New developments at CLU

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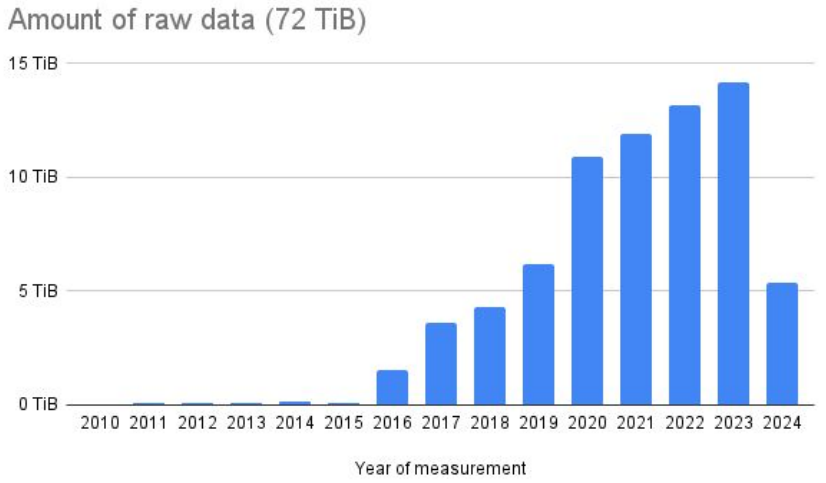
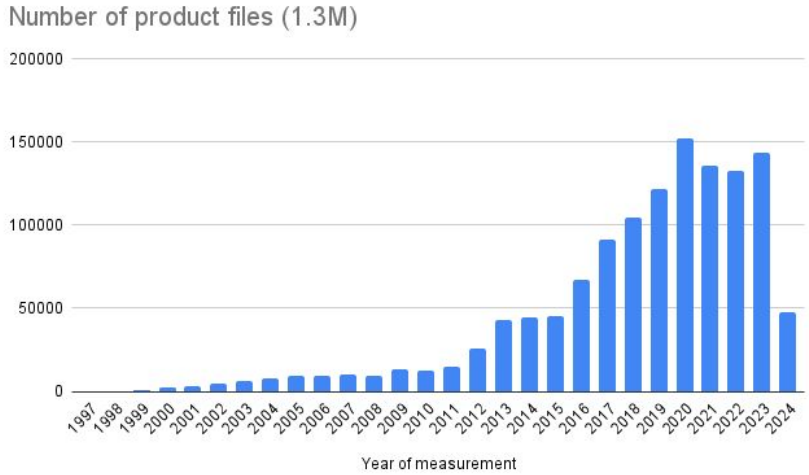
CCRES workshop 2024-06-11

Cloudnet data volume

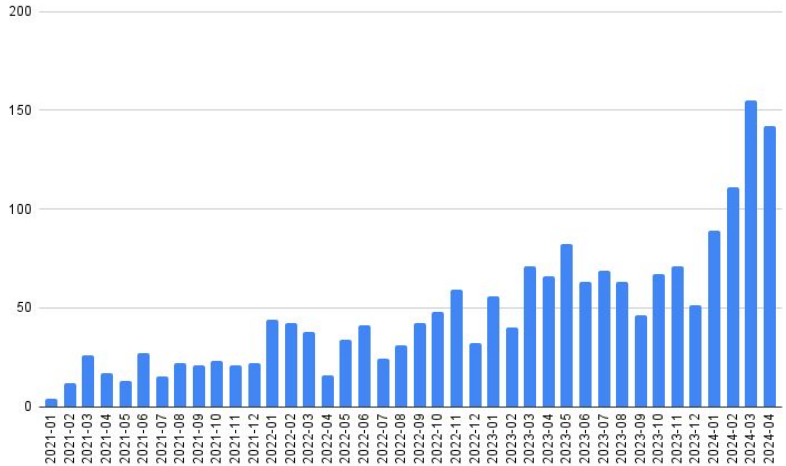
- ★ 1035 years of data
- ★ 1.3 M product files
- ★ 8.9 M raw files
- ★ 72 TiB of raw data
  (72% RPG *.LV0 files)



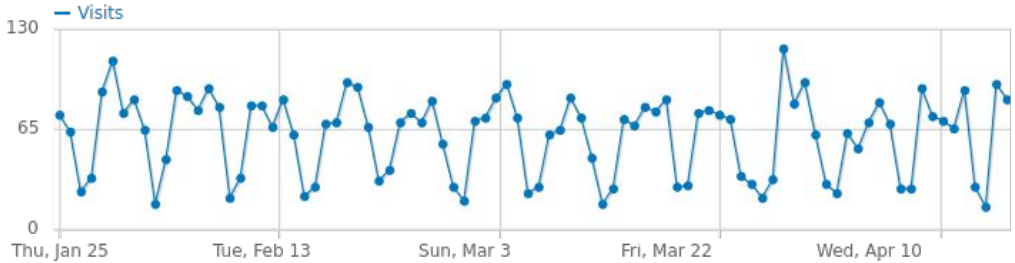


cloudnet.fmi.fi user statistics

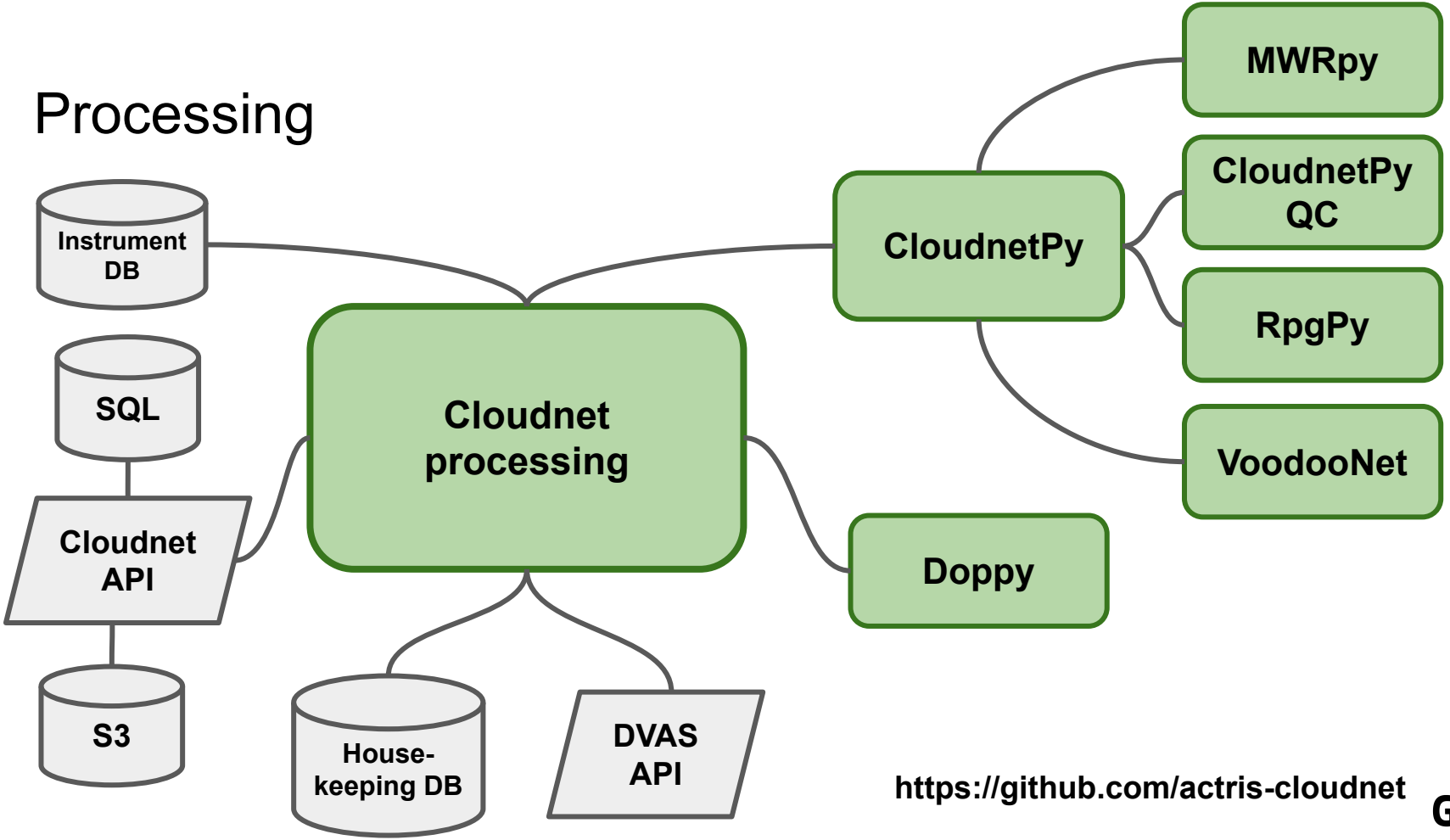
Monthly unique IPs downloading data



Daily data portal visits



Processing



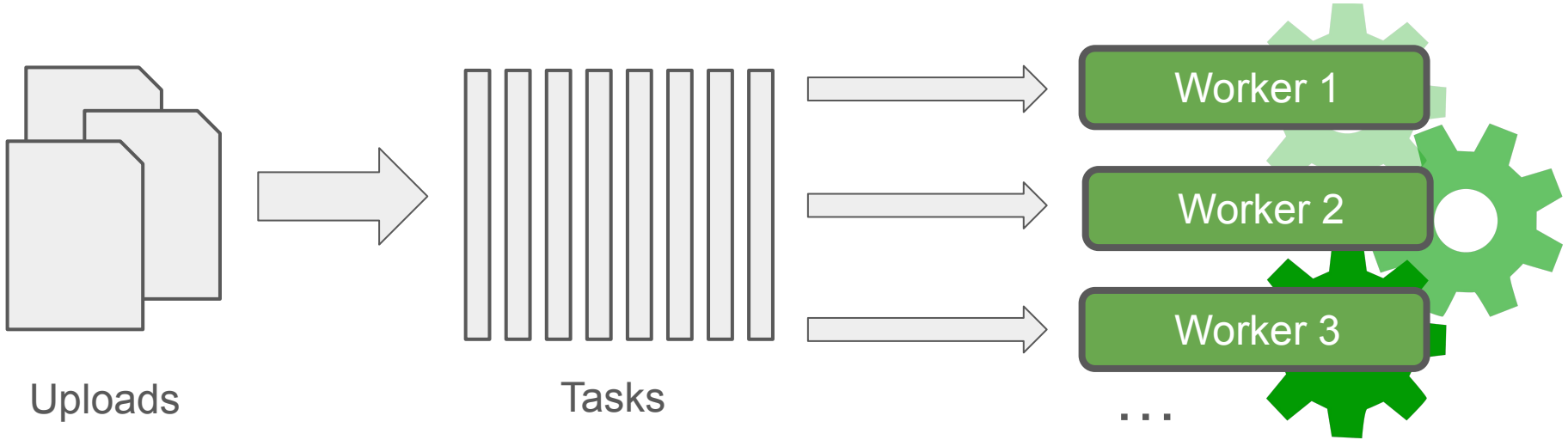
https://github.com/actris-cloudnet

GitHub

Processing queue

Move from cron jobs to queue/worker architecture.

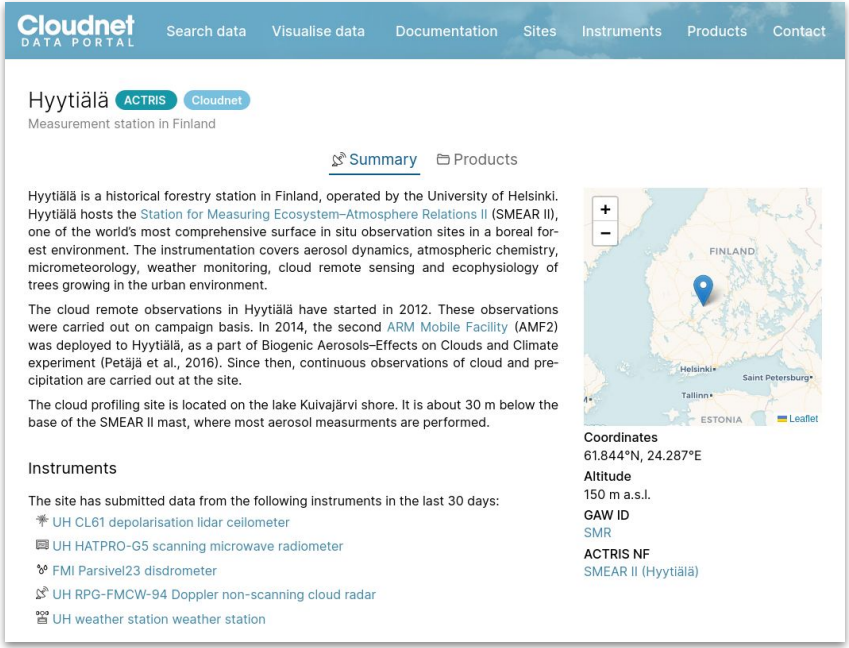
Processing is now more flexible and real-time.



Site page

New design for site landing page.

➔ We need descriptions for the sites! Should focus on the cloud remote sensing component, not the whole station or ACTRIS National Facility.



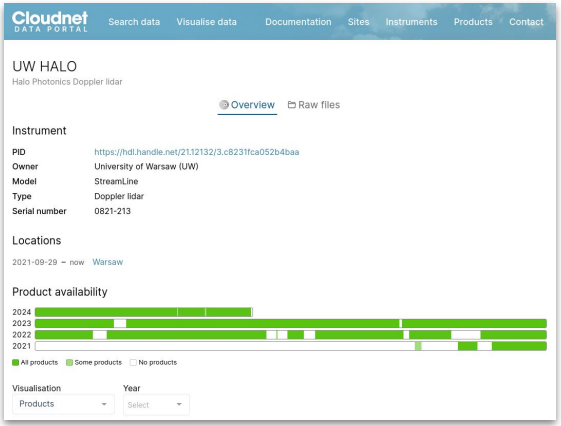
https://cloudnet.fmi.fi/sites

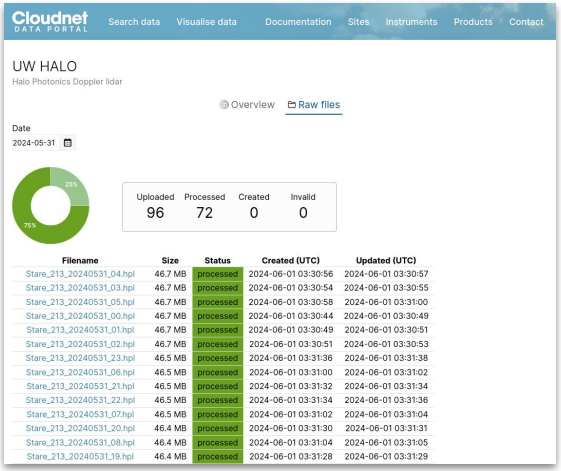
Instrument page

New page in the data portal for each instrument.

Visualise available products and status of submitted raw files.

Will replace PID landing page / InstrumentDB page in the future.



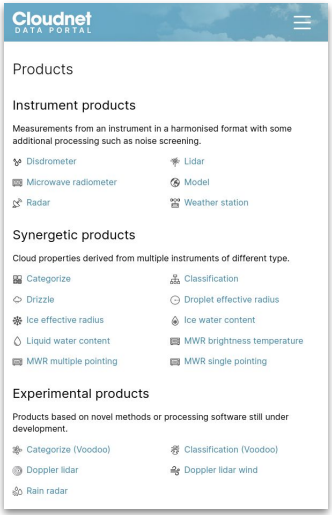


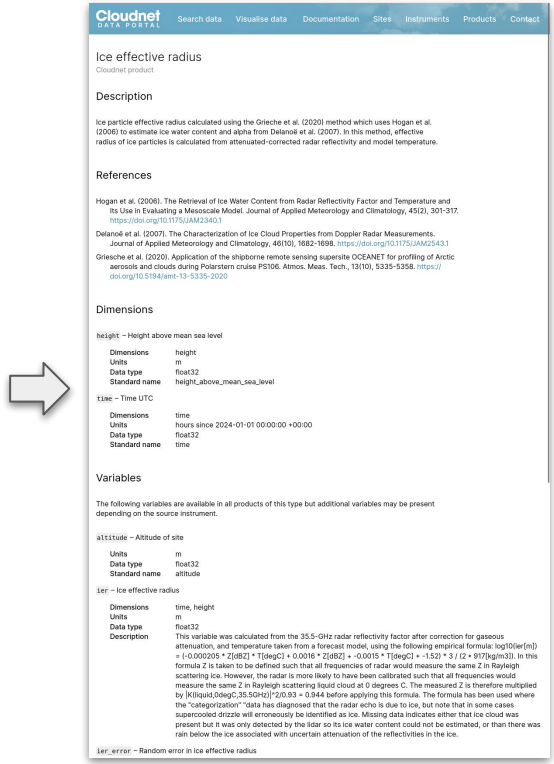
https://cloudnet.fmi.fi/instruments

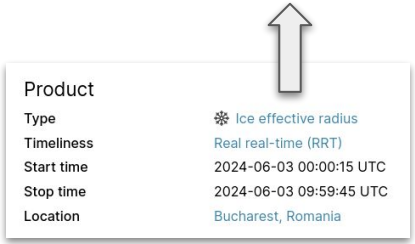
Product page

Online documentation on available products in the portal:

- Description
- References
- Dimensions
- Variables







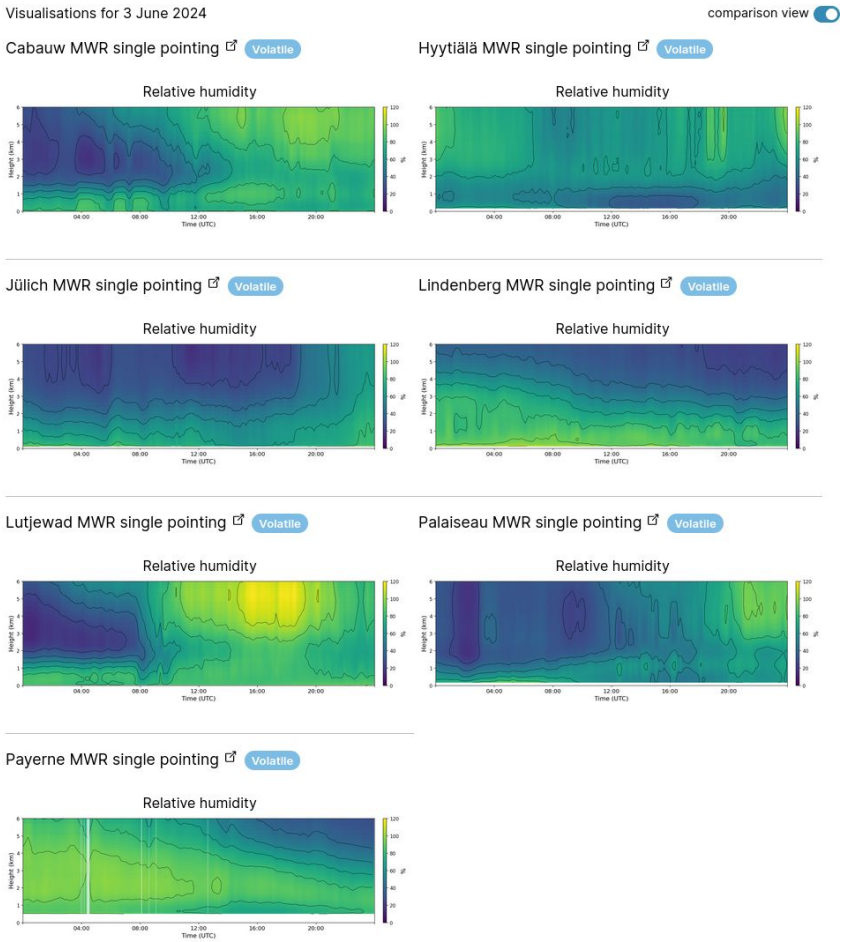
https://cloudnet.fmi.fi/products

MWRpy

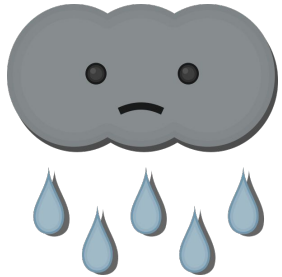
MWRpy products are now available in 7/20 sites.

➔ Sites need to send retrieval coefficients to us!

https://github.com/actris-cloudnet/mwrpy



Weather station?



5 weather stations, 5 file formats 26+ sites, 26+ formats?

- Unclear fields, wrong units, typos, local time, different resolutions, measurements at multiple heights, multiple rain gauges, …

What fields are needed? Can we agree on a common file format?

```
"TOA5","CR1000XSeries","CR1000X","23644","CR1000X.Std.05.01","CPU:AGORA_UGR.CR1X","54351","meteo"
"TIMESTAMP","RECORD","air_t_Avg","rh_Avg","pressure_Avg","wind_speed_avg","wind_dir_avg","wind_dir_std","
rain_Tot"
"TS","RN","degC","%","hPa","m/s","Deg","Deg","mm"
"","","Avg","Avg","Avg","WVc","WVc","WVc","Tot"
"2024-04-21 00:00:00",5319,12.7,100,937.7554,0,0,0,0
```

```
# y m d  minute AaRNRT/mm AaNRT/mm BaRT/mm BaNRT/mm AbRNRT/mm AbNRT/mm BbRT/mm BbNRT/mm
Pa/kPa Ta/dsC RH/pcnt WD/ds WS/(m/s)
2024  5 23    0          0.000      0.000  477.938  477.945    0.000      0.000  984.585  984.596 100.86
5.50  87.00 155.35   0.39
```

```
"Read time (UTC+2)","Temp 2m (C)","Humidity 2m (%)","Temp 10m (C)","Temp 20m (C)","Temp -5cm (C)","Dew
point temp (C)","Wind speed (m/s)","Wind speed max/3h (m/s)","Wind speed 10min (m/s)","Wind dir (deg)","Wind
dir 10min (deg)","Pressure (hPa)","Pressure s.l. (hPa)","PPFD (umol/m2s)","Error  code 1 (code)","Error  code 2
(code)","Snow depth (cm)","Humidity 20.6m (%)","Cloud base height (10m)","Cloud layer1 height (10m)","Layer1
cloudiness (1/8)","Cloud layer2 height (10m)","Layer2 cloudiness (1/8)","Cloud layer3 height (10m)","Layer3
cloudiness (1/8)","Precipitation (?)"
2024-05-22 00:10:00,-0.8,61,1.7,1.8,0.6,-7.4,1.2,1.5,1.1,61,53,9830,10271,6.0,,,37,48,416,389,4,582,7,,0,0.0
```

```
# Date created : 2024-05-28
# Version : 01
# File contains 1-min average standard ground weather data calculated from 5s wind data (speed and direction) at 10 m AGL
# and from 5s weather data (temperature, humidity, pressure, precipitation) all at 2 m AGL from meteoairsol station
# Location : SIRTA (48.7N, 2.2E), zone 1
# Created by : Christophe Boitel
# For information concerning those files, contact email : sirtascience (at) ipsl.polytechnique.fr
#
# Col. 1 : Date Time (yyyy-mm-ddThh:mm:ssZ)
# Col. 2 : Wind speed (m/s)
# Col. 3 : Wind direction (degres)
# Col. 4 : Air temperature (°C)
# Col. 5 : Relative humidity (%)
# Col. 6 : Pressure (hPa)
# Col. 7 : Precipitation rate (mm/min)
# Col. 8 : 24-hr cumulated precipitation since 00UT (mm)
#
#              01          02          03          04          05          06          07          08
#
2024-05-27T00:00:00Z    0.00         nan   13.04   86.69  999.940.00         0.00
```

Multiple instruments

Which instruments to select in synergetic products?

- Prioritise ACTRIS labelled instruments?
- How to choose between instruments of same type?
- What if data is missing?

Example from Lindenberg:

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

Microwave radiometer
- RPG HATPRO-G5
- Radiometrics MP-3000A

Cloud radar
- METEK MIRA-35
- RPG-FMCW-94-DP

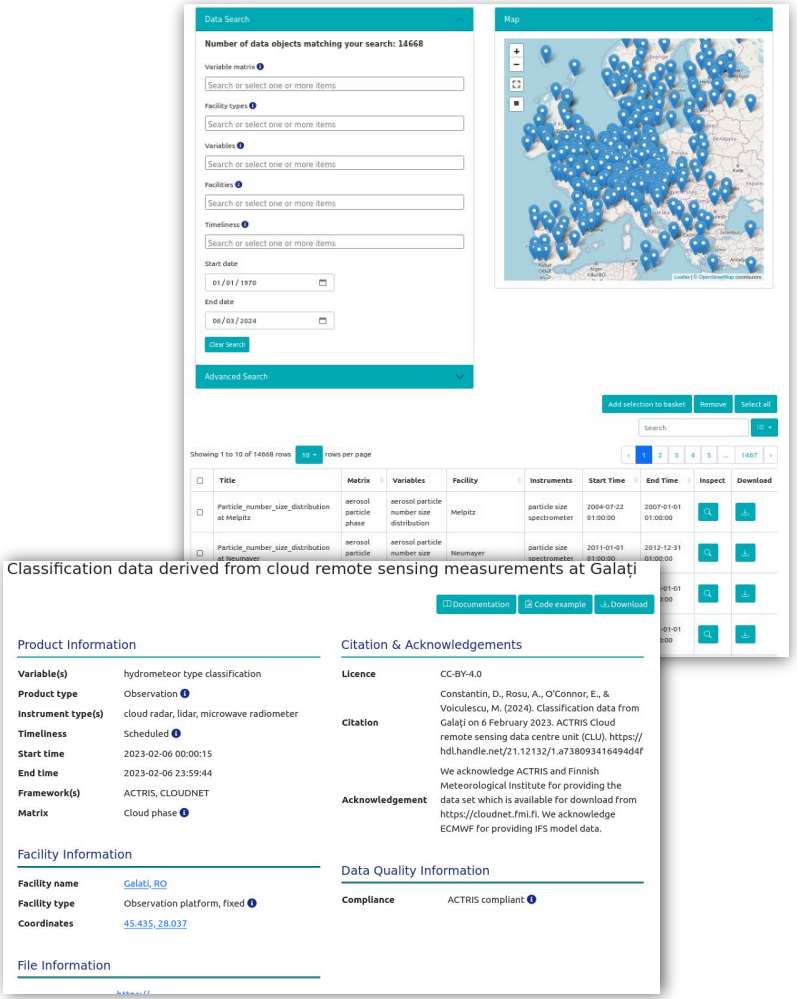
Disdrometer
- OTT Parsivel²
- Thies LPM

Upcoming ACTRIS data portal

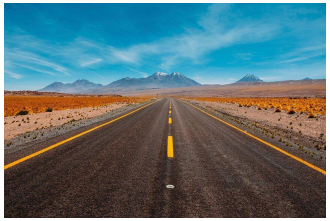
Developed by NILU.

Search Cloudnet data alongside other ACTRIS data.

Release is scheduled Autumn 2024.

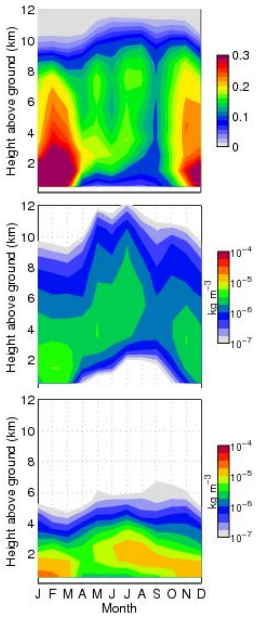


Roadmap for future developments



- Level 3 / model evaluation

Seasonal / diurnal composites

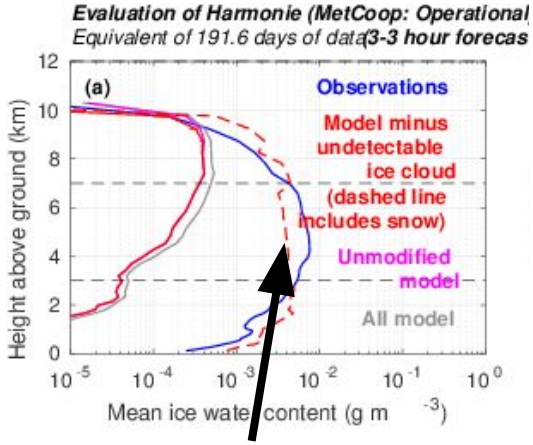


Cloud fraction

IWC

LWC

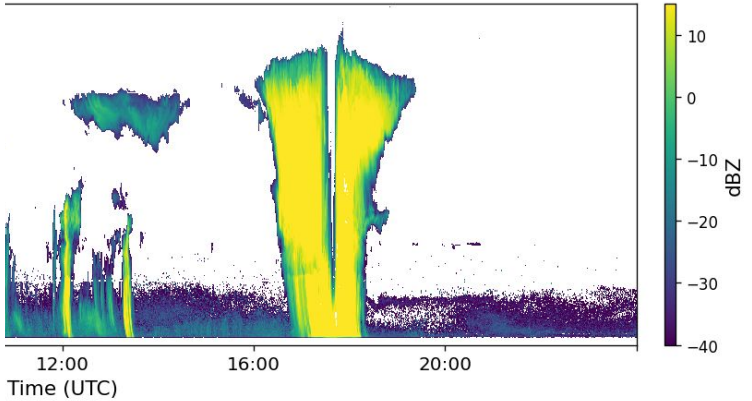
Model evaluation

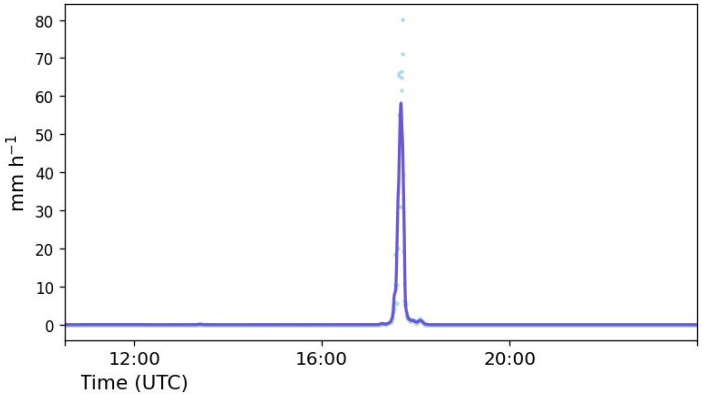


Mean ice water content also compares quite well at all levels, if snow and graupel included.

Roadmap for future developments

- Improved methods
  - Target categorization updates
  - ML target categorization
- New classification ‘bits’ for attenuation
  - Rain
    - disdrometer at surface and rain-reflectivity retrieval (Mom and Moisseev)
  - Melting level
    - retrieval in testing (Li and Moisseev, 2019)
  - Radome
    - blower, sky noise
  - Flag complete attenuation





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 in production
- Landing pages for campaigns? Now we only have “campaign sites”.
- Multiple instrument combinations on the same site (e.g. to generate multiple classification products)