

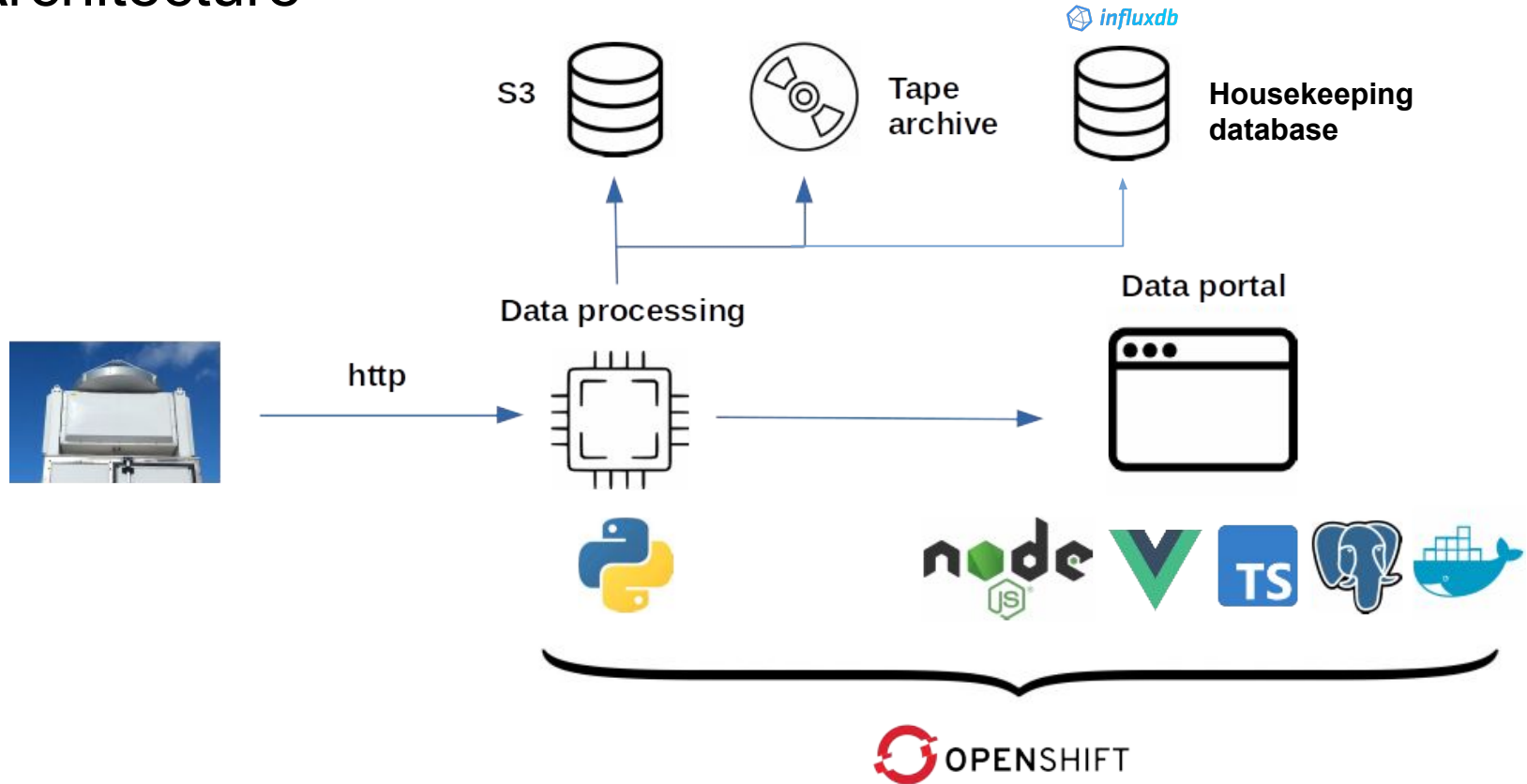


Latest developments on
Cloudnet data portal

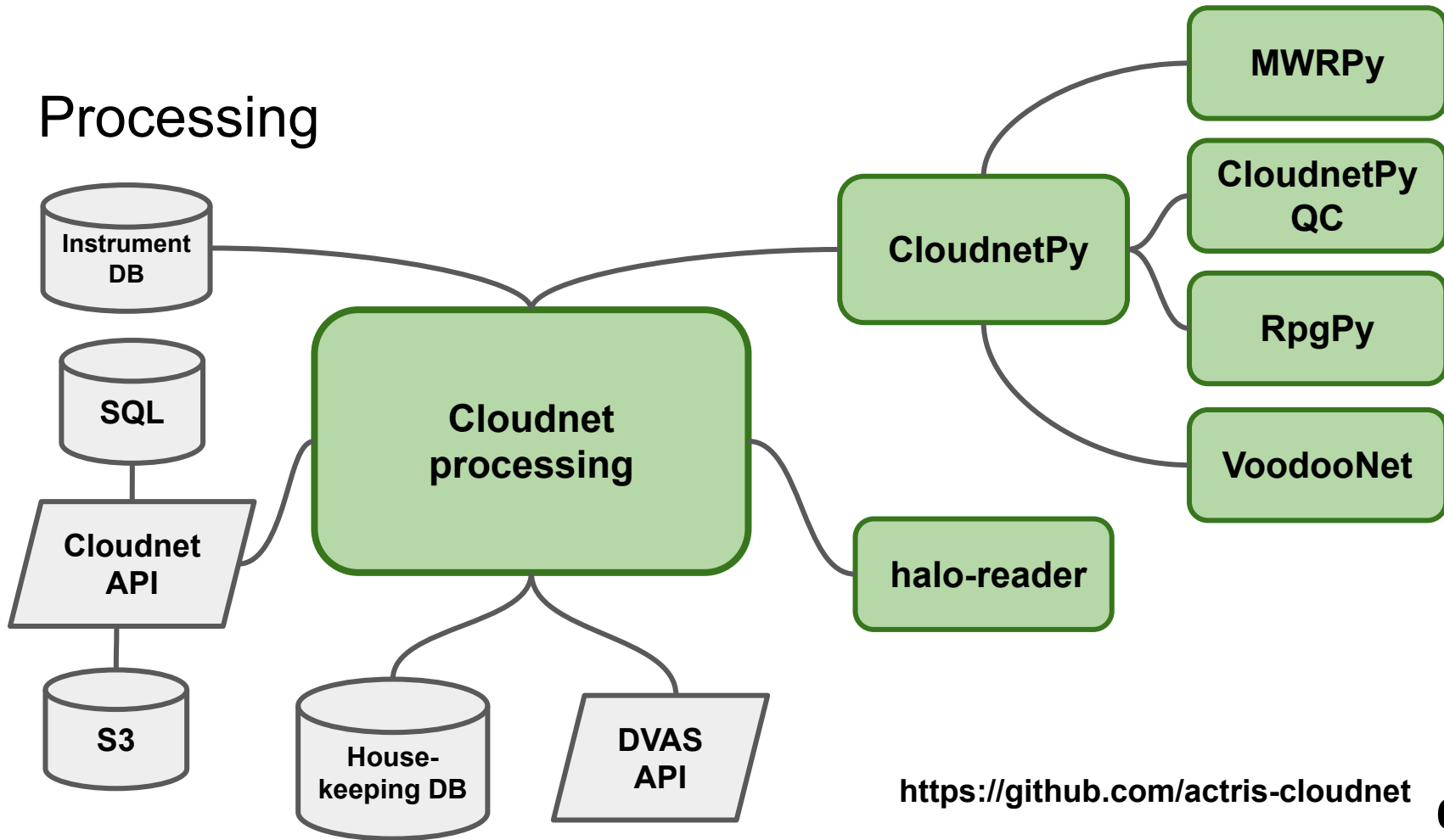
Simo Tukiainen, Tuomas Siipola,
Niko Leskinen, Ewan O'Connor

ACTRIS Data Centre – CLU unit
Finnish Meteorological Institute

Architecture



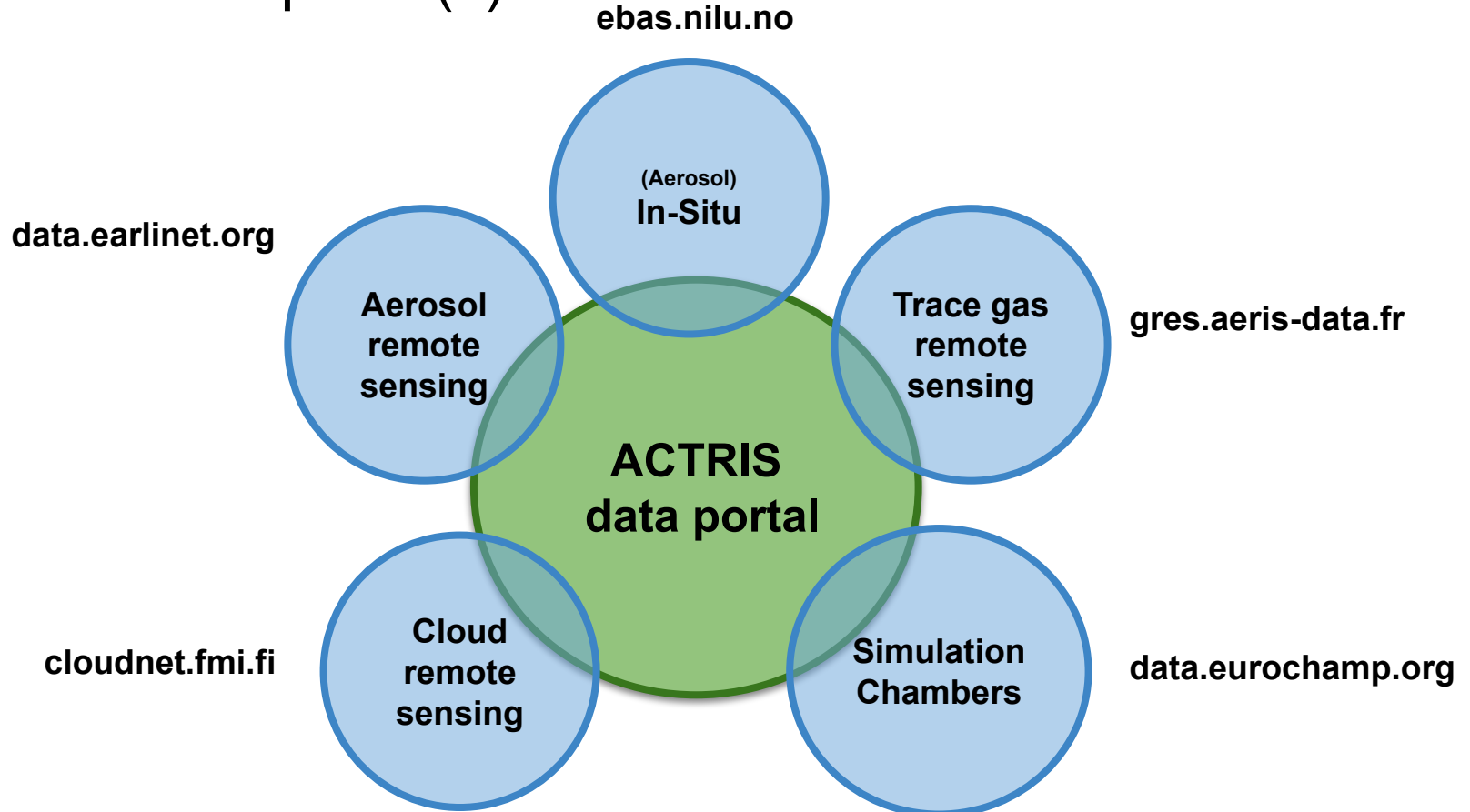
Processing



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



ACTRIS data portal(s)



Cloudnet data volume

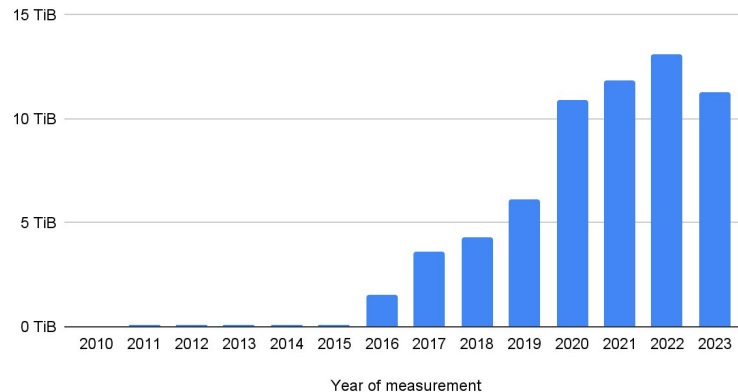
- ★ 971 years of data
- ★ 1.1 M product files
- ★ 6.1 M raw files
- ★ 63 TiB of raw data
(73% RPG Level 0)

Recommended submission tool:

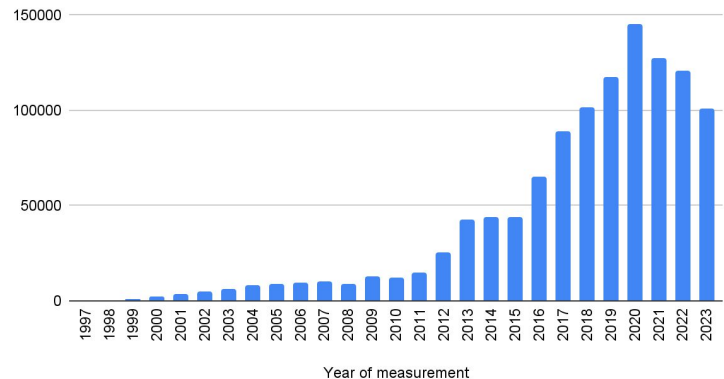
<https://github.com/actris-cloudnet/cloudnet-submit>

→ pip install cloudnet-submit

Amount of raw data (63 TiB)



Number of product files (1.1M)



Typical data submission problems

- Data missing (e.g. an hour at the end of date)
- Missing / incorrect instrument PID
- Invalid data

Please check logs of your submissions scripts and inspect processed data in the data portal from time to time!

Metadata

- 200 OK : Metadata creation was successful.
- 400 Bad Request : There was a problem in handling the request. Check request headers and content type.
- 401 Unauthorized : Problem in authentication. Check credentials.
- 409 Conflict : Metadata for this file already exists, and the file has been received. Do not attempt file submission.
- 422 Unprocessable Entity : Problem in handling metadata body. Check that the metadata JSON is correct.

Data

- 201 Created : File was received successfully.
- 200 OK : File already exists, doing nothing.
- 400 Bad Request : There was a problem in handling the request. Check that the MD5 checksum is valid and corresponds to the file.
- 401 Unauthorized : Problem in authentication. Check credentials.

Cloudnet sites

Permanent sites with instrumentation required for the Cloudnet processing scheme. Most of the sites are part of the ACTRIS research infrastructure.

Site	Country	Latitude	Longitude	Altitude
● Bucharest	Romania	44.348°N	26.029°E	93m
● Cabauw	Netherlands	51.968°N	4.927°E	-1m
● Chilbolton	United Kingdom	51.144°N	1.439°W	85m
● Delft	Netherlands	51.996°N	4.379°E	-4m
● Galați	Romania	45.435°N	28.037°E	40m
● Granada	Spain	37.164°N	3.605°W	680m
● Hyytiälä	Finland	61.844°N	24.288°E	174m
● Jülich	Germany	50.908°N	6.413°E	111m
● Kenttäröva	Finland	67.987°N	24.243°E	345m
● Leipzig	Germany	51.353°N	12.435°E	126m
● Leipzig LIM	Germany	51.333°N	12.389°E	126m
● Lindenberg	Germany	52.208°N	14.118°E	104m
● Lutjewad	Netherlands	53.24°N	6.21°E	1m
● Mace Head	Ireland	53.326°N	9.9°W	16m
● Mindelo	Cabo Verde	16.8778°N	24.995°W	13m
● Munich	Germany	48.148°N	11.573°E	538m
● Norunda	Sweden	60.086°N	17.479°E	46m
● Ny-Ålesund	Norway (Svalbard)	78.923°N	11.922°E	19m
● Palaiseau	France	48.716°N	2.212°E	156m
● Payerne	Switzerland	46.813°N	6.944°E	491m
● Potenza	Italy	40.601°N	15.724°E	760m
● Rzecin	Poland	52.758°N	16.31°E	57m
● Schneefernerhaus	Germany	47.417°N	10.977°E	2653m
● Warsaw	Poland	52.21°N	20.98°E	112m

● Operational site ● Some data ● Inactive

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

Instrument PIDs

Fully operational

- Used in provenance, calibration, housekeeping and data citation
- Now required in data submission
- 164 instruments in total

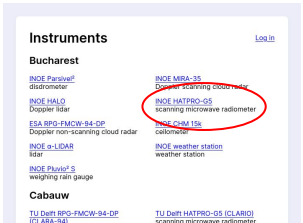
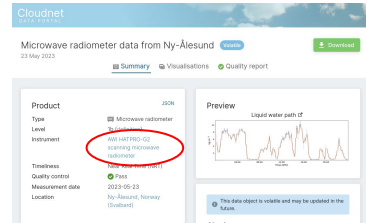
Check that information is up to date for your instruments!

- Send us photographs!

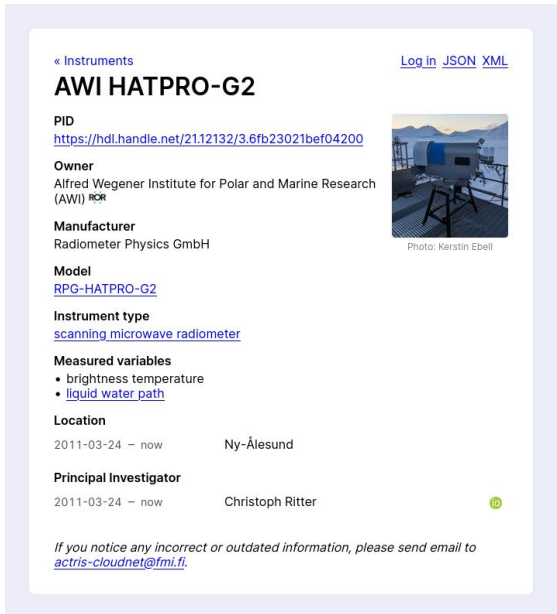
Ideas for further development?

- Login for PIs to update information themselves?
- Instrument logbook?

cloudnet.fmi.fi instrumentdb.out.ocp.fmi.fi



↓ ↓



« Instruments [Log in](#) [JSON](#) [XML](#)

AWI HATPRO-G2

PID
<https://hdl.handle.net/21.12132/3.6fb23021bef04200>

Owner
Alfred Wegener Institute for Polar and Marine Research (AWI) **ROR**

Manufacturer
Radiometer Physics GmbH

Model
[RPG-HATPRO-G2](#)

Instrument type
[scanning microwave radiometer](#)


Measured variables

- brightness temperature
- [liquid water path](#)

Location

2011-03-24 – now Ny-Ålesund

Principal Investigator

2011-03-24 – now Christoph Ritter 

If you notice any incorrect or outdated information, please send email to actris-cloudnet@fmi.fi.

Doppler lidar processing

Vertical backscatter and
velocity profiles from HALO
Photonics StreamLine Doppler
lidars:

Visualisations for 19 October 2023

Jülich Halo Doppler lidar

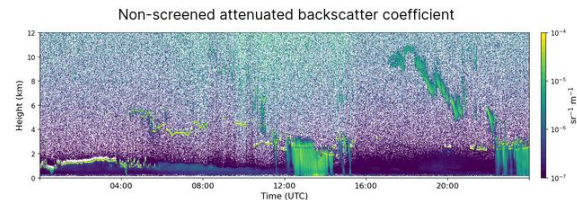
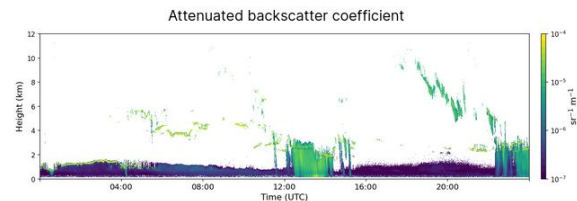
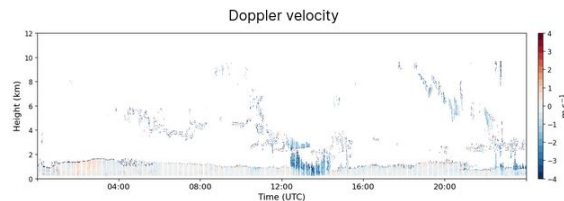
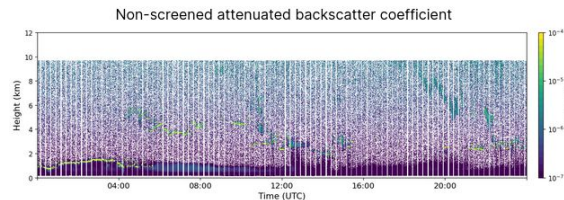
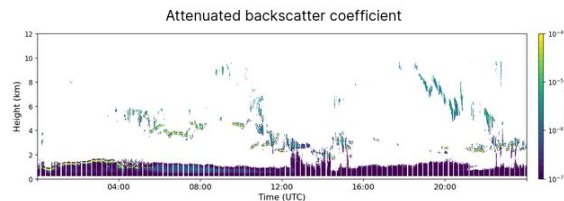
Volatile

Experimental

Jülich CHM 15k ceilometer

Volatile

comparison view

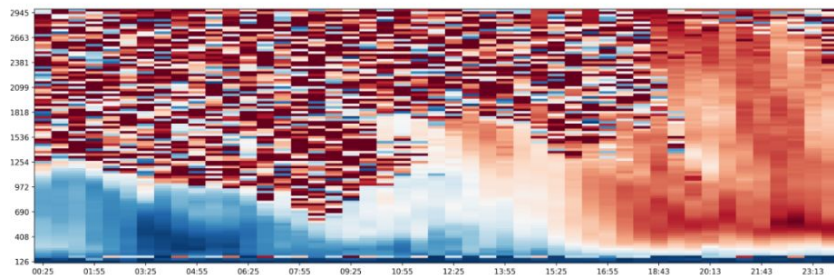


<https://github.com/actris-cloudnet/halo-reader>

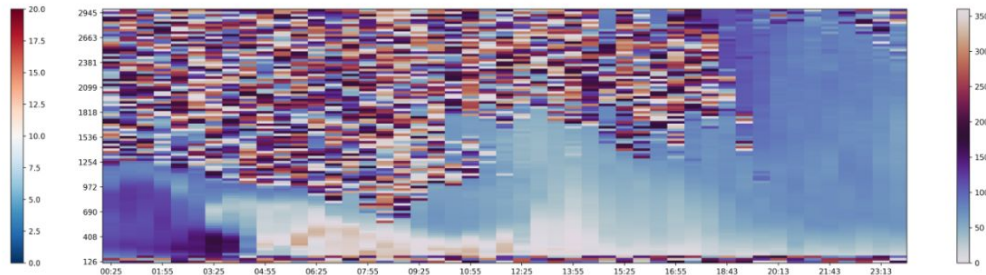
Doppler lidar processing: Winds derived from scans

Warsaw
2023-10-13

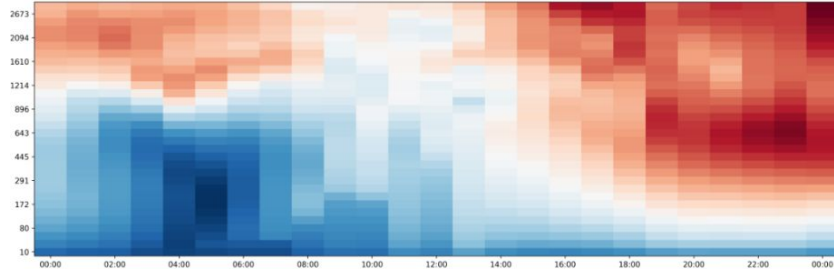
Wind speed (Halo)



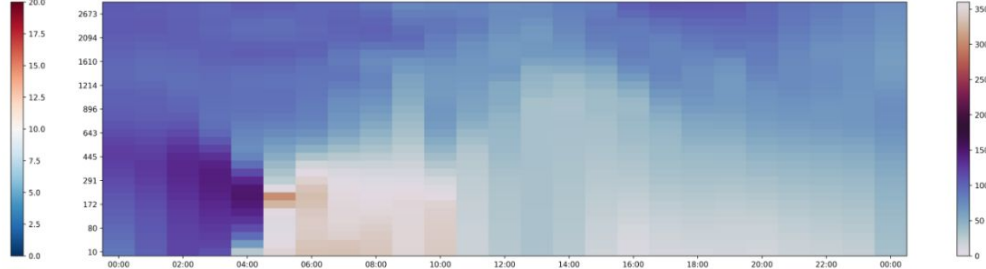
Wind direction (Halo)



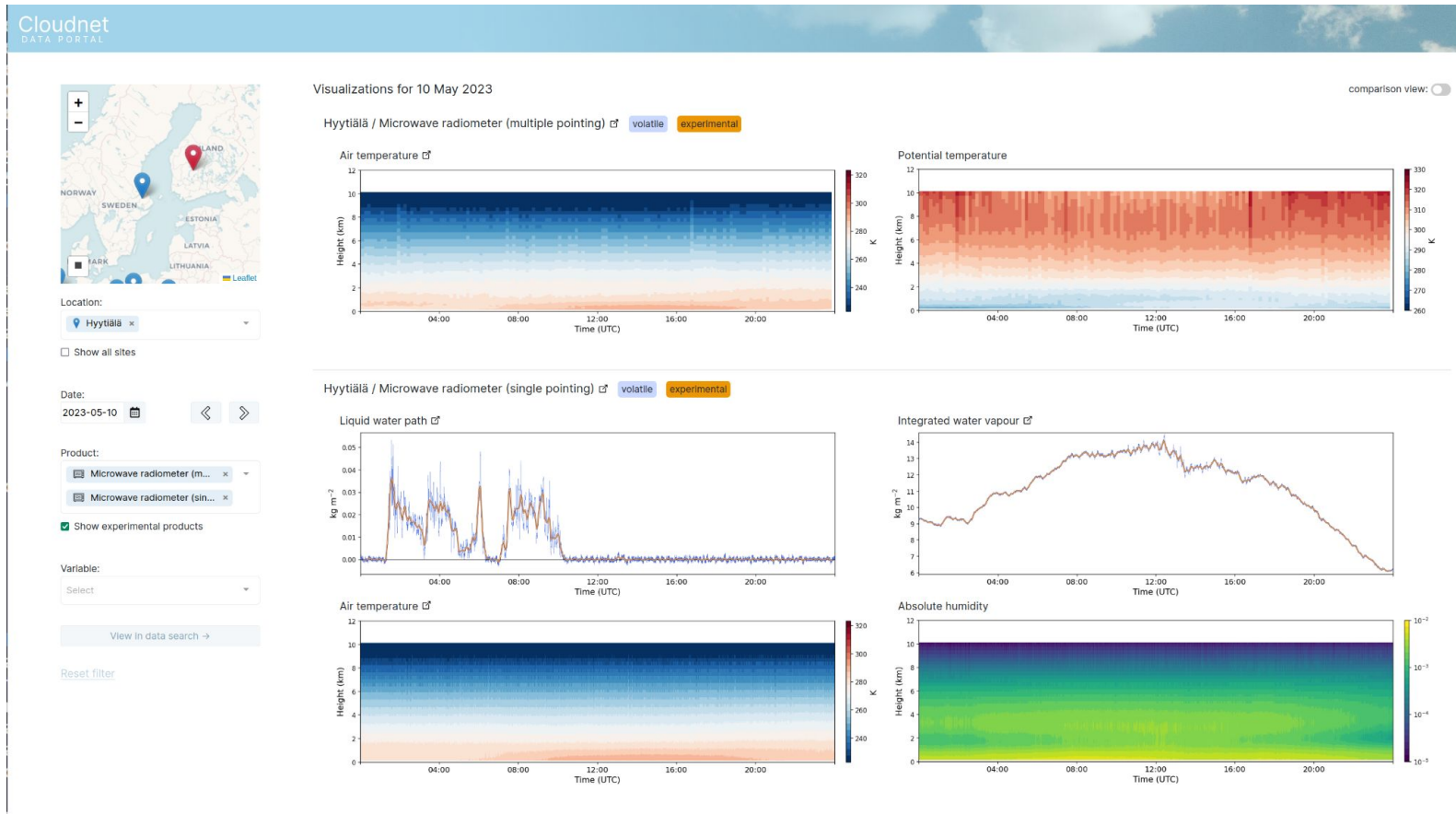
Wind speed (ECMWF)



Wind direction (ECMWF)



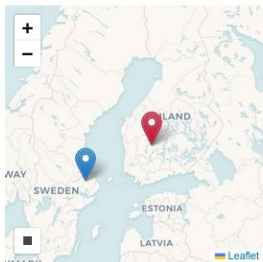
MWRpy – New processing pipeline for HATPRO



MWRPy input

- Retrieval coefficients
 - Send to Simo / Tobias

- HATPRO binary files
 - .LWP, .IWV, .HKD, .BRT, .MET, .BLB / .BLS, .IRT
 - Submit these!



Location

Hyytiälä x

Show all sites

Date

2023-10-19



Product

Select

Show experimental products

Instrument

Select

Variable

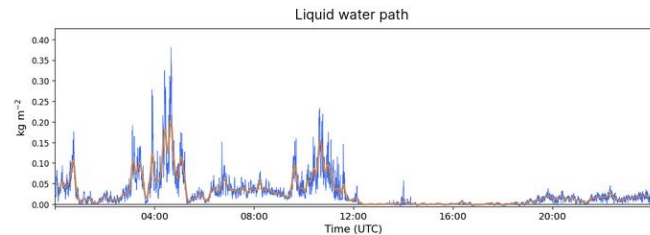
- Liquid water path x
- Liquid water path x
- Liquid water path x

View in data search →

[Reset filter](#)

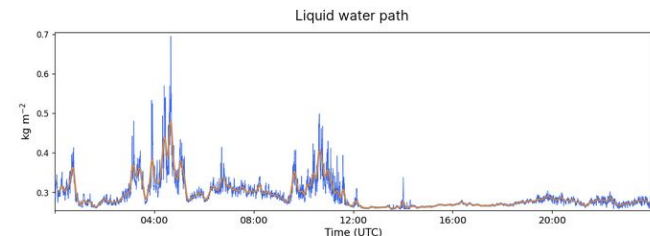
Visualisations for 19 October 2023

Hyytiälä HATPRO microwave radiometer ☑ Volatile



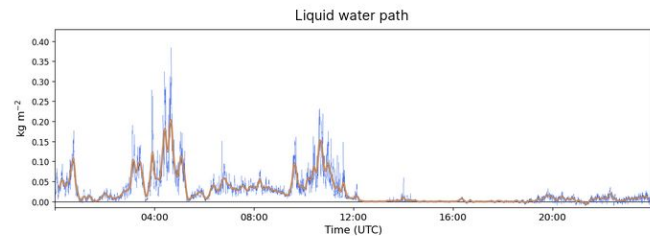
← LWP from HATPRO

Hyytiälä RPG-FMCW-94 cloud radar ☑ Volatile



← LWP from FMCW-94 cloud radar

Hyytiälä MWR single pointing ☑ Volatile Experimental



← Calibrated LWP from HATPRO using MWRpy

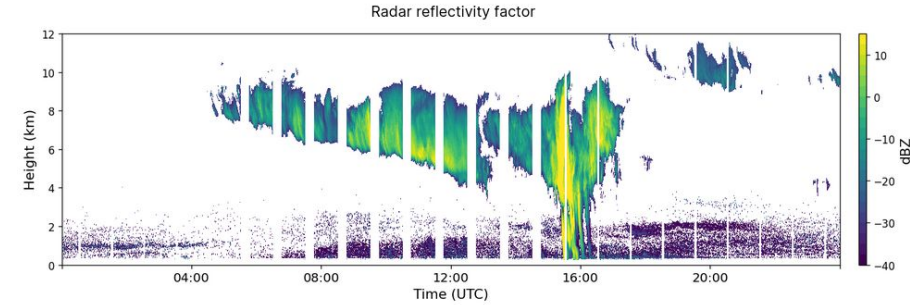
Multiple instruments

Now multiple instruments of the same type are supported for a single site (e.g. two cloud radars).

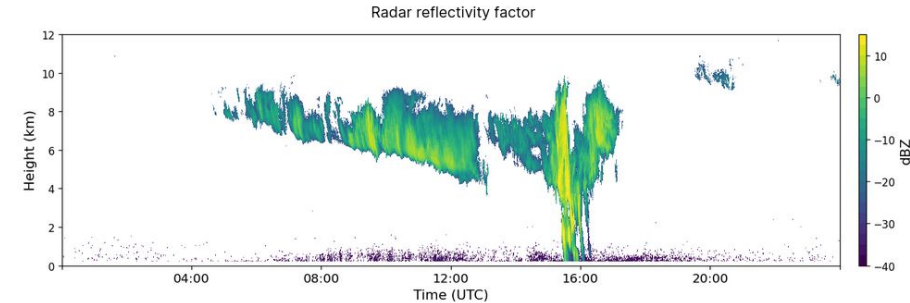
Only a single instrument is used in further processing. How to prioritise the different instruments and instrument types??

Visualisations for 19 September 2023

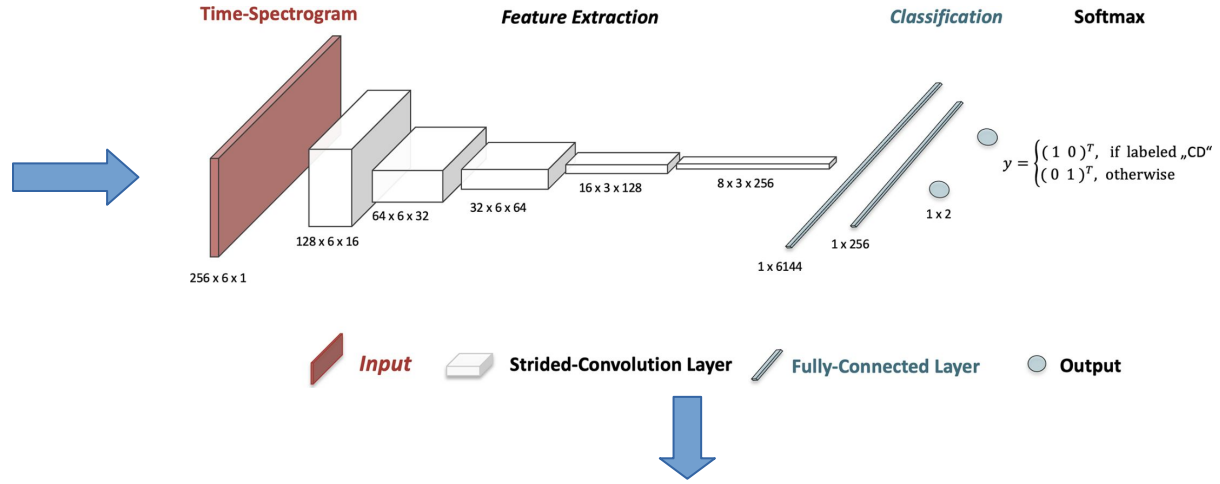
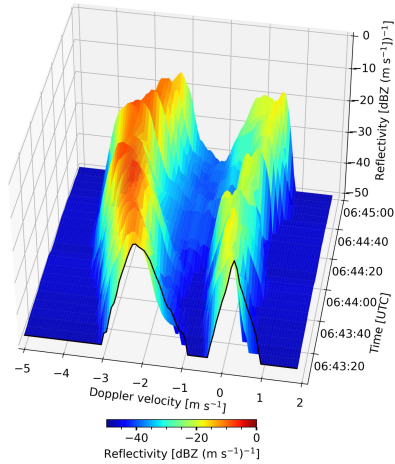
Bucharest MIRA-35 cloud radar [Vollatie](#)



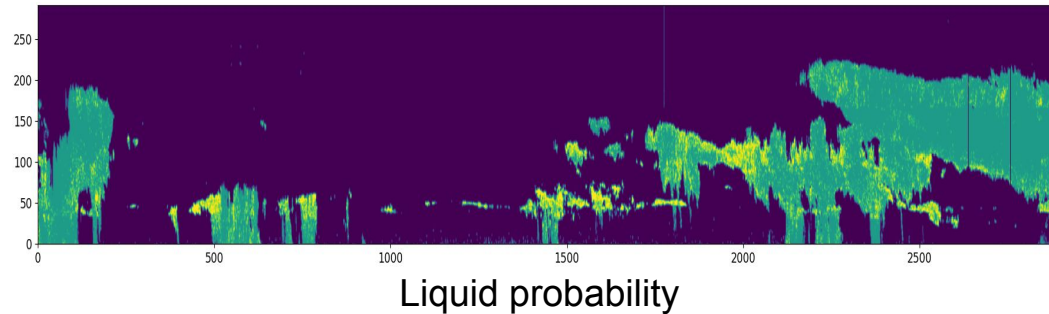
Bucharest RPG-FMCW-94 cloud radar [Vollatie](#)



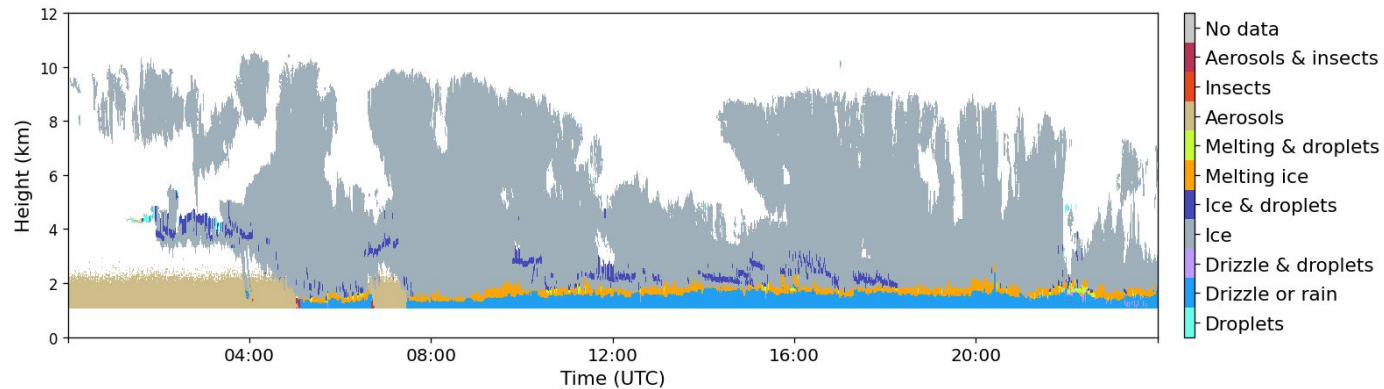
Voodoo – ML method for finding mixed-phase clouds



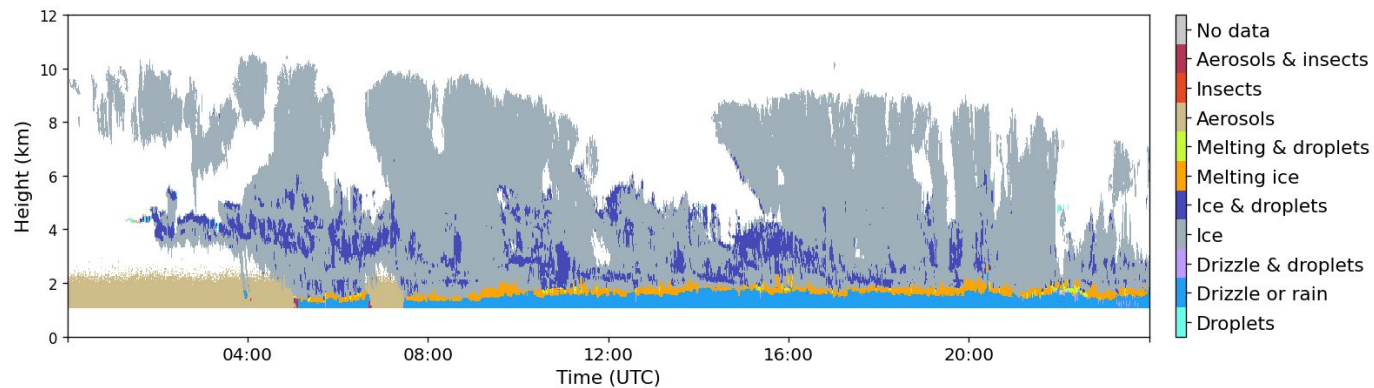
Schimmel et al. (2022). Identifying cloud droplets beyond lidar attenuation from vertically pointing cloud radar observations using artificial neural networks. *Atmos. Meas. Tech.*, 15(18), 5343-5366



Cloudnet classification



Voodoo classification



Disdrometer processing

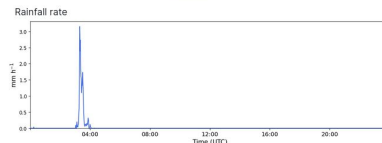
NRT data from 8-9 sites

Parsivel² has different file format for almost all sites:

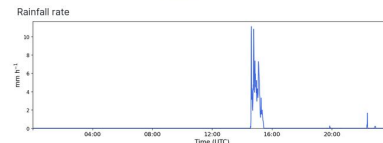
- Unspecified columns / data telegram
- Files with no timestamps
- Configuration changes without notice

We can manage for now but an effort to harmonise data logging and submission would simplify our work

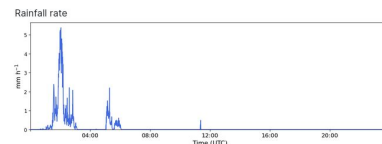
Granada Parsivel2 disdrometer of [volatie](#)



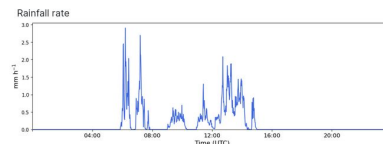
Jülich Parsivel2 disdrometer of [volatie](#)



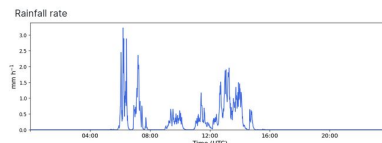
Leipzig Parsivel2 disdrometer of [volatie](#)



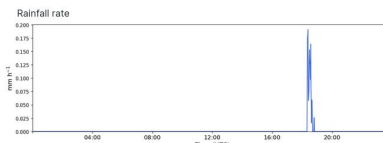
Lindenberg Parsivel2 disdrometer of [volatie](#)



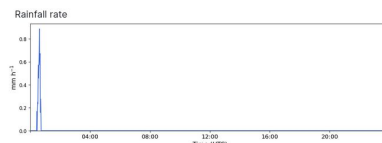
Lindenberg LNM disdrometer of [volatie](#)



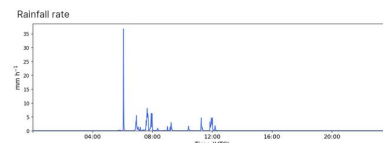
Norunda Parsivel2 disdrometer of [volatie](#)



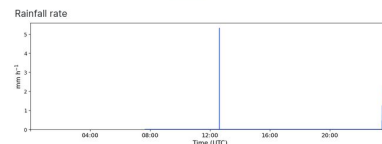
Ny-Ålesund Parsivel2 disdrometer of [volatie](#)



Palaiseau Parsivel2 disdrometer of [volatie](#)



Warsaw Parsivel2 disdrometer of [volatie](#)



Weather station

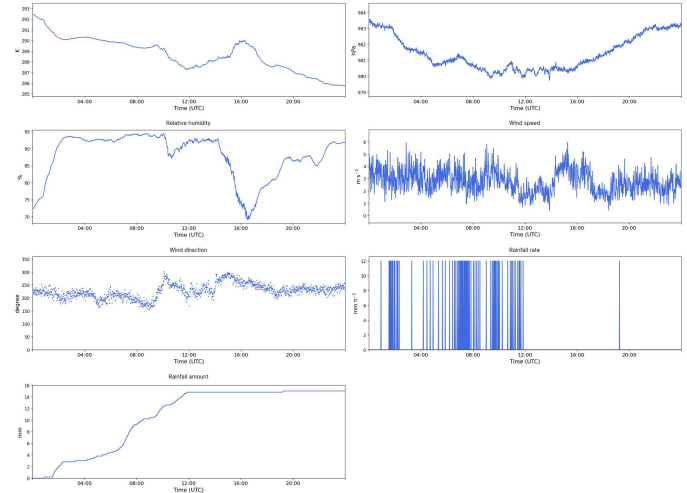
Currently we have some data in Palaiseau/SIRTA format.

We propose a common format for all sites:

<https://github.com/actris-cloudnet/cloudnetpy/blob/main/specs/weather-station.md>

Requires conversion of your data before submission to the Cloudnet data portal.

Palaiseau, 21 September 2023



Collection DOIs



- DOI is now assigned for collection of files (created when clicking “Download all” on search page)
- Simplifies data citation for researchers and allows better tracking of data usage

<https://doi.org/10.60656/aca60d45fe564093>

Data availability

The data used in this study are generated by the Aerosol, Clouds and Trace Gases Research Infrastructure (ACTRIS) and are available from the ACTRIS Data Centre using the following link: <https://doi.org/10.60656/aca60d45fe564093>.

Acknowledgements

We acknowledge ACTRIS and Finnish Meteorological Institute for providing the data set which is available for download from <https://cloudnet.fmi.fi>. Measurements were supported by the European Space Agency through the FRM4RADAR project (ESA Contract No. 4000122916/17/I-EF). The measurements at Norunda were also supported by ICOS Sweden. We acknowledge ECMWF for providing IFS model data.

Citation

Adam, M., Constantin, D., Delanoë, J., Dupont, J.-C., Eliasson, S., Kotthaus, S., Moisseev, D., Mölder, M., Navas Guzmán, F., O'Connor, E., Pfitzenmaier, L., Pirloagă, R., Pospichal, B., Rosu, A., Schween, J., Seifert, P., Țoancă, F., Unal, C., Walden, C., Zinner, T., Alados-Arboledas, L., Fomba, K., Haeffelin, M., Hyvärinen, A., Löhnert, U., Mayer, B., Petäjä, T., & Vasilescu, J. (2023). Custom collection of categorize, classification, disdrometer, drizzle, ice water content, and 5 other products from Bucharest, Chilbolton, Galați, Granada, Hyttiälä, and 11 other sites on 9 Aug 2023. ACTRIS Cloud remote sensing data centre unit (CLU). <https://doi.org/10.60656/aca60d45fe564093>

Citation

Currently the following people are included:

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

IS THIS SUFFICIENT??

Citation

BibTeX RIS

Kotthaus, S., Delanoë, J., Dupont, J. C., O'Connor, E., and Haeffelin, M. "Classification data from Palaiseau on 19 October 2022", ACTRIS Cloud remote sensing data centre unit (CLU), <https://cloudnet.fmi.fi/file/087c6b05-f4d0-4143-8a9d-ce7861cc53ab>, 2022

Lidar

Radar

MWR

Model

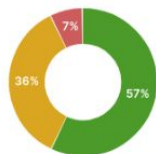
Site

Quality control

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

Evaluates the overall quality of a processed file:

- Metadata
- Data checks



Tests	Errors	Warnings	Info
14	1	5	0

Tested with CloudnetPy-QC v1.0.7 at 2022-10-01 16:16:51 UTC

Tests



Variables

Check that file contains required variables.

- Tw is missing.*
- model_time is missing.*
- q is missing.*
- v_sigma is missing.*
- rain_rate is missing.*



CF conventions

Test compliance with the CF metadata conventions.

Variable time: Use of the calendar and/or month_lengths attributes is recommended for time coordinate variables.



Data types

Check that variables have expected data types.

- Expected float32 but received int16 with variable numgates_zbeta.*
- Expected int32 but received int8 with variable category_bits.*
- Expected int32 but received int8 with variable quality_bits.*



Global attributes

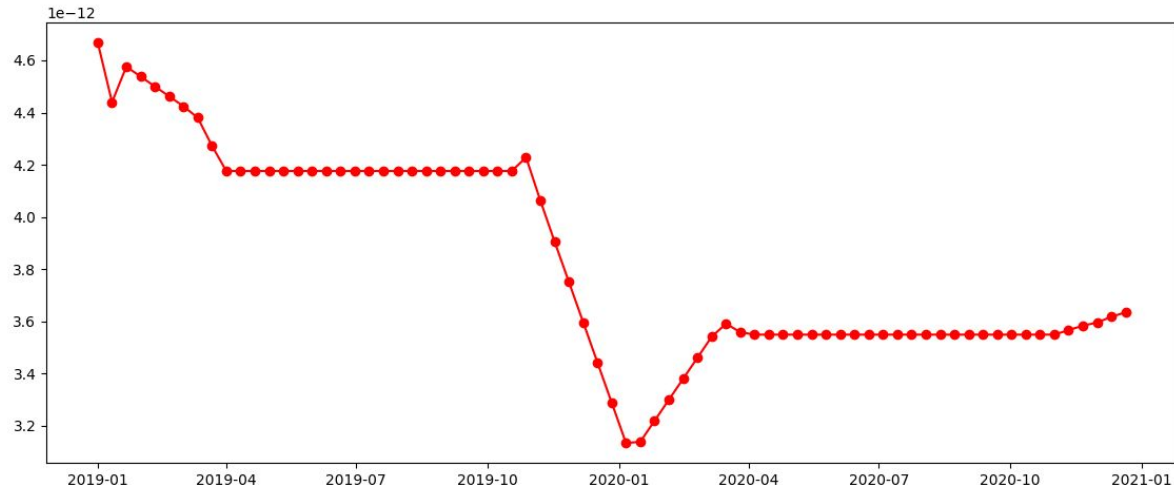
Check that file contains required global attributes.

ccloudnet_file_type is missing.

Calibration: current

Database and API (GET, POST) for calibration data.

TROPOS CHM 15k-x calibration factor



Calibration: next steps

- Build better architecture for calibration
- Discuss with domain experts and port their research code to operational use
- Start with ALC (Vaisala and Lufft ceilometers) and HATPRO with MWRpy

Future

- New Doppler lidar (HALO, WindCube) products
 - Winds, turbulence, ...
- Utilize new data:
 - MWRPy products
 - Disdrometer data
 - Weather station data
- (More) automated Level 2 product generation
- Proper calibration workflow
- Monitoring pages for raw data submission / processing status
- Dynamic plots
- Spectral processing
- AI / machine learning