



Access to Atmospheric Research Facilities



New developments at CLU

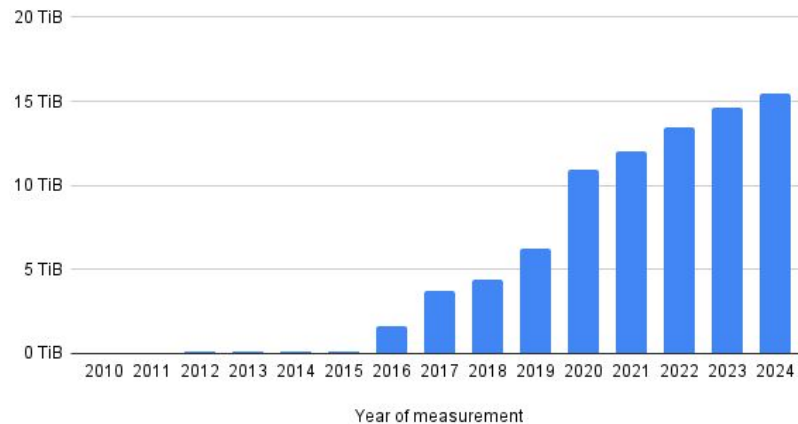
Simo Tukiainen, Ewan O'Connor,
Tuomas Siipola, Niko Leskinen

ACTRIS Data Centre – CLU unit
Finnish Meteorological Institute

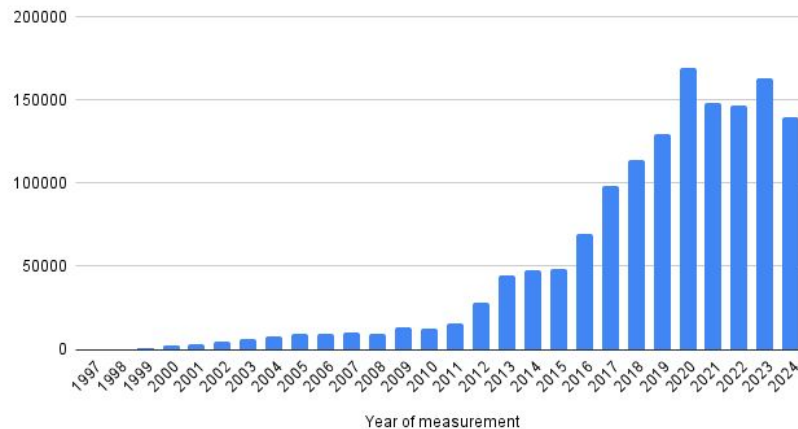
Cloudnet data volume

- ★ 0.8 M product files
- ★ 0.6 M model files
- ★ 15.5 M raw files
- ★ 83 TiB of raw data
(67 % RPG *.LV0 files)

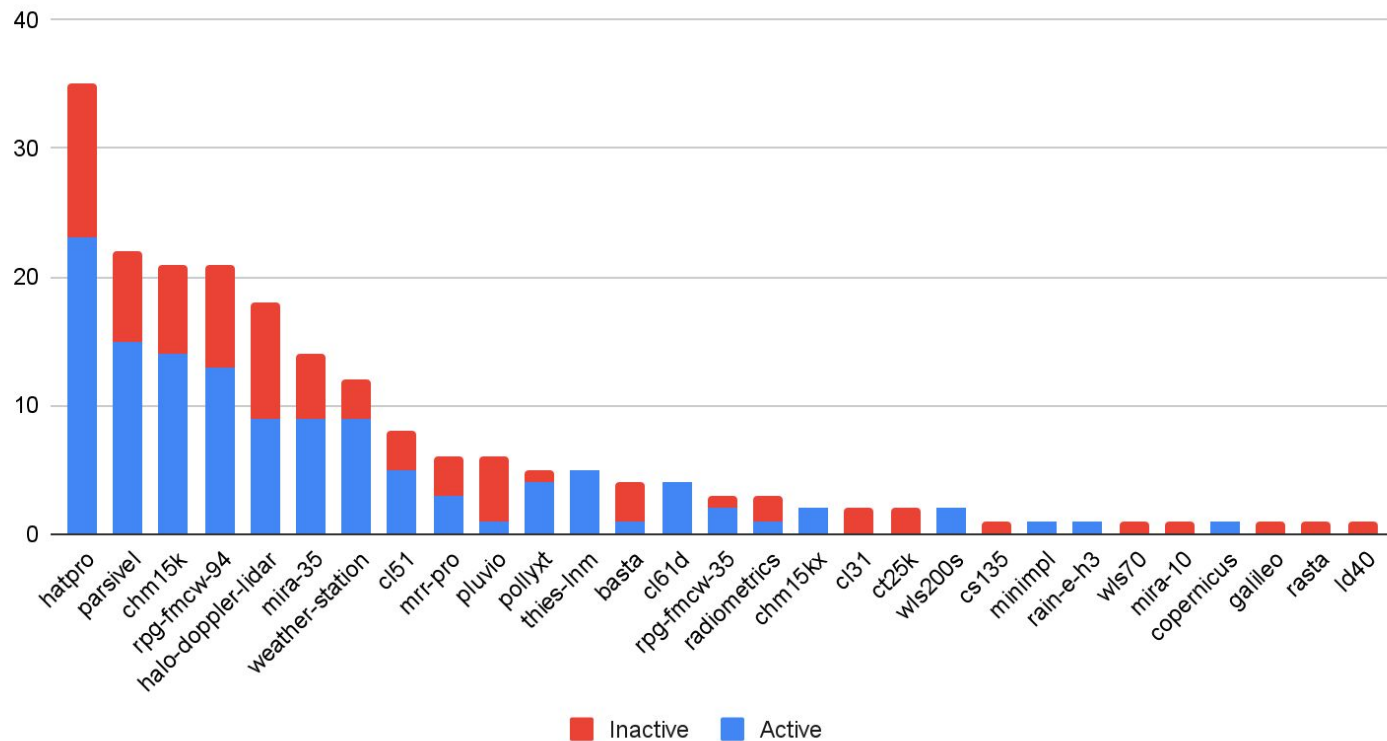
Amount of raw data (83 TiB)



Number of product / model files (1.45M)

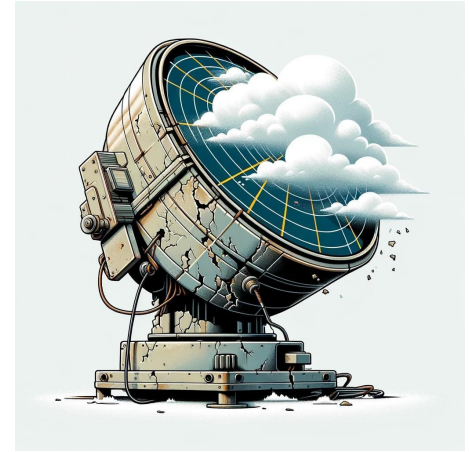


Cloudnet instruments



Data submission

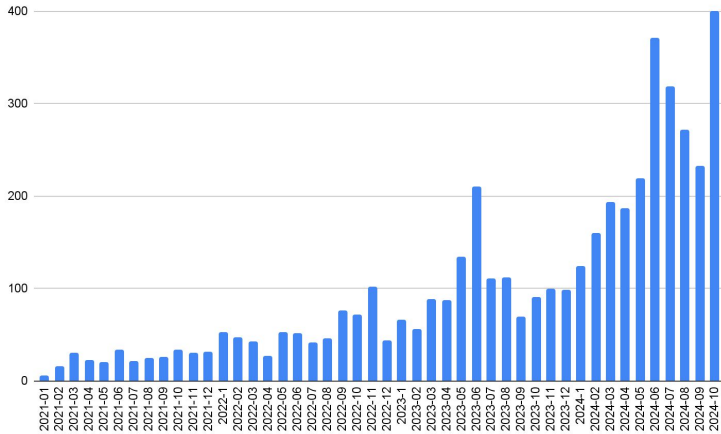
- 2-step submission (metadata + data) over HTTP
- Personal credentials
 - Permissions to submit from site X, Y, Z...
 - Contact CLU unit for credentials: actris-cloudnet@fmi.fi
- Recommended tool: cloudnet-submit
 - <https://github.com/actris-cloudnet/cloudnet-submit>
 - pip install cloudnet-submit



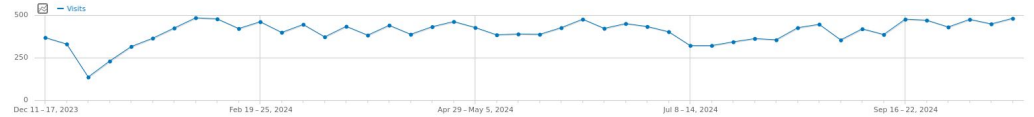
Questions, comments, problems??

cloudnet.fmi.fi user statistics

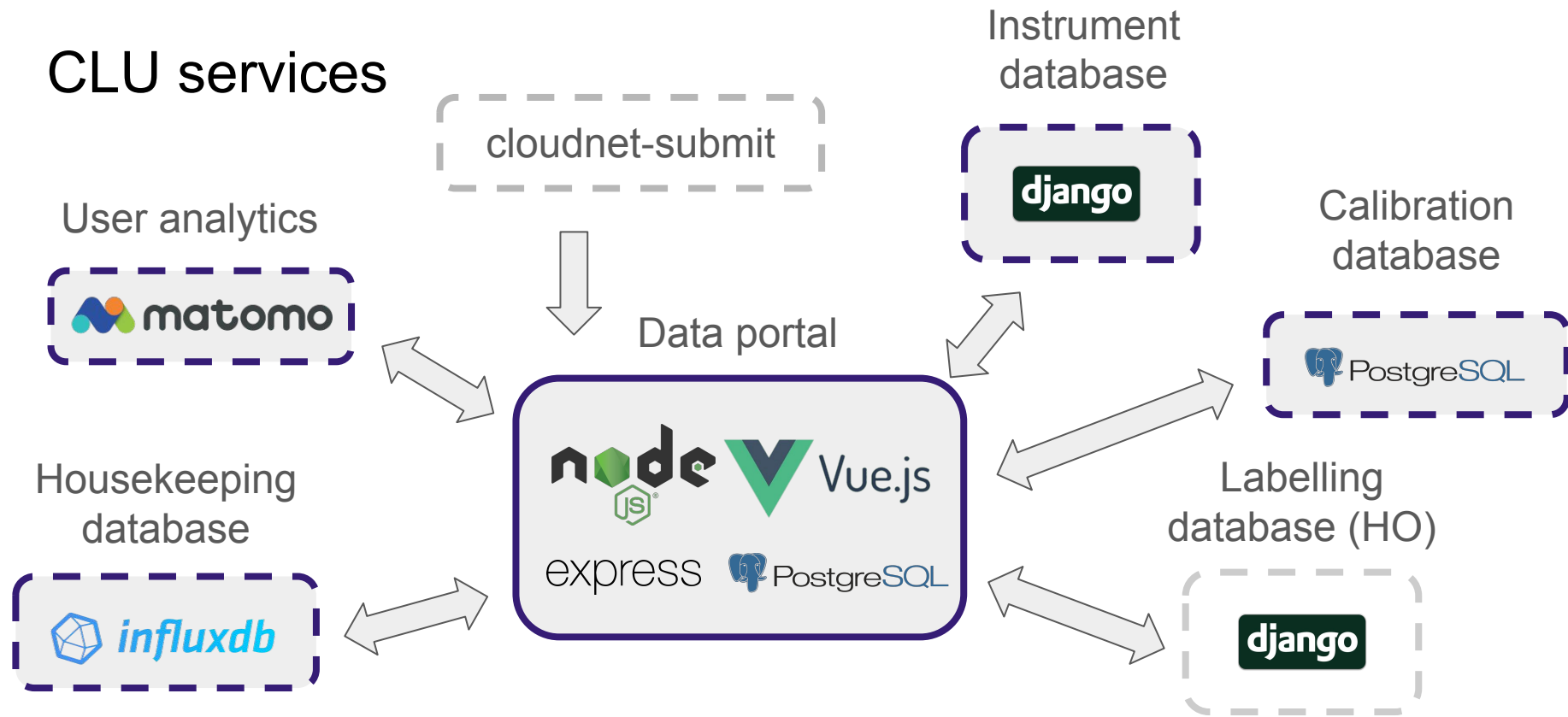
Monthly unique IPs downloading data



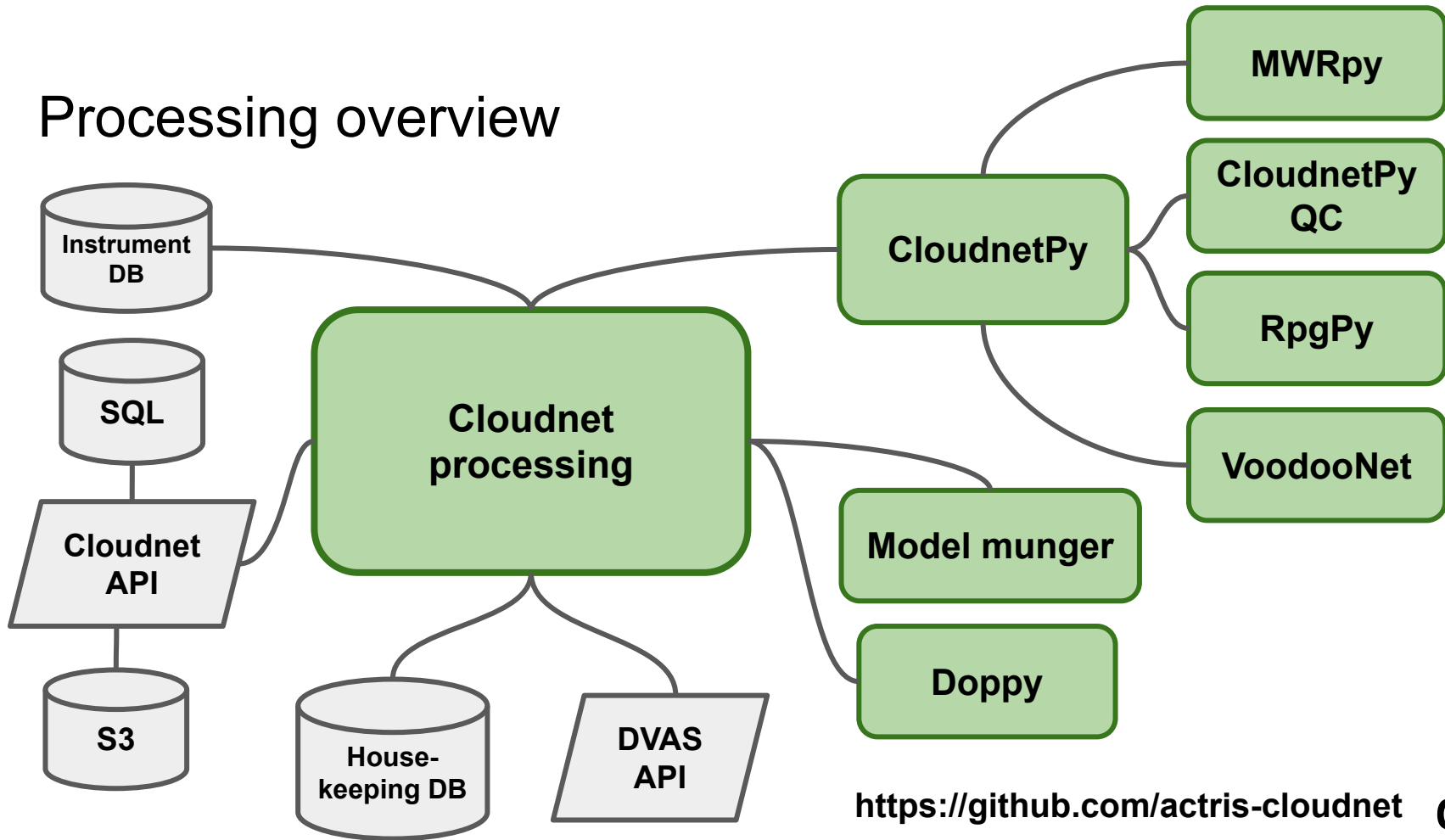
Weekly data portal visits



CLU services



Processing overview



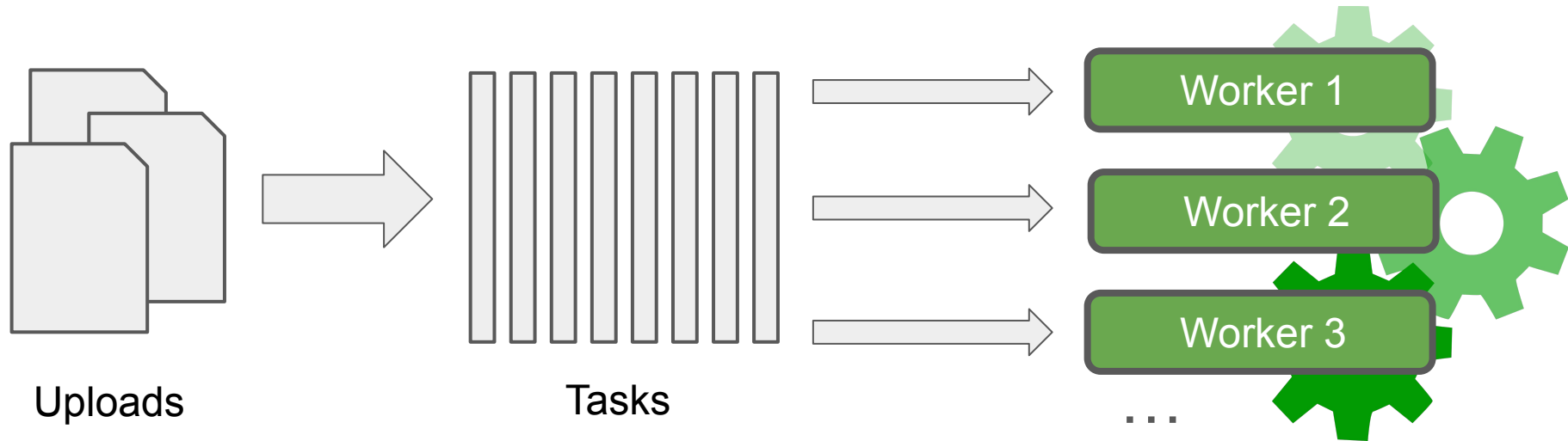
<https://github.com/actris-cloudnet>



Processing queue

Move from traditional cron jobs to modern queue/worker architecture.

Processing is now more flexible, scalable and real-time.



Processing queue

Total tasks: 25

Show failed tasks

Type	Status	Site	Date	Product	Instrument / model	Due in
process	running	payerne	2024-10-25	lidar	MeteoSwiss CHM 15k	
process	running	payerne	2024-10-25	mwr	MeteoSwiss HATPRO-G5	
process	pending	payerne	2024-10-25	mwr-l1c	MeteoSwiss HATPRO-G5	
process	created	kenttarova	2024-10-25	lidar	FMI CL61-B	1 min
process	created	kenttarova	2024-10-25	weather-station	FMI weather station	2 min
process	created	kenttarova	2024-10-24	weather-station	FMI weather station	2 min
process	created	vehmasmaki	2024-10-25	radar	FMI MIRA-35S	2 min
process	created	payerne	2024-10-25	doppler-lidar	MeteoSwiss WLS200S	2 min
process	created	payerne	2024-10-25	doppler-lidar-wind	MeteoSwiss WLS200S	2 min
process	created	chilbolton	2024-10-25	doppler-lidar	UL HALO	2 min
process	created	chilbolton	2024-10-25	doppler-lidar-wind	UL HALO	2 min
process	created	evora	2024-10-25	mwr	UÉ HATPRO-G4	2 min
process	created	evora	2024-10-25	mwr-l1c	UÉ HATPRO-G4	2 min
process	created	hyytiala	2024-10-25	lidar	UH CL61	2 min
process	created	cabauw	2024-10-25	doppler-lidar	KNMI WLS200S	4 min
process	created	cabauw	2024-10-25	doppler-lidar-wind	KNMI WLS200S	4 min
process	created	evora	2024-10-25	lidar	UÉ CHM 15k	4 min
process	created	granada	2024-10-25	categorize		7 min
process	created	kenttarova	2024-10-25	categorize		7 min
process	created	chilbolton	2024-10-25	categorize		7 min
process	created	cabauw	2024-10-25	categorize		8 min
process	created	hyytiala	2024-10-25	categorize		9 min
process	created	evora	2024-10-25	categorize		10 min
process	created	lindenberg	2024-10-25	categorize		12 min
process	created	neumayer	2024-10-25	categorize		13 min

Site page

→ Send us an description of your site!

The description should focus on the cloud remote sensing component, not the whole station or ACTRIS National Facility.

<https://cloudnet.fmi.fi/sites>

Hyttiälä ACTRIS Cloudnet

Measurement station in Finland

[Summary](#) [Products](#)

Hyttiälä is a historical forestry station in Finland, operated by the University of Helsinki. Hyttiälä hosts the Station for Measuring Ecosystem–Atmosphere Relations II (SMEAR II), one of the world's most comprehensive surface in situ observation sites in a boreal forest environment. The instrumentation covers aerosol dynamics, atmospheric chemistry, micrometeorology, weather monitoring, cloud remote sensing and ecophysiology of trees growing in the urban environment.

The cloud remote observations in Hyttiälä started in 2012 on a campaign basis. In 2014, the second ARM Mobile Facility (AMF2) was deployed to Hyttiälä, as a part of Biogenic Aerosols–Effects on Clouds and Climate experiment (Petäjä et al., 2016). Since then, continuous observations of cloud and precipitation are carried out at the site.

The cloud profiling site is located on the lake Kuivajärvi shore. It is about 30 m below the base of the SMEAR II mast, where most aerosol measurements are performed.

Instruments

The site has submitted data from the following instruments in the last 30 days:

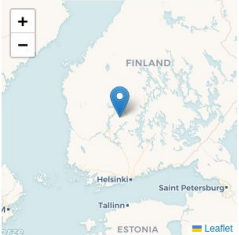
- UH CL61 depolarisation lidar cellometer
- UH HATPRO-G5 scanning microwave radiometer
- FMI Parsivel23 disdrometer
- UH RPG-FMCW-94 Doppler non-scanning cloud radar
- UH weather station weather station

References

Petäjä et al. (2016). BAEC: A Field Campaign to Elucidate the Impact of Biogenic Aerosols on Clouds and Climate. *Bull. Amer. Meteor. Soc.*, 97(10), 1909–1928. <https://doi.org/10.1175/BAMS-D-14-00199.1>.


Links

- [Hyttiälä home page](#)
- [Hyttiälä in ACTRIS data portal](#)
- [SMEAR II \(Hyttiälä\) in ACTRIS labelling database](#)
- [SMR in GAW Station Information System](#)



Coordinates
61.844°N, 24.287°E

Altitude
150 m a.s.l.

Contact
Dmitri Moisseev 

Data citation

Currently the following people are included:

- Instrument PI(s)
- ACTRIS NF PI (from labelling)
- Additional site-specific people

Recent example from the wild:

Radar **Lidar** **MWR** **Model**

↓ ↓ ↓ ↓

Ebell, K., Maturilli, M., Ritter, C., and O'Connor, E.: Custom collection of categorize, classification, droplet effective radius, ice effective radius, ice water content, and liquid water content data from Ny-Ålesund between 1 Sep 2021 and 30 May 2022, ACTRIS Cloud remote sensing data centre unit (CLU), <https://doi.org/10.60656/2498625552e84611>, 2024.

Instrument overview

TROPOS CHM 15k-x (LACROS)

Lufft CHM 15k-x ceilometer

[* Overview](#) [Raw files](#) [Calibration](#)

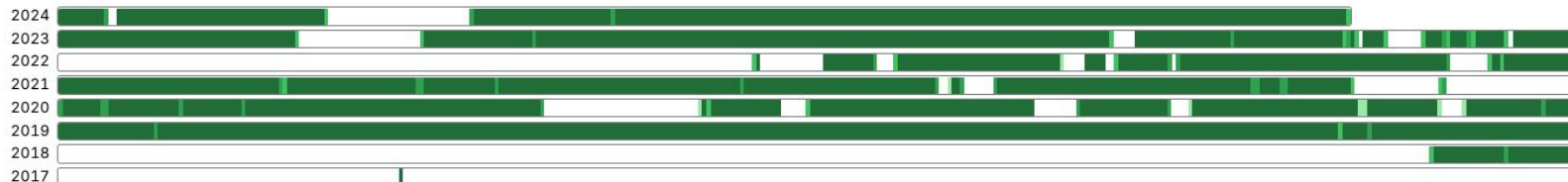
Instrument

PID <https://hdl.handle.net/21.12132/3.cd3578e9f68b42c0>
Owner Leibniz Institute for Tropospheric Research (TROPOS)
Model Lufft CHM 15k-x
Type lidar ceilometer
Serial number CHX090111

Locations

2023-03-29 – now [Leipzig](#)
2022-12-11 – 2024-03-05 [Eriswil](#)
2022-06-17 – 2022-12-01 [Leipzig](#)
2018-11-27 – 2021-11-30 [Punta Arenas](#)
2017-03-24 – 2017-03-24 [Limassol](#)

Total size of uploaded raw files



Less More

Visualisation

Total size

Year

Select

Raw file status

TROPOS CHM 15k-x (LACROS)

Lufft CHM 15k-x ceilometer

[🌟 Overview](#) [📁 Raw files](#) [🔗 Calibration](#)

Date

2024-11-06 

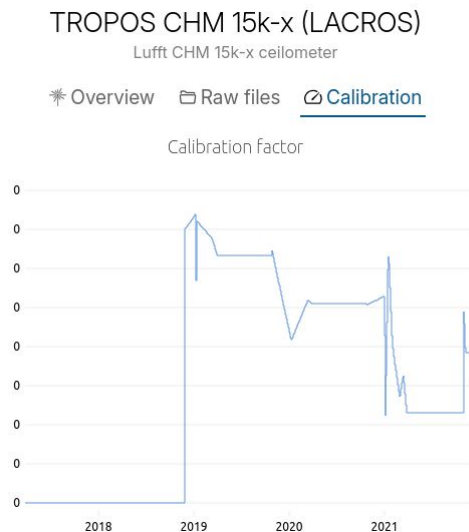


Uploaded	Processed	Created	Invalid
1	1	0	0

Filename	Size	Status	Created (UTC)	Updated (UTC)
20241106_Leipzig_CHX090111.nc	6.5 MB	processed	2024-11-06 02:05:05	2024-11-06 14:05:15

Calibration

Calibration data is now visible on instrument page:



Uni Köln HATPRO-G5 (JOYHAT)

RPG-Radiometer Physics HATPRO microwave radiometer

[Overview](#) [Raw files](#) [Calibration](#)

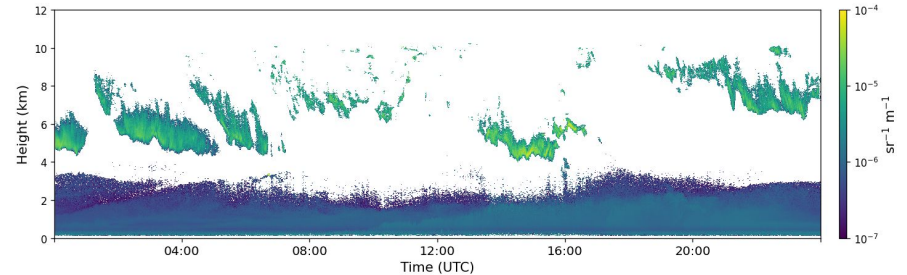
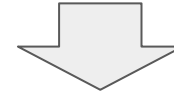
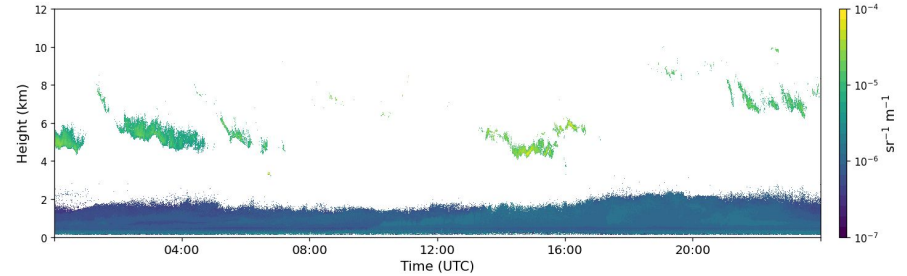
Retrieval coefficients

Date	Coefficient files	Updated at
2024-01-01	tbx_deb_rt00_90_00.nc tbx_deb_rt00_90_07.nc tbx_deb_rt00_90_09.nc hpt_deb_rt00_90.nc iwv_deb_rt00_90.nc tbx_deb_rt00_90_08.nc tbx_deb_rt00_90_06.nc tbx_deb_rt00_90_05.nc lwp_deb_rt00_90.nc tbx_deb_rt00_90_02.nc tpt_deb_rt00_90.nc tbx_deb_rt00_90_03.nc tpb_rao_rt03.nc tbx_deb_rt00_90_10.nc tbx_deb_rt00_90_12.nc tbx_deb_rt00_90_11.nc tbx_deb_rt00_90_13.nc tbx_deb_rt00_90_01.nc tbx_deb_rt00_90_04.nc	2024-08-08 13:10:02 UTC

Lidar background screening

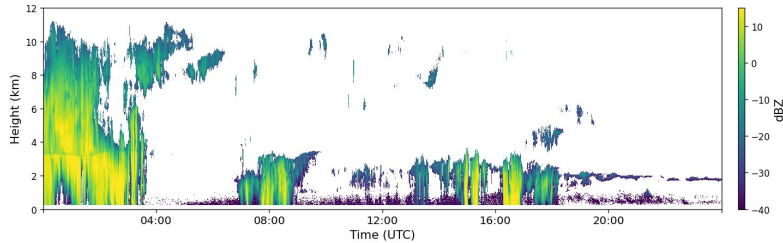
Harmonized screening for all ceilometers using improved method first introduced for CL61.

2019-04-03 Lindenberg CHM 15k

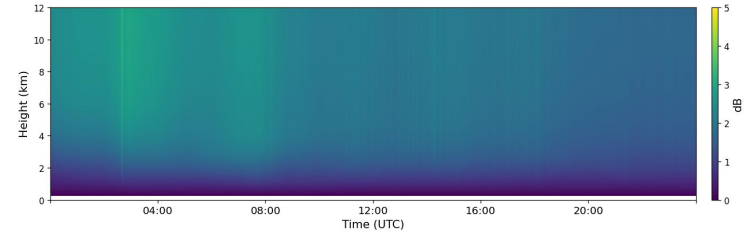
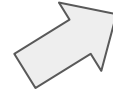


Radar attenuation

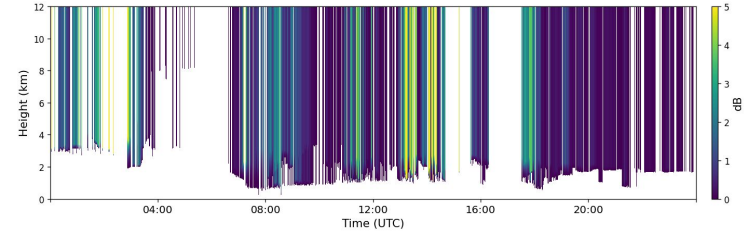
- Revised corrections **gas** and **liquid** water attenuation
- Implemented new corrections for **rain** and **melting** layer attenuation



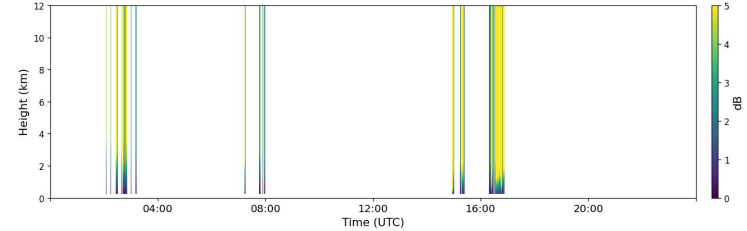
Leipzig 10.10.2024



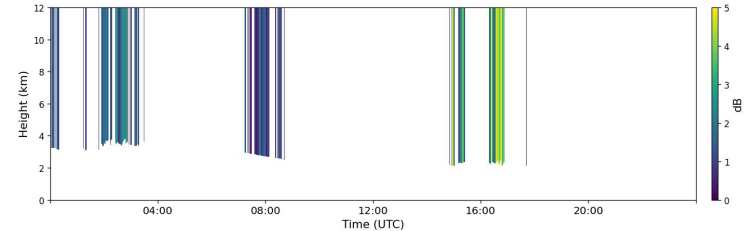
gas



liquid



rain

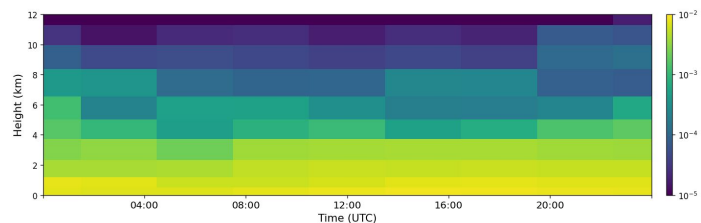
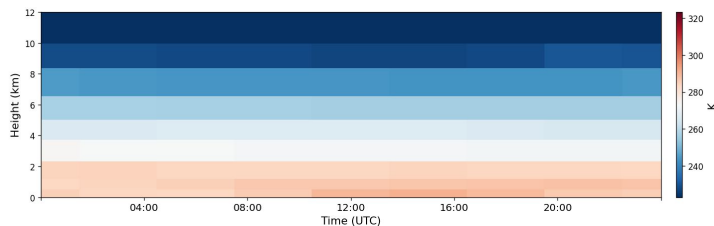


melting
layer

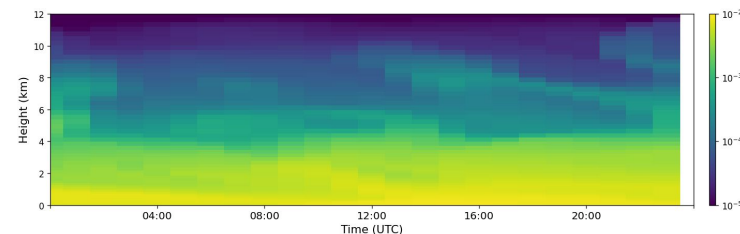
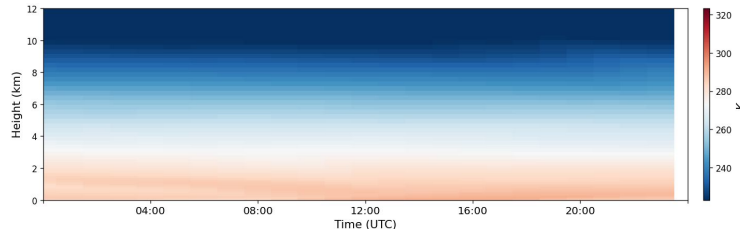
New model processing pipeline “Model munger”

- <https://github.com/actris-cloudnet/model-munger/>
- ECMWF IFS open implemented as Cloudnet fallback model

IFS Open



IFS full resolution



CloudnetPy CLI

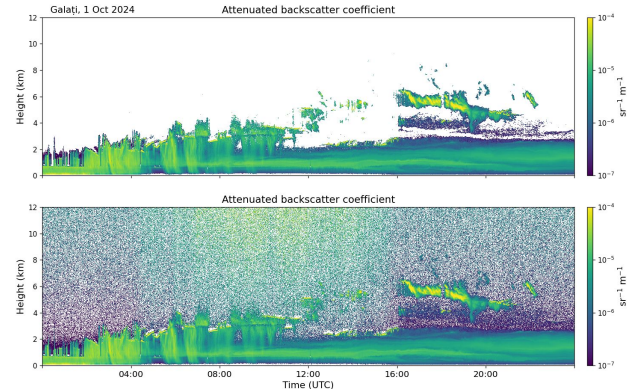


- User-friendly interface for trying / debugging CloudnetPy

usage: cloudnetpy [-h] -s SITE -d DATE -p PRODUCTS [--input INPUT] [--output OUTPUT] [--plot | --no-plot] [--show | --no-show] [--dl | --no-dl]

For example:

```
pip3 install cloudnetpy
cloudnetpy -s galati -p lidar -d 2024-10-01 --show
```



Multiple instruments of same type

- Which one to use for geophysical products?
- Now possible to define “nominal” instrument for a site (e.g. labelled or otherwise preferred instrument)

Site A (no nominal instrument)



Use MIRA by default



RPG



Site B (RPG as nominal instrument)



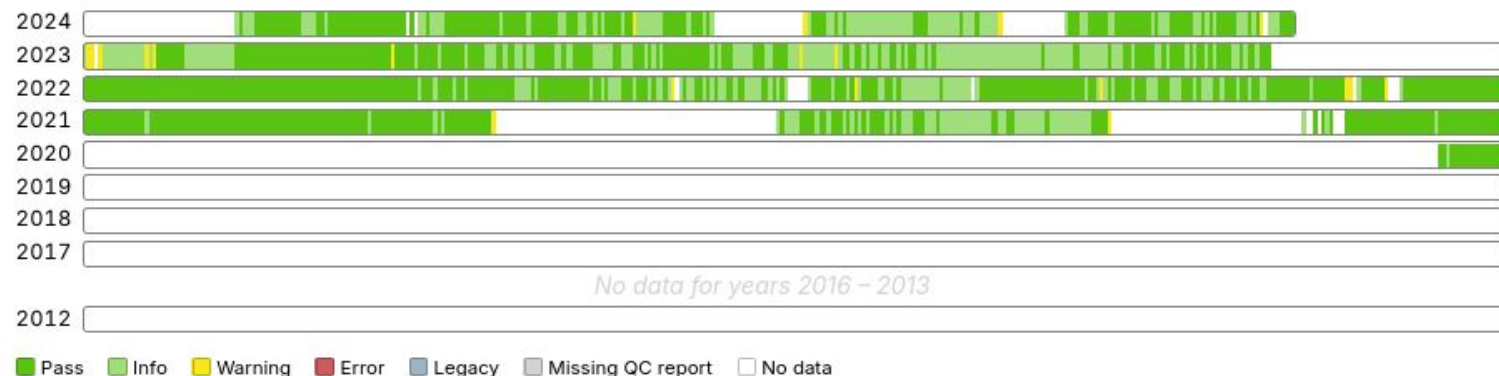
MIRA



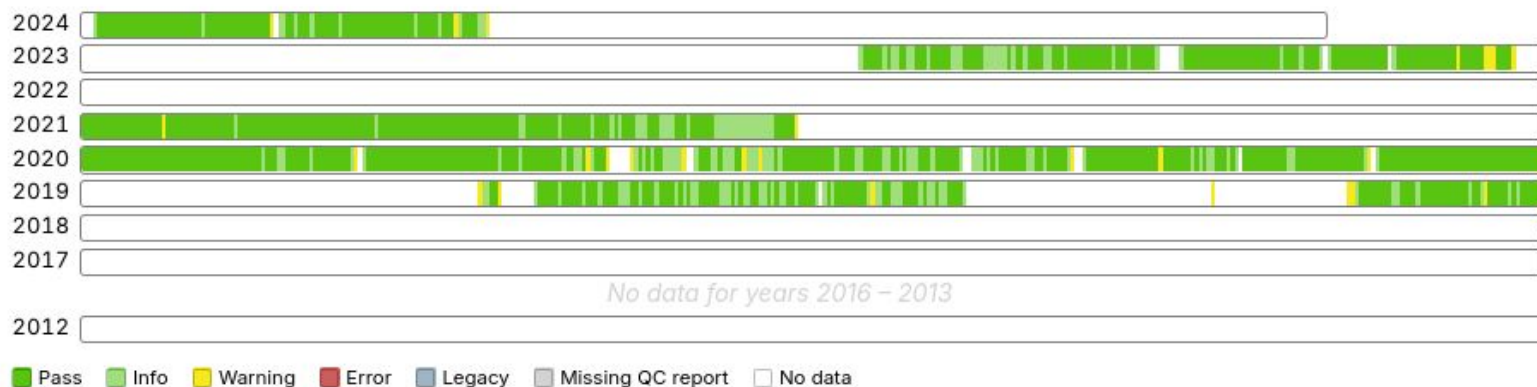
Use RPG (if available)



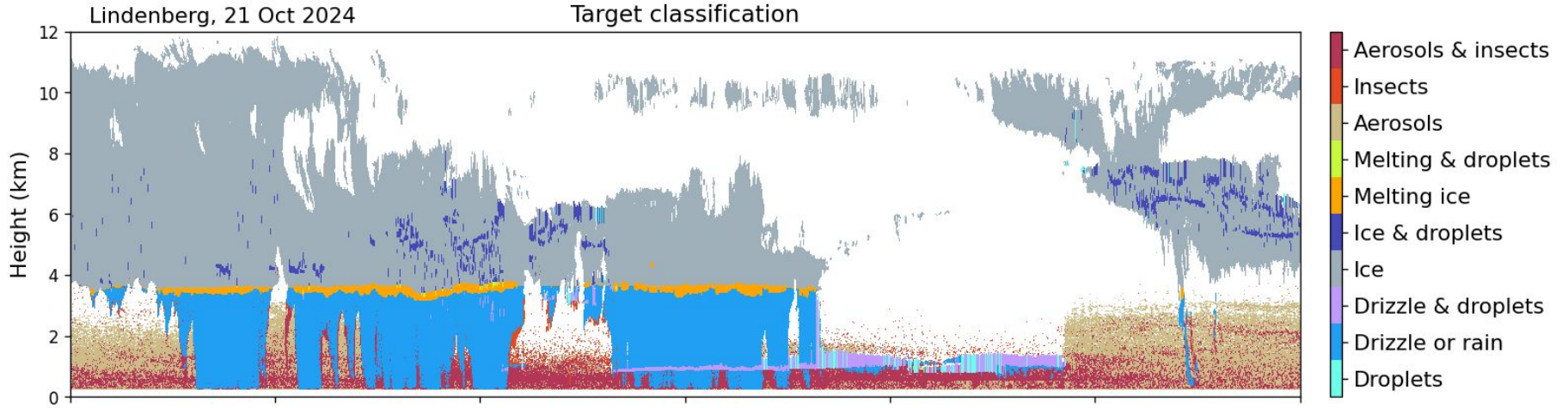
Product quality / availability - Radar (INOE MIRA-35S)



Product quality / availability - Radar (ESA RPG-FMCW-94-DP)



Instrument configuration example



Lidar

- **Lufft CHM 15k**
- Vaisala CL61
- HALO StreamLine

Cloud radar

- **METEK MIRA-35**
- RPG-FMCW-94-DP

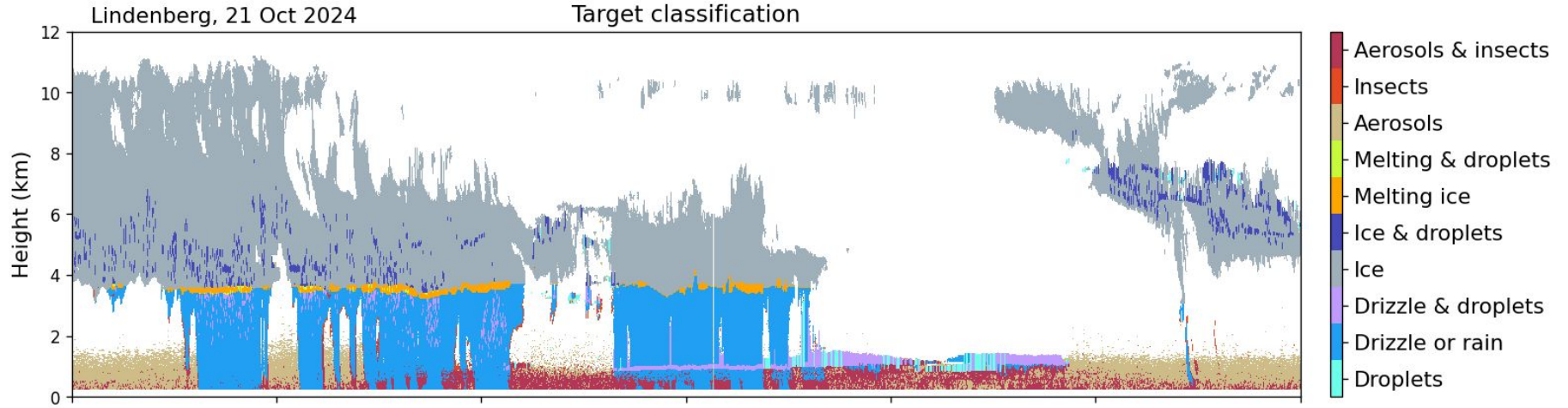
Microwave radiometer

- **RPG HATPRO-G5**
- Radiometrics MP-3000A

Disdrometer

- **OTT Parsivel²**
- Thies LPM

Instrument configuration example



Lidar

- Lufft CHM 15k
- **Vaisala CL61**
- HALO StreamLine

Cloud radar

- METEK MIRA-35
- **RPG-FMCW-94-DP**

Microwave radiometer

- RPG HATPRO-G5
- **Radiometrics MP-3000A**

Disdrometer

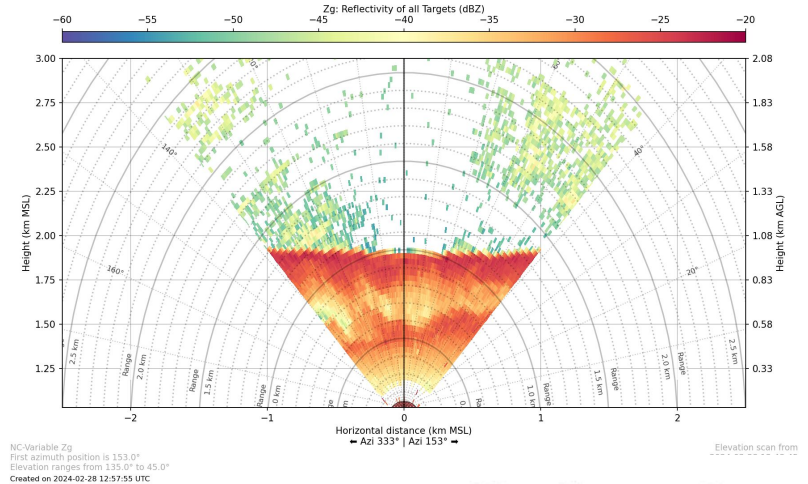
- OTT Parsivel²
- **Thies LPM**

Radar scanning products

Currently only zenith-pointing radar product.

Planning to receive radar scan data from sites:

- Calculate winds (similarly to Doppler lidar wind product)
- Merged product with Doppler lidar?
- File format? (CfRadial2 or Cloudnet convention)
- Which other products are possible and wanted from scan data?



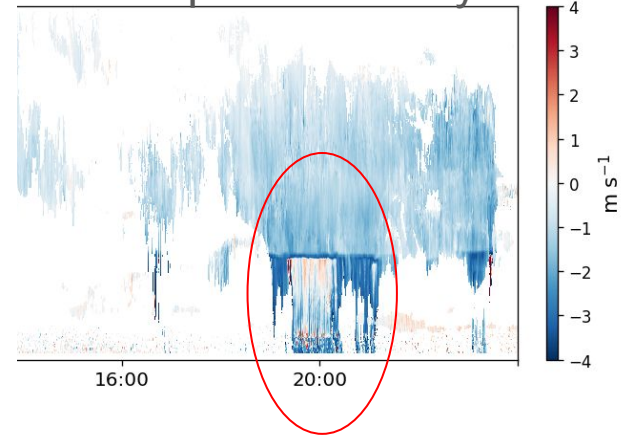
Elevation scan from
2024-02-28 12:48:45
to 2024-02-28 12:50:19
© ETH Zurich, ERC project CLOUDLAB

Radar spectra dealiasing

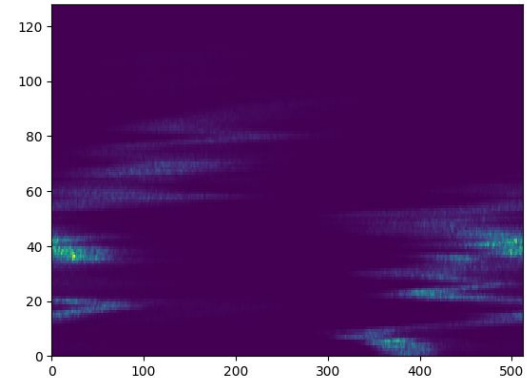
Folding is a common problem especially with RPG cloud radars.

→ Investigating operational methods for dealiasing cloud radar spectra.

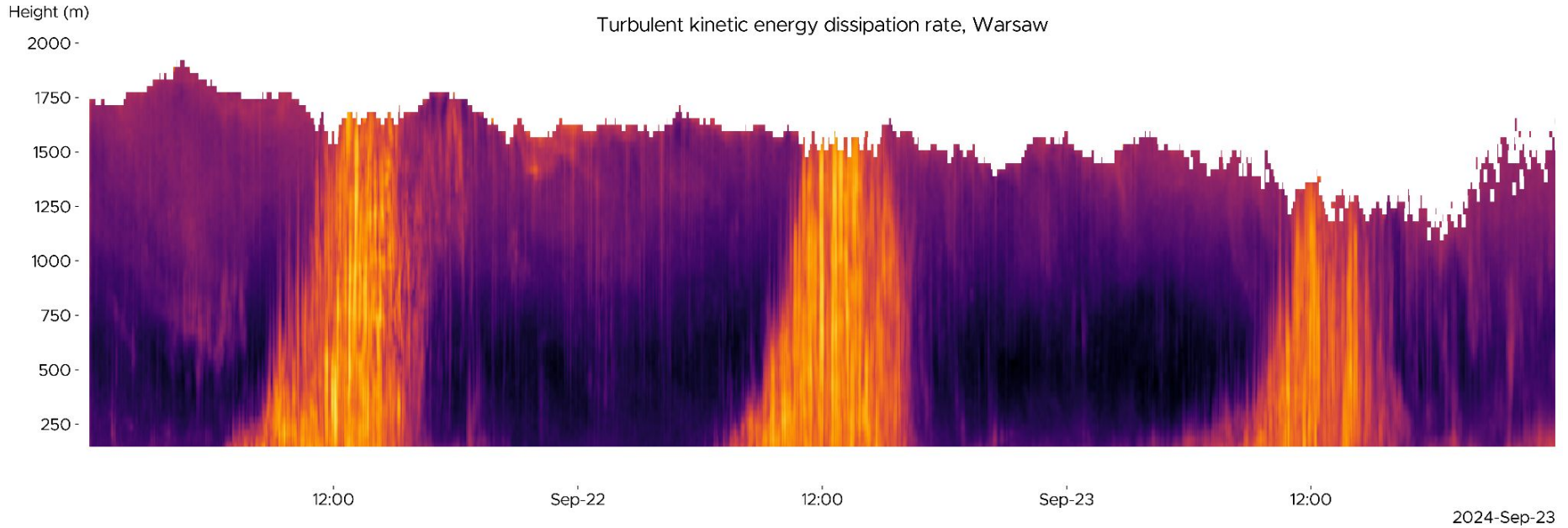
Example 1: velocity



Example 2: spectra



Doppler lidar winds / turbulence, work in progress



Roadmap for future developments



- Level 3 / model evaluation
- Improved methods (e.g. ML classification)
- New products (e.g. Doppler lidar)
- New instruments (e.g. MiniMPL)
- Instrument calibration and monitoring
- Landing pages for campaigns? Now we only have “campaign sites”
- ARM data ??