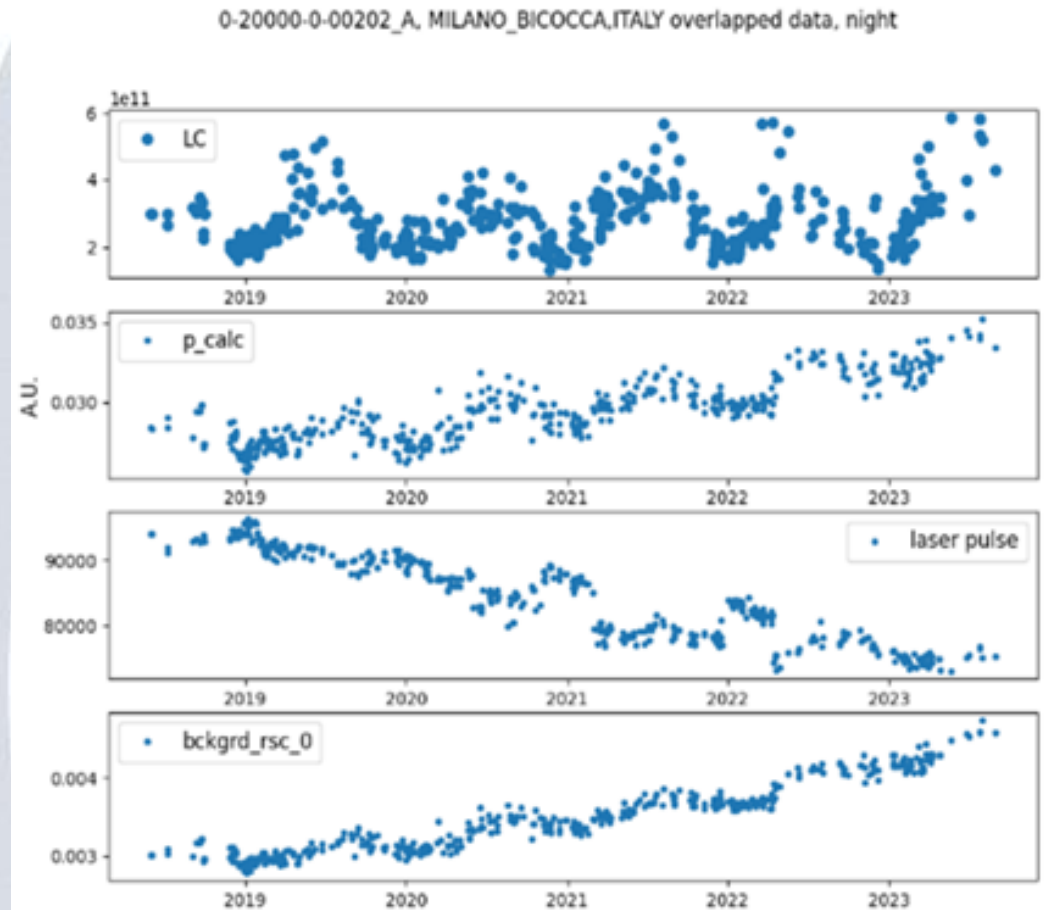
Rayleigh calibration

- 1) Assume lidar ratio
- 2) Perform Klett Inversion
- 3) Determine lidar constant
- 4) Kalman filter

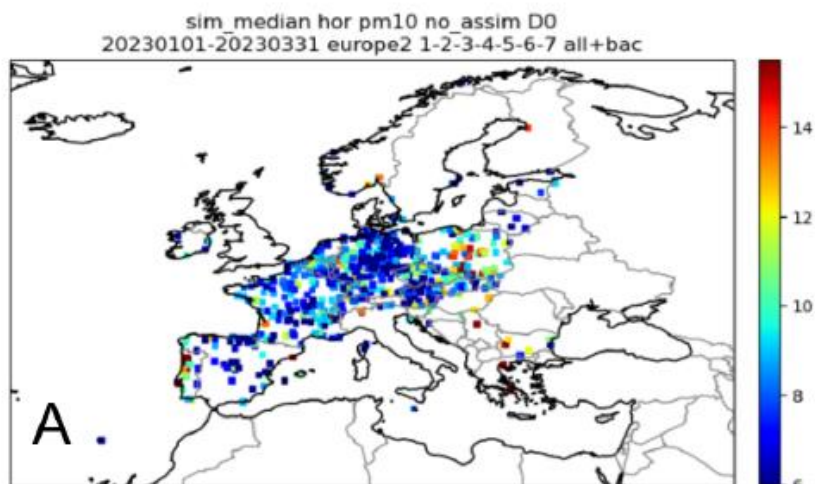


Internal calibration (work in progress):

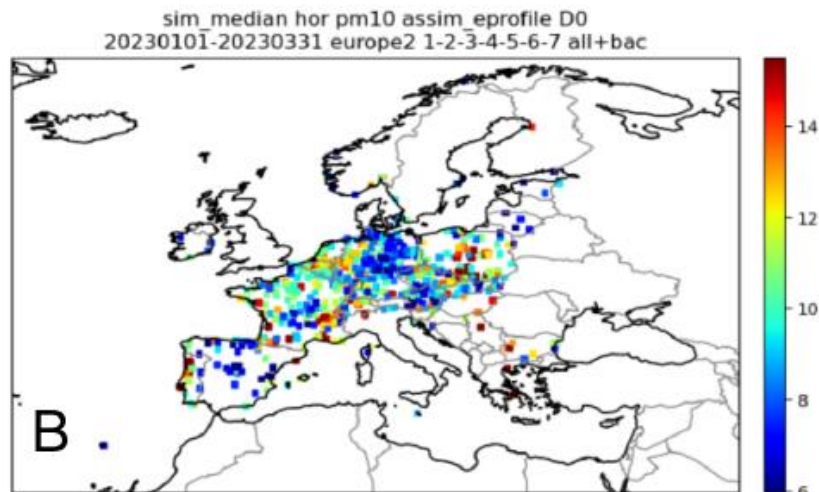
$$CL = f(\text{system parameters})$$



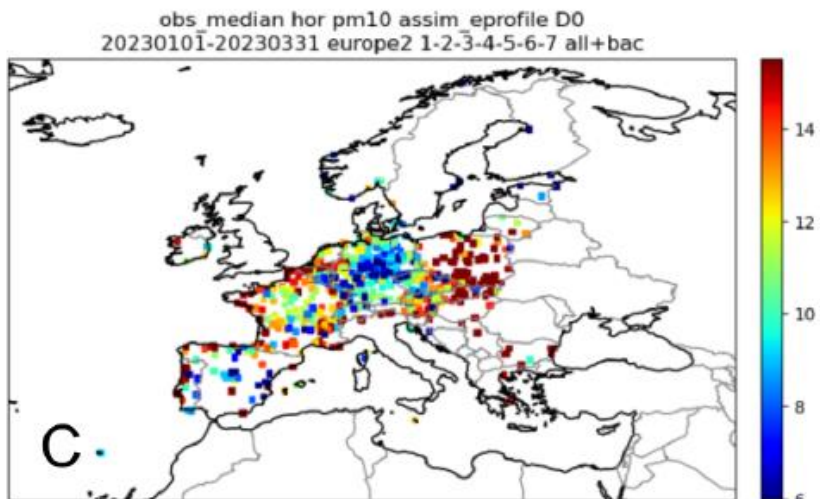
Assimilation of attenuated backscatter coefficient



710 processed stations over 710
min: 2.42, avg: 9.53, max: 34.14



710 processed stations over 710
min: 2.48, avg: 11.2, max: 34.69



710 processed stations over 710
min: 2.54, avg: 12.76, max: 32.05

Median PM10 concentration observed (C) and simulated by MOCAGE without (A) and with (B) assimilation of the E-PROFILE network. Period from the 1st January and the 31st March 2023.

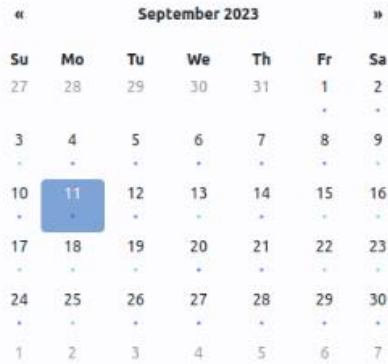
Assimilation of the E-PROFILE network improves PM10 concentration at the MOCAGE surface

EUMETNET

Advanced Aerosol Product

<https://vprofiles.met.no/>

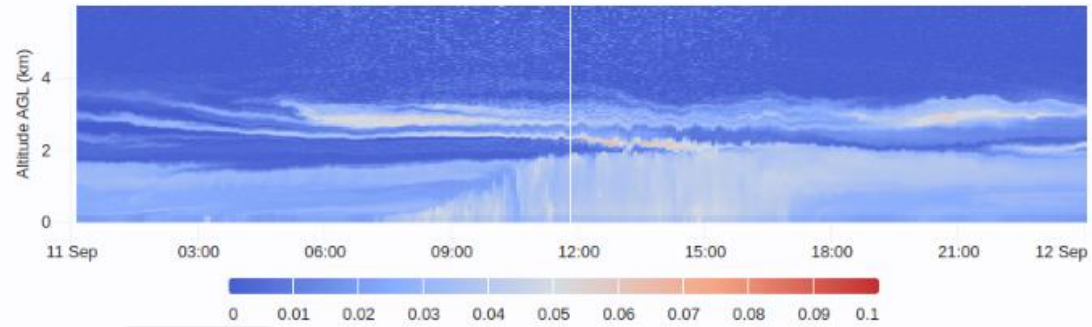
VProfiles Home Events Statistics About Contact



Measurements Retrievals

SZEGED, HUNGARY - 2023/09/11

Extinction Coefficient



Profiles Time Series



Product

Ext Dust Ash BB Urban

Lidar Ratio (sr)

30 50 70

Avg Time (h)

4 6 8 12

AERONET

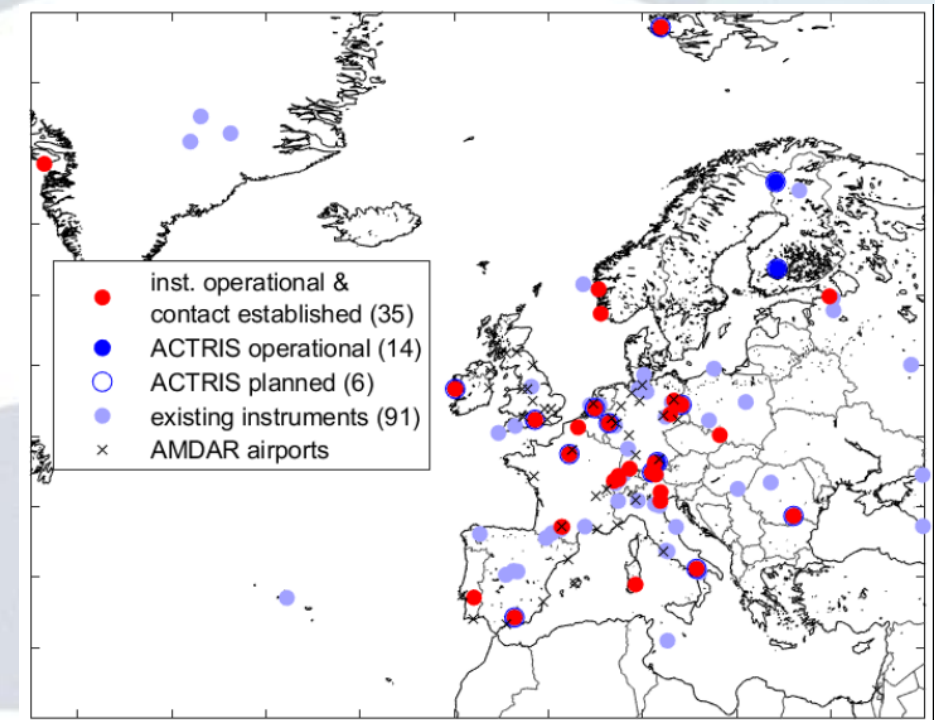
Timisoara (106.62 km)

Aeronet measurements

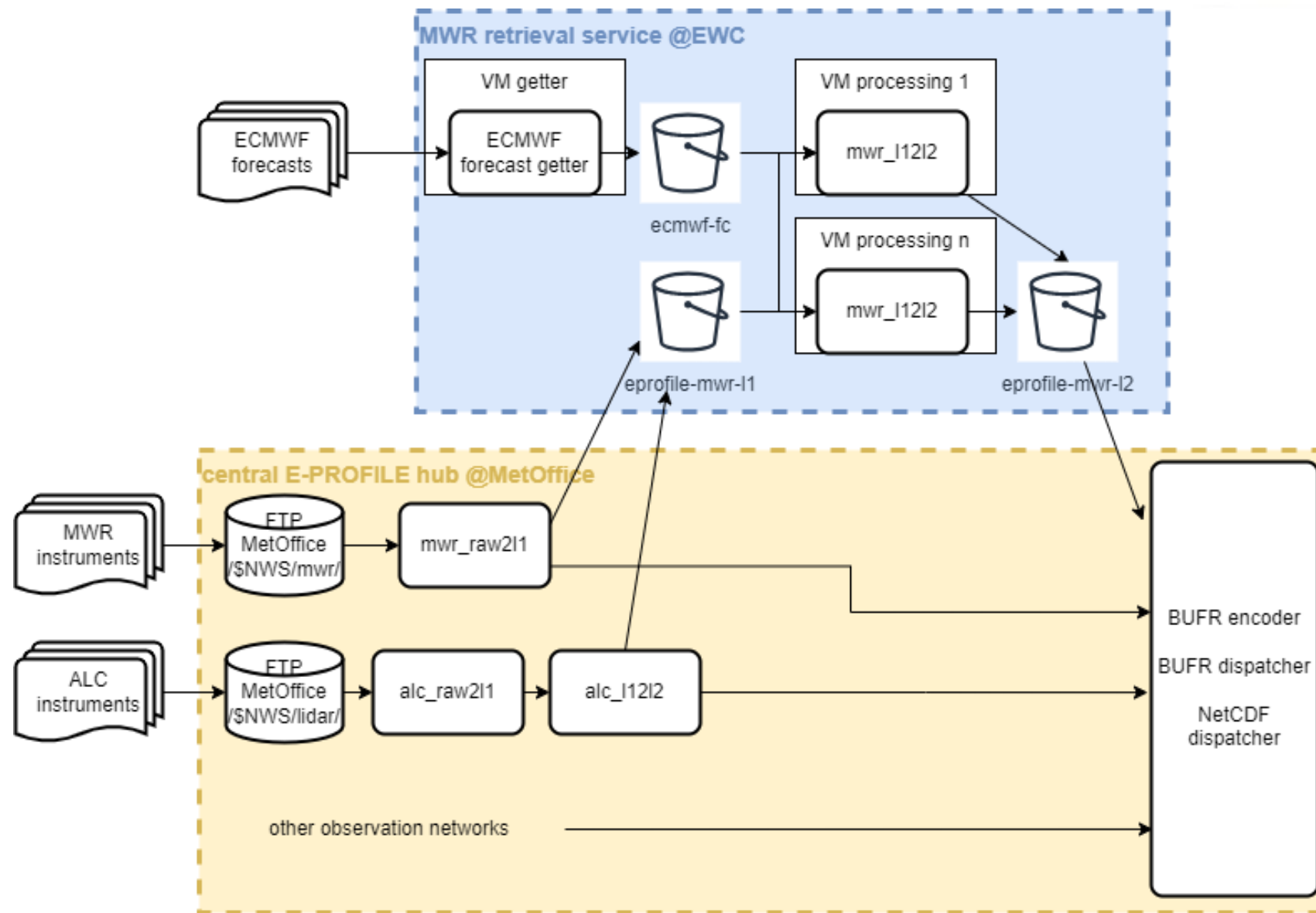
Microwave radiometers in E-PROFILE

Instruments

- Microwave radiometer (MWRs)
 - Passive receivers measuring microwave radiation from the atmosphere
- Dense network of MWR in Europe (90 existing)
 - First Target: ~40 operational instruments in Europe
 - 17 countries represented
- Instruments from 3 manufacturers
 - RPG ~ 80%
 - Radiometrics ~10%
 - Attex ~ 10%
- Data processing pipeline:
 1. Calibration (manufacturer)
 2. Harmonization of the calibrated data (L1)
 3. Thermodynamic retrievals (L2)

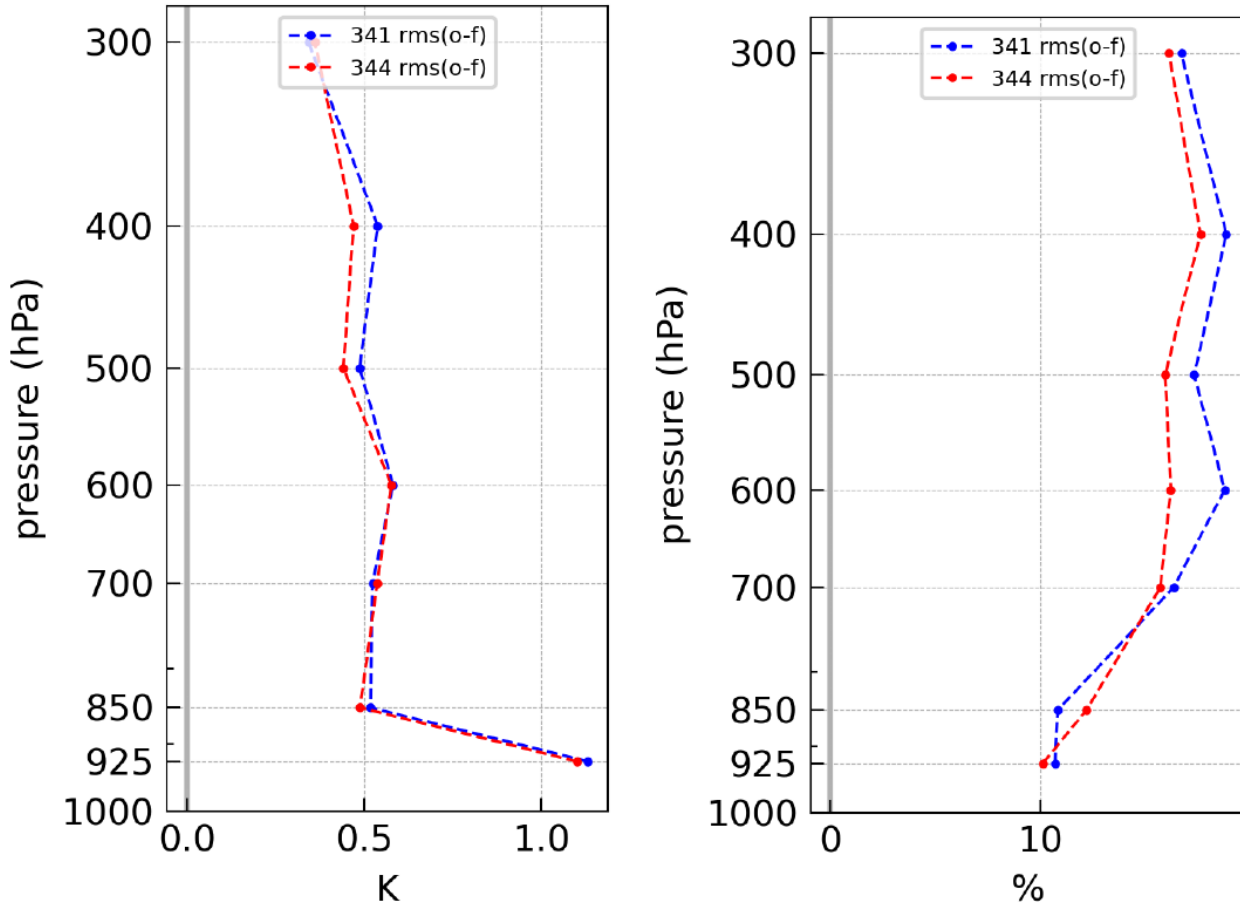


Overview of processing pipeline

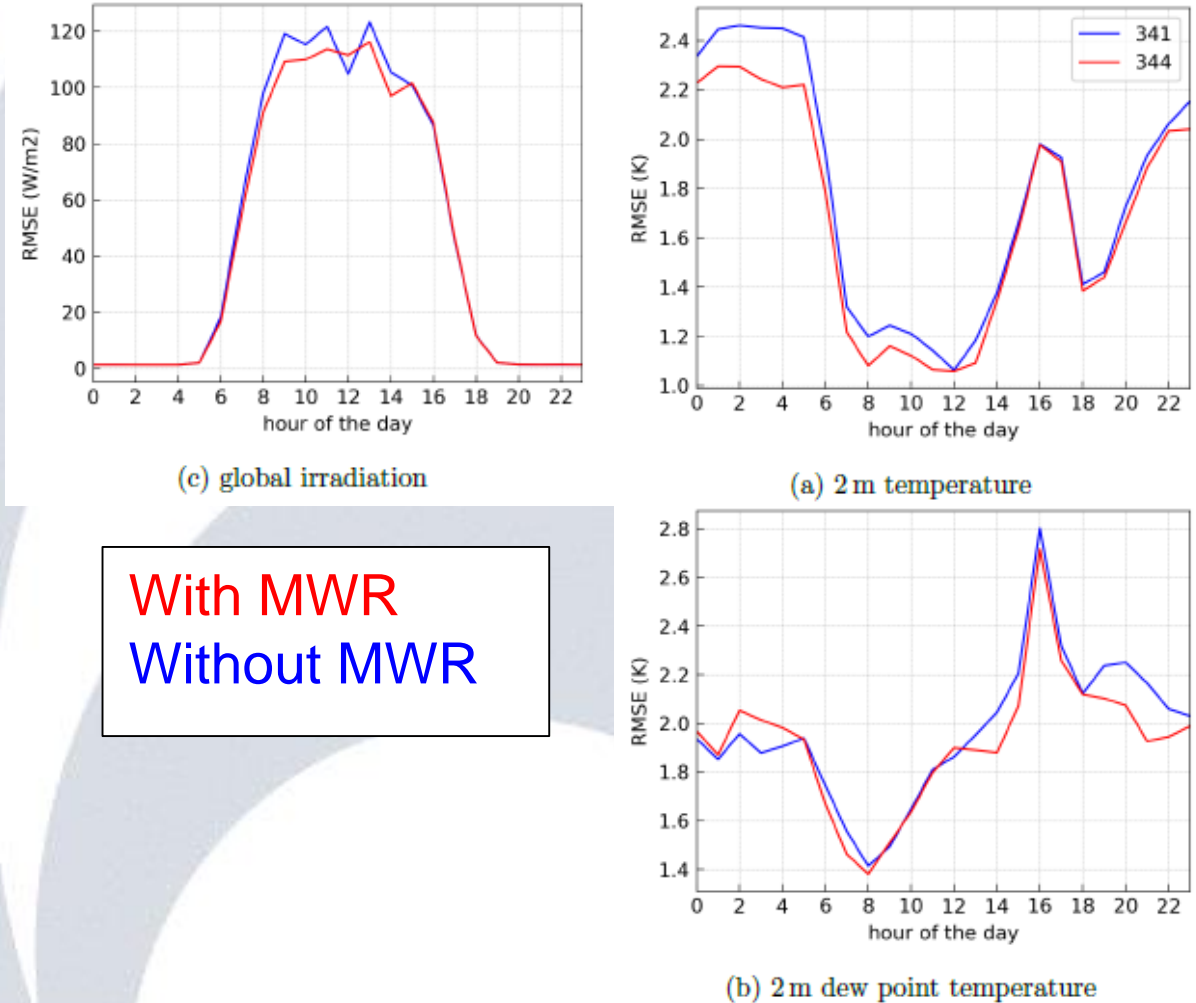


Assimilation of brightness temperatures in COSMO

Comparison against Radiosonde Obs



Comparison against Surface Obs



With MWR
Without MWR

Summary

- Operational networks for the profiling of temperature, humidity, wind, clouds and aerosols
- The main application is NWP; impact studies showd the positive impact of E-Profile data
- Important improvements underway for ALC calibration and overlap correction

and outlook

- Ops deployment of Doppler lidar and MWR processing
- More work needed to validate aerosol products and assoc. Uncert.
- Combine advanced aerosol products with auxiliary data (CAM5, Aeronet, ...)

