

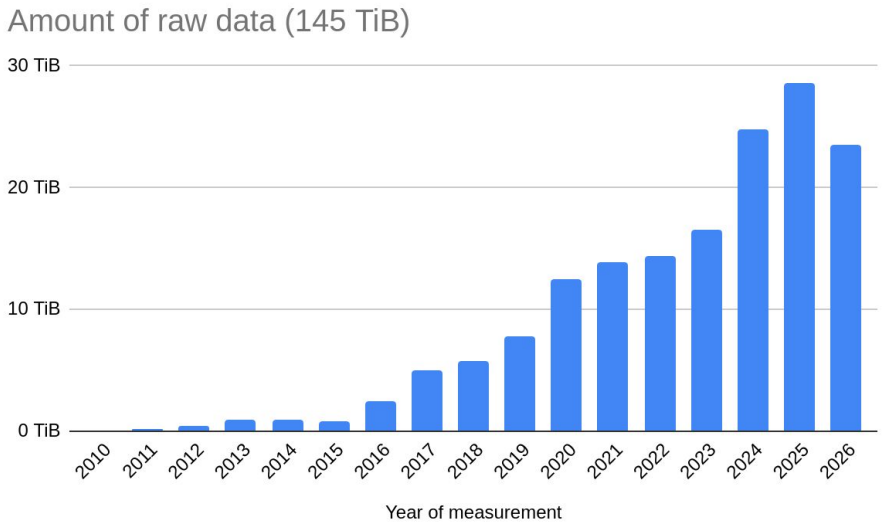
ACTRIS
CCRES

Latest developments at CLU

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

CCRES/CLU Spring Workshop, online, 1st and 2d of June 2026

cloudnet.fmi.fi statistics



Year	Visits
2026	28,177
2025	30,100
2024	21,963
2023	828

Year	Downloads
2026	11,184,252
2025	8,089,709
2024	2,917,352
2023	830,083
2022	273,799
2021	240,008

Year	Unique IPs
2026	11,695
2025	2,788
2024	1,710
2023	495
2022	302
2021	159

2026

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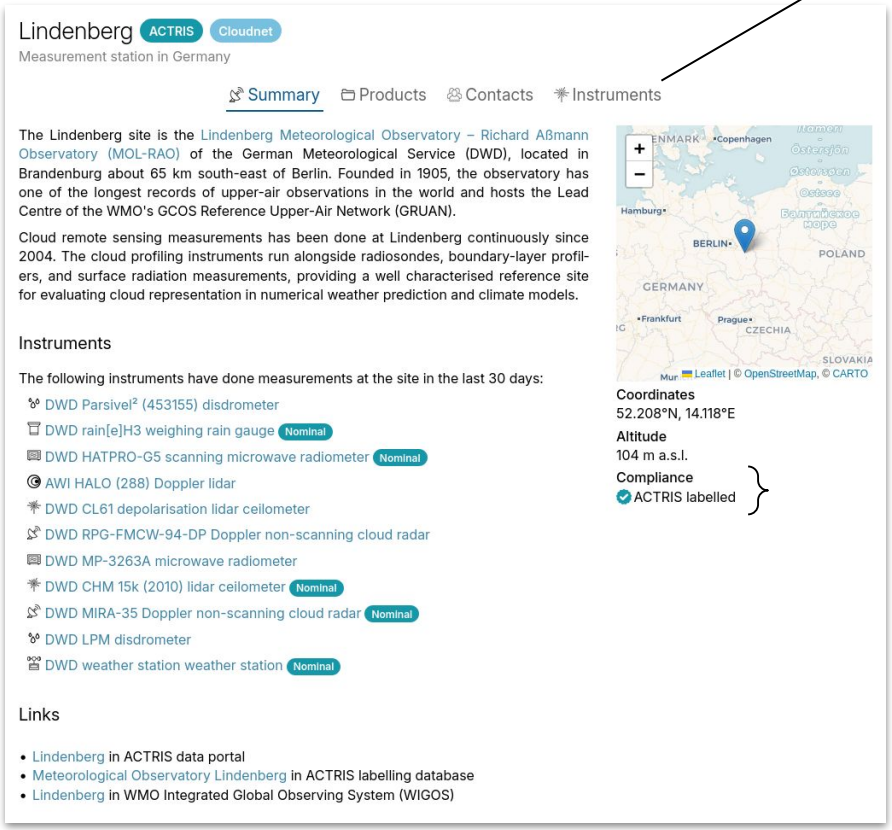
Lochmann, M., Haest, B., Vogl, T., van Klink, R., Addison, F. I., Maahn, M., Schimmel, W., Wirth, C., Quaas, J., & Kalesse-Los, H. (2026). Derivation of Aerial Insect Concentration With Triple Frequency Cloud Radar Observations. *IEEE Trans. Geosci. Remote Sensing*, *64*, 4109614–4109614. https://doi.org/10.1109/TGRS.2026.3709607

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https://cloudnet.fmi.fi/publications

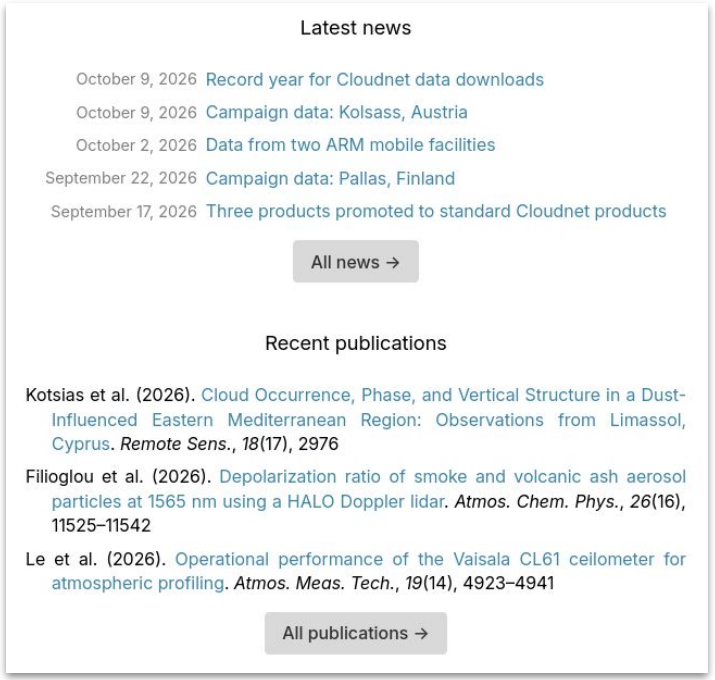
GUI updates

- Nominal instruments tab
- News & recent publications
- Site page improvements
- Optimizations



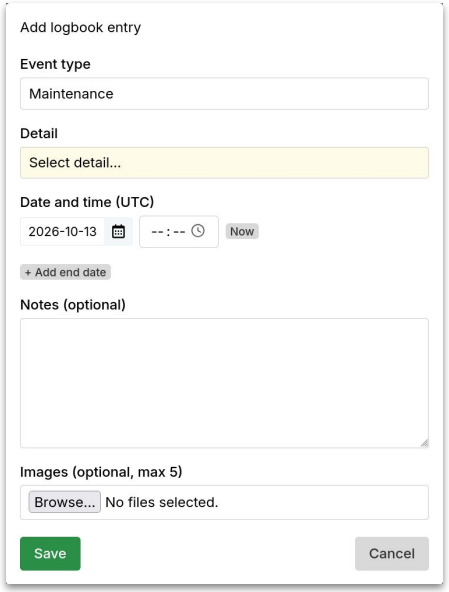
Nominal instruments

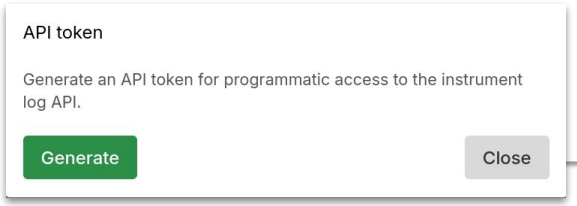
Microwave radiometer		
DWD HATPRO-G5 003 0193 Current	2022-02-25	now
DWD HATPRO-G5 003 0126	2020-01-05	2022-02-24
DWD MP-3263A 3263A	2018-08-10	2020-01-04
DWD MP-3039A 3039A	2016-12-20	2018-08-09
DWD TP/WVP-3001	2007-07-01	2016-12-19
DWD WVR-1100	2004-04-01	2007-06-30



Logbook

- GUI + API
- Structured / free text
- Images
- 896 log entries so far





DWD MIRA-35

METEK MIRA-35 cloud radar

Overview | Raw files | Calibration | Contacts | Logbook

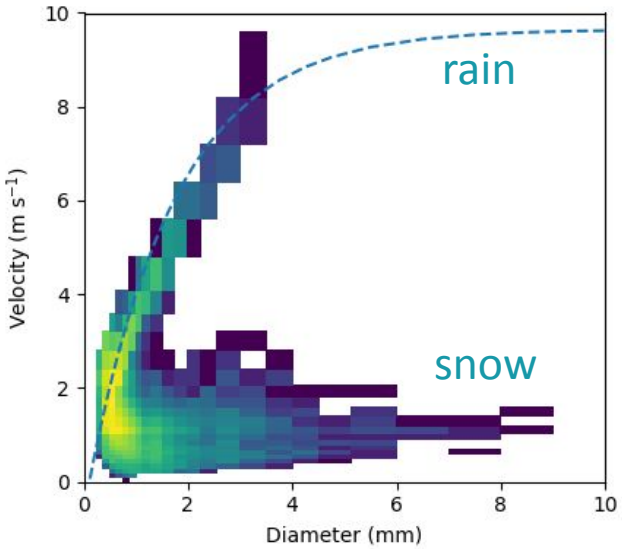
Add entry

Date (UTC) ▼	Event type	Result	Notes	Added by	
2026-07-12 22:30	Note	–	until 2026-07-13 interference signals up to approx. 1200 m altitude due to drone flights in the immediate vicinity at 15 to 45-minute intervals	ulrich-goersdorf	Edit Delete
2026-03-25	Note	–	same as on 24 March between 12 and 16 UTC	ulrich-goersdorf	Edit Delete
2026-03-24	Note	–	Due to a bug in the spectrum processing software (spectrenprocessing), processing was interrupted several times between 10 and 16 UTC. The error occurred in connection with drone flights taking place in the immediate vicinity. These caused unusually broad Doppler spectra, which led to the programme crashing. The bug was fixed by the manufacturer on 25 March. The Doppler spectra were subsequently reprocessed and uploaded to CLU.	ulrich-goersdorf	Edit Delete
2026-03-17 08:30	Note	–	Troubleshooting of a fault with LO1 by Metek (M. Bauer); probable cause: a small foreign object in the SMA connector of the cable running from the synthesiser to LO1 (VCO); measurements interrupted from approximately 08:30 to 15:00 UTC	ulrich-goersdorf	Edit Delete
2026-03-16 10:00	Malfunction	–	until 16:00 UTC, insufficient frequency stability of LO1 (error message: pinLOCK_LO1), no or wrong data, details see 12.03.2026	ulrich-goersdorf	Edit Delete
2026-03-12 00:01	Malfunction	–	until 13:00 UTC, insufficient frequency stability of LO1 (error message: pinLOCK_LO1), AFC can no longer adjust frequency deviation, no or wrong data	ulrich-goersdorf	Edit Delete
2026-03-11 12:00	Malfunction	–	until 24:00 UTC, insufficient frequency stability of LO1 (error message: pinLOCK_LO1), no or wrong data, details see 12.03.2026	ulrich-goersdorf	Edit Delete
2026-02-25 10:30	Note	–	Until 23 UTC, interference signals up to approx. 1200 m altitude due to drone flights in the immediate vicinity at 15 to 45-minute intervals, see figures	ulrich-goersdorf	Edit Delete
2026-02-24 17:00	Malfunction	–	insufficient frequency stability of LO1 (error message: pinLOCK_LO1), no or wrong data, details see 12.03.2026	ulrich-goersdorf	Edit Delete

Disdrometer processing

- Real-time data from 25 disdrometers, 45 in total
- Now rainfall rate, particle size distribution and visibility are retrieved from raw spectra in harmonized fashion
- Distinguishing rain from other precipitation could be improved

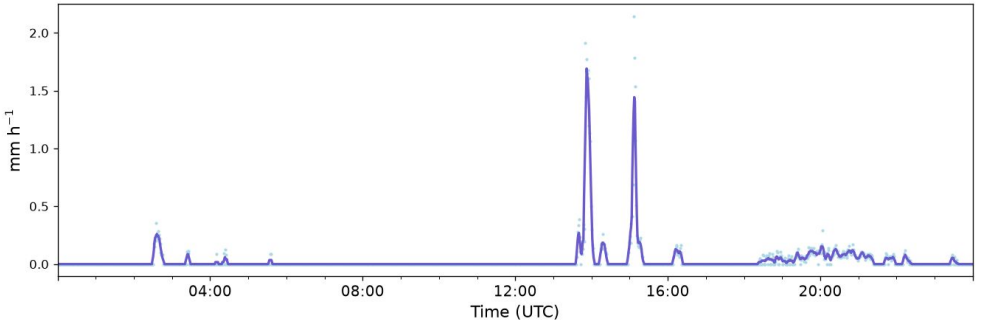
Raw data (24h)



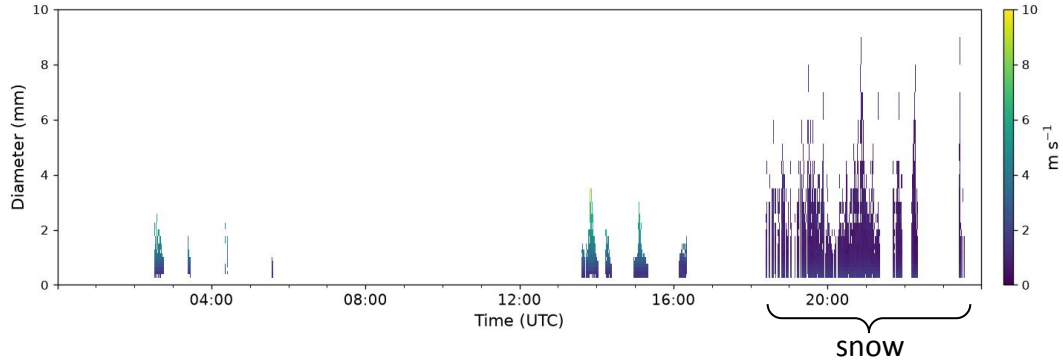
Ny-Ålesund

2026-09-21

Rainfall rate



Average velocity by diameter

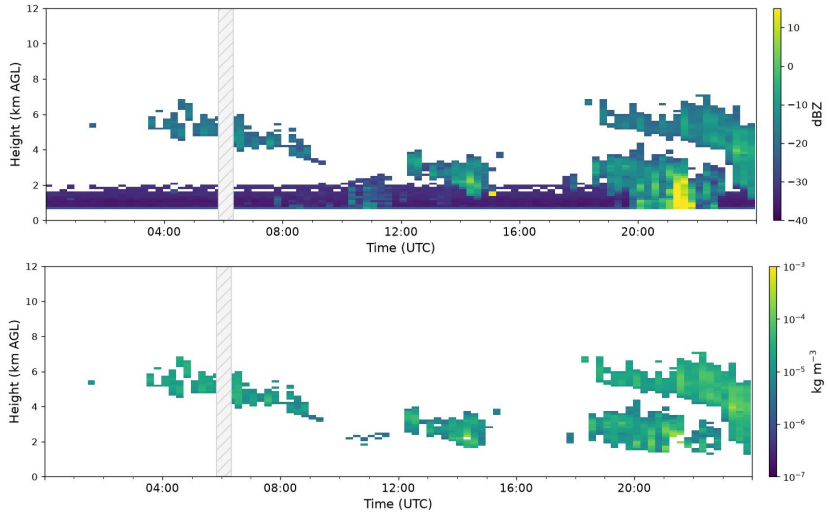


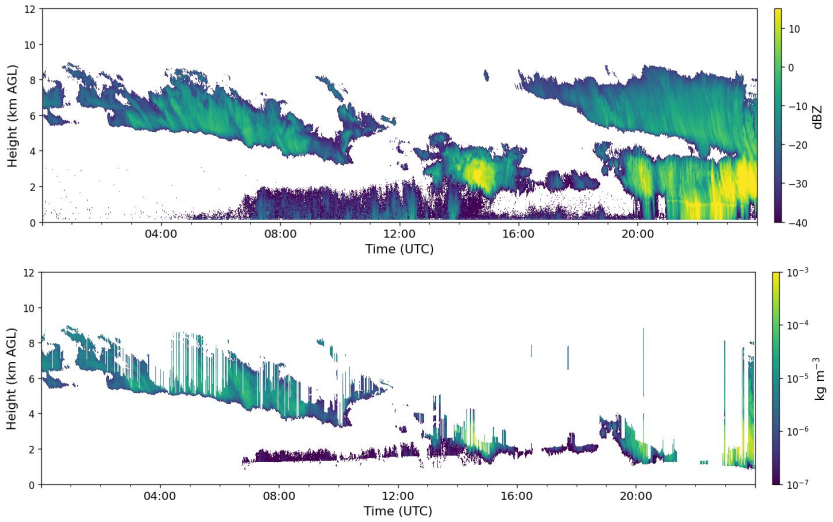
IWC from weather radar

Experimental

Z

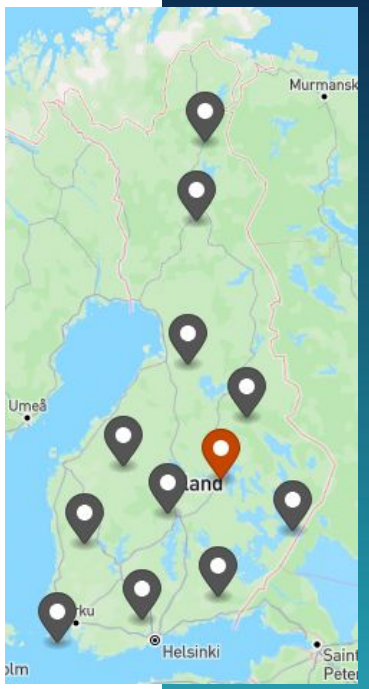
IWC





Rytky weather radar
(5.6 GHz)

Vehmasmäki cloud radar
(35.5 GHz)

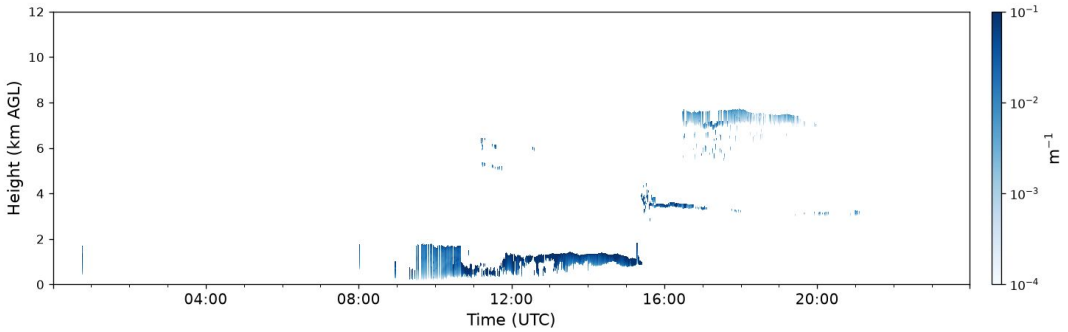


- Data from 12 Finnish weather radars
- Weather radars are scheduled for a vertical birdbath scan every 15 min for ZDR calibration

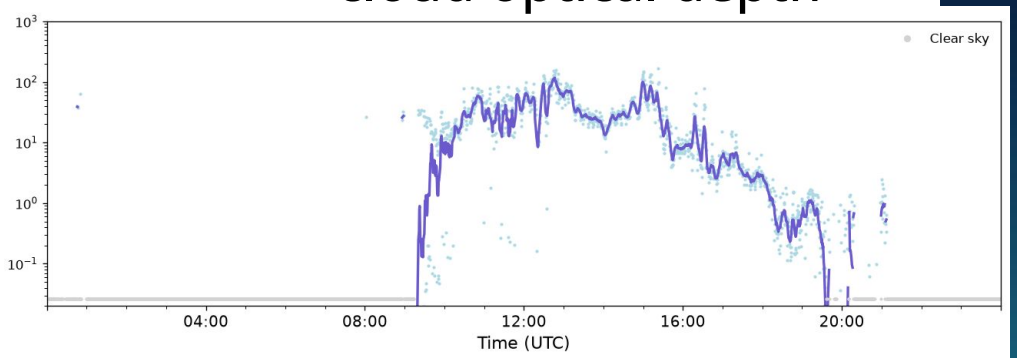
Cloud Optical Depth

Experimental

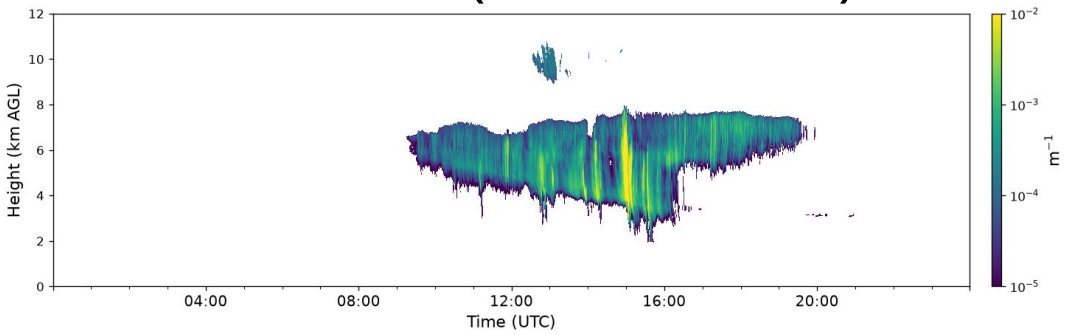
liquid extinction (from lwc & der)



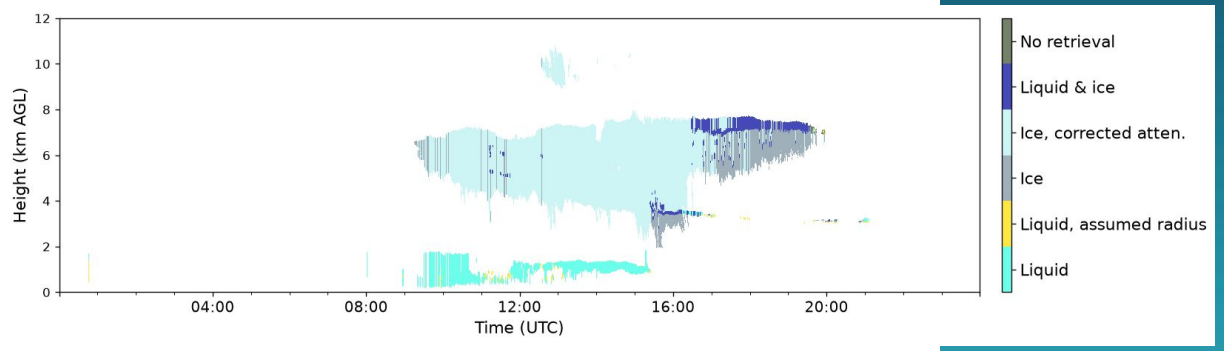
cloud optical depth



ice extinction (from iwc & ier)



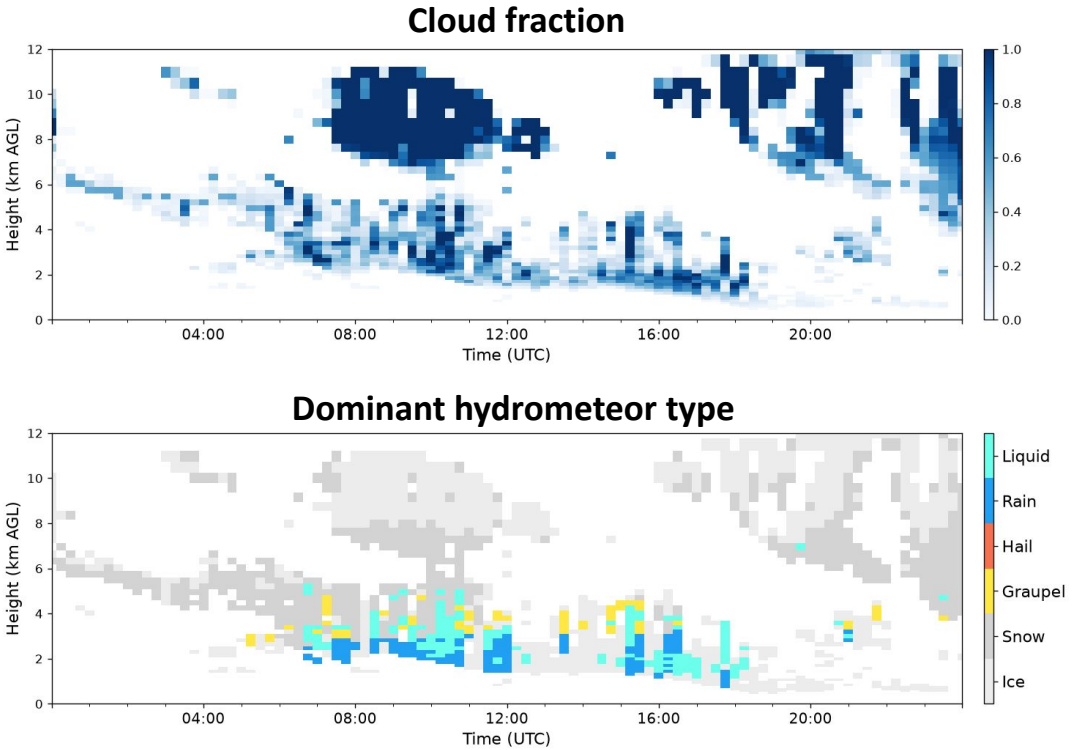
retrieval status



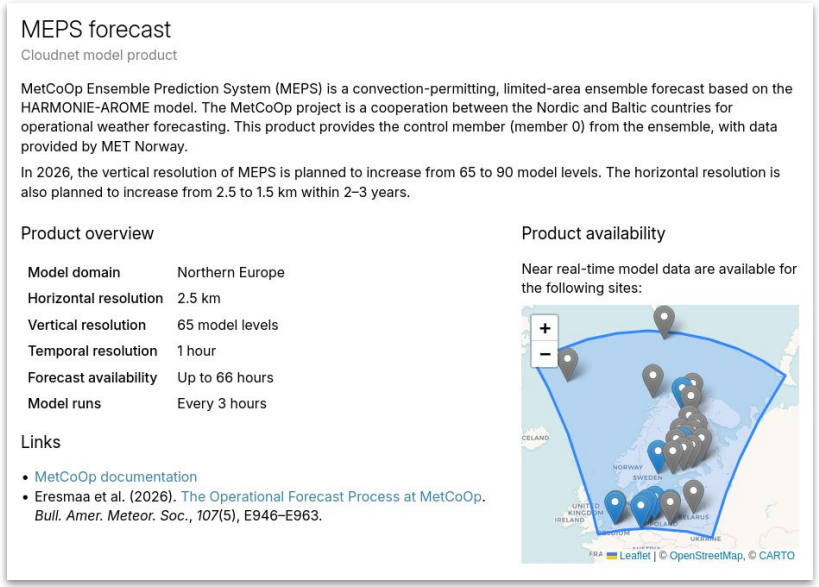
- der: valid range 2 to 50 μm, otherwise 10 μm assumed
- MWR LWP > 2 * adiabatic LWP ⟶ missing liquid, flag the profile

Model improvements

- New models: ARPEGE, AROME, AROME-Arctic, MEPS, ICON-D2
- Model documentation page
- Dominant hydrometeor type plot



Lindenberg 2026-09-03 (ICON-D2)



MEPS forecast

Cloudnet model product

MetCoOp Ensemble Prediction System (MEPS) is a convection-permitting, limited-area ensemble forecast based on the HARMONIE-AROME model. The MetCoOp project is a cooperation between the Nordic and Baltic countries for operational weather forecasting. This product provides the control member (member 0) from the ensemble, with data provided by MET Norway.

In 2026, the vertical resolution of MEPS is planned to increase from 65 to 90 model levels. The horizontal resolution is also planned to increase from 2.5 to 1.5 km within 2–3 years.

Product overview

Model domain	Northern Europe
Horizontal resolution	2.5 km
Vertical resolution	65 model levels
Temporal resolution	1 hour
Forecast availability	Up to 66 hours
Model runs	Every 3 hours

Links

- MetCoOp documentation
- Eresmaa et al. (2026). The Operational Forecast Process at MetCoOp. *Bull. Amer. Meteor. Soc.*, *107*(5), E946–E963.

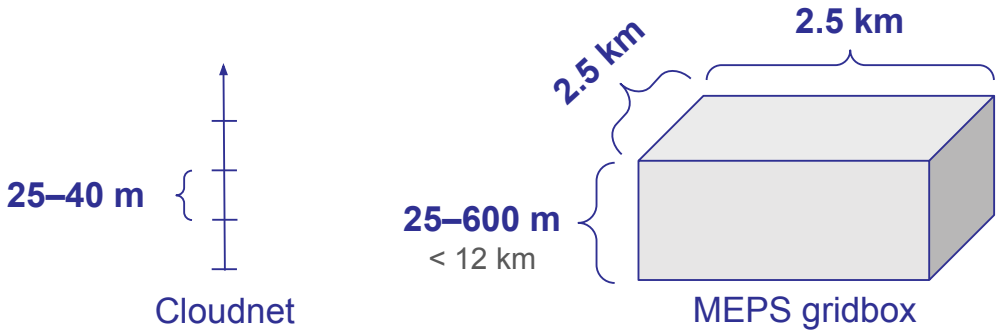
Product availability

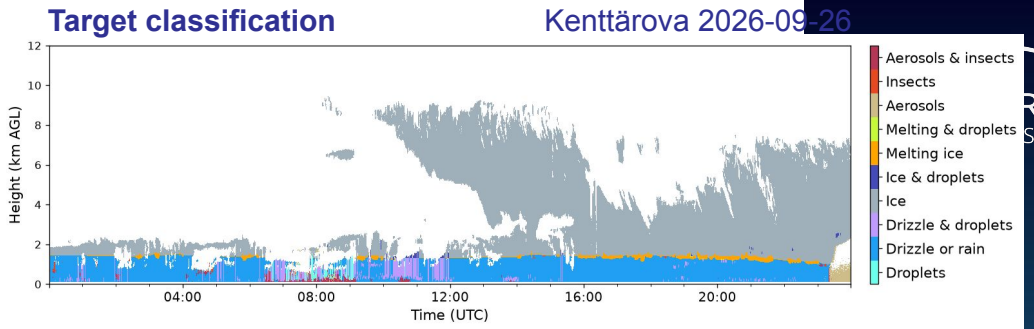
Near real-time model data are available for the following sites:

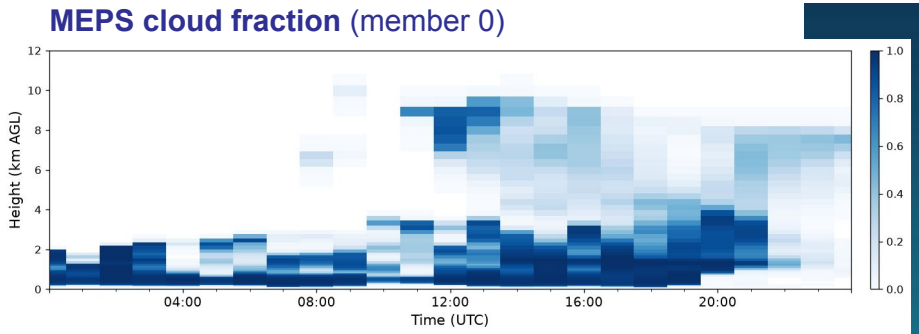
https://cloudnet.fmi.fi/model/meps

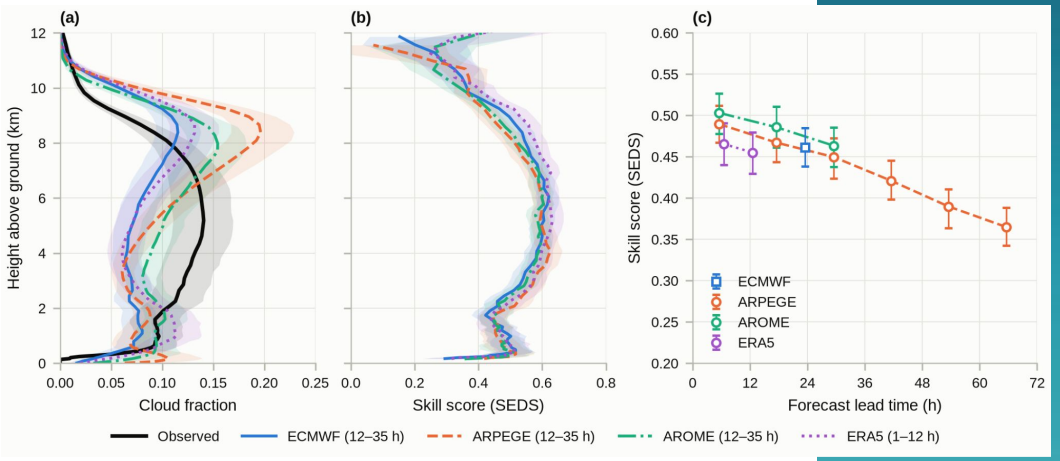
Model evaluation

1. Downsample observations to model time and height grid
2. Screen out model data below instrument sensitivity
3. Compute skill score









Model cloud fraction vs Cloudnet observations at Palaiseau in 2025

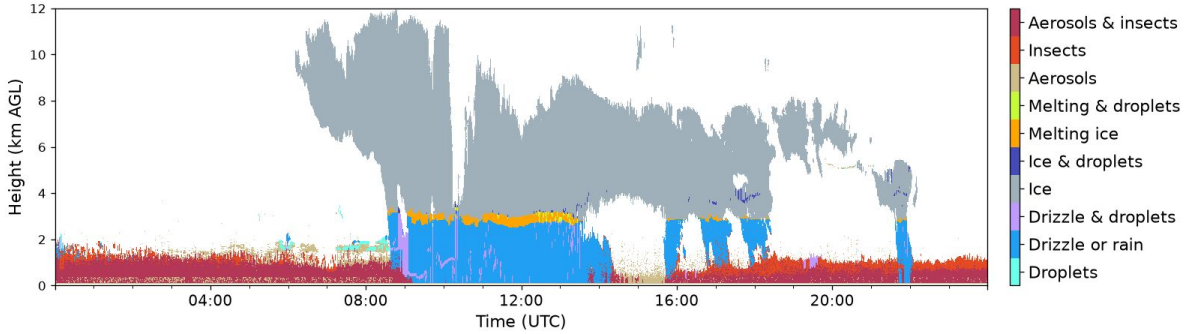
Brooks et al. (2005) https://doi.org/10.1175/JAS3467.1
Hogan et al. (2009) https://doi.org/10.1002/qj.481
McCusker et al. (2023) https://doi.org/10.5194/acp-23-4819-2023

ARM data

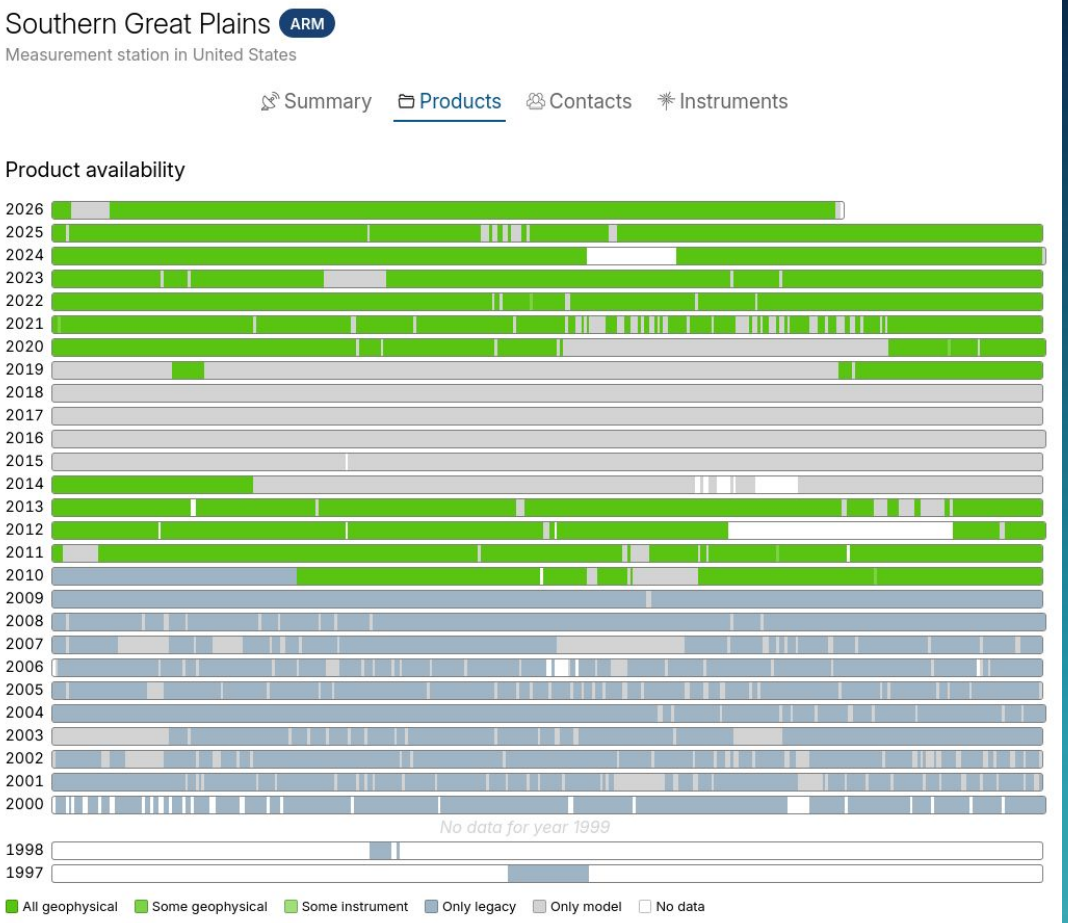
ARM support added to CloudnetPy
➔ Requires ARM Live API credentials!

NRT data from:

- Southern Great Plains, USA
- North Slope of Alaska, USA
- Graciosa, Azores
- Bankhead National Forest, USA (mobile)
- Phoenix, USA (mobile)



SGP 2026-05-23



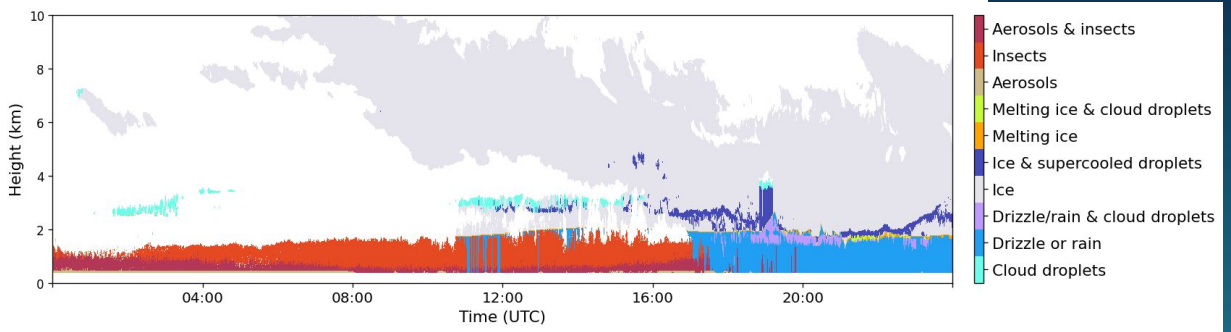
Lindenberg reprocessing

- Reprocessed 20+ years of data from Lindenberg, including legacy products from raw data
- Some corrections may be missing for old instruments…
- Few other sites have legacy data… may require some work…

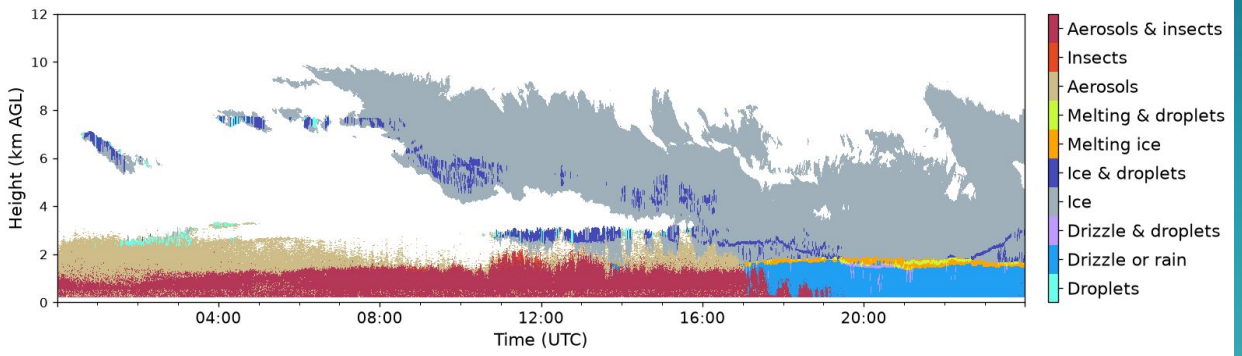


Lindenberg 2008-04-28

(processed in 2008)



(reprocessed in 2026)



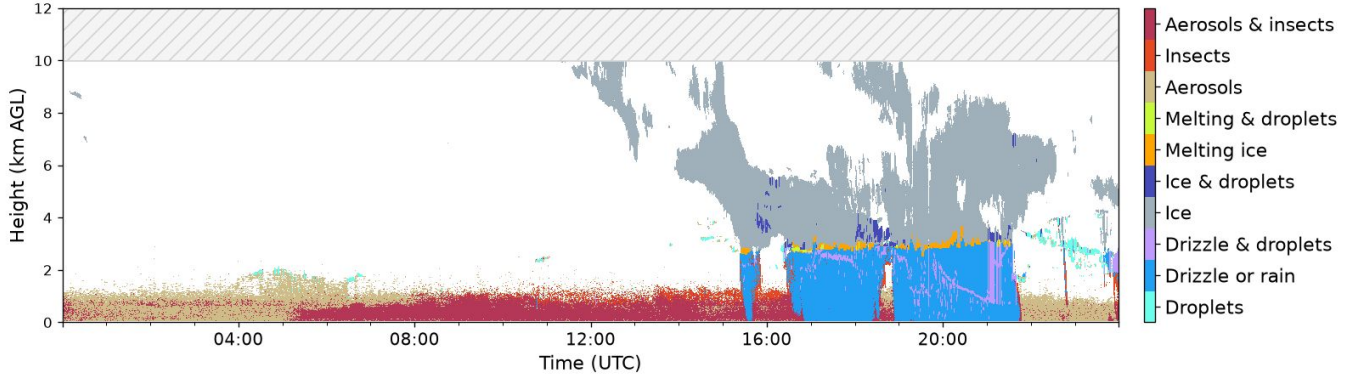
Mobile facilities

NEW

KIT

KLOCX

Kappelrodeck, Germany
2026-10-07

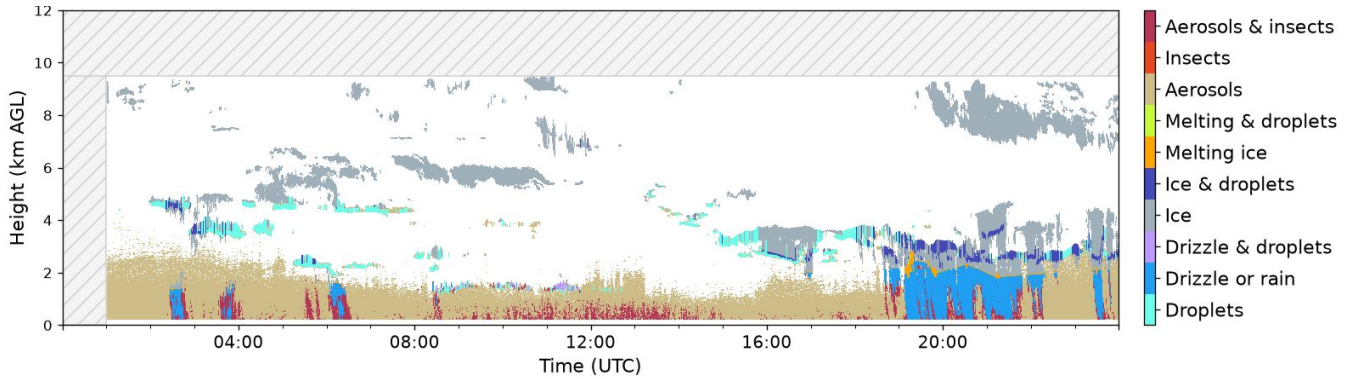


NEW

GAMB²LE

AURORA

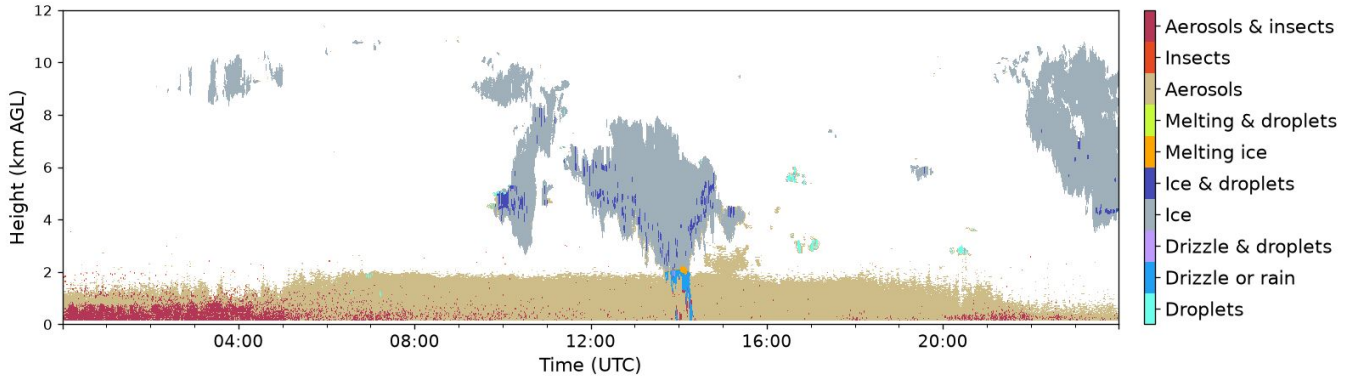
Snæfellsnes, Iceland
2026-08-01



TROPOS

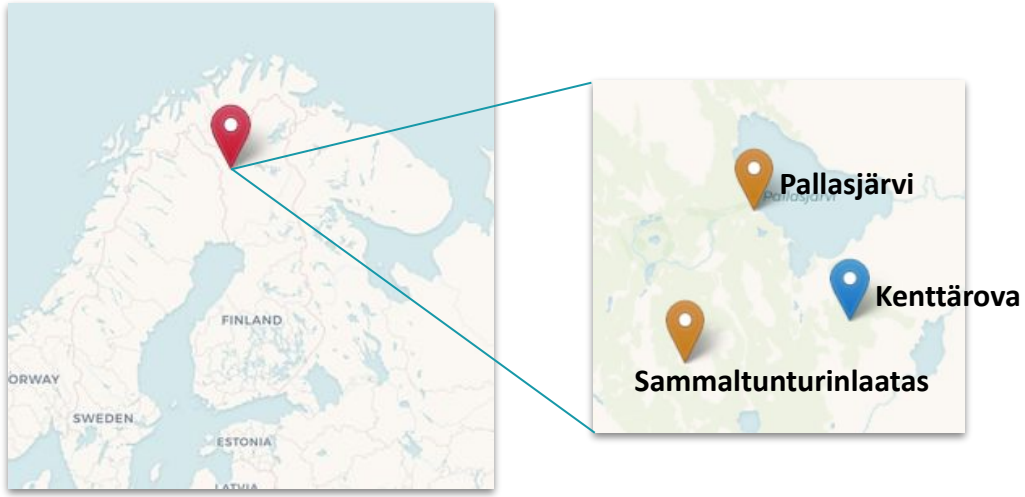
LACROS

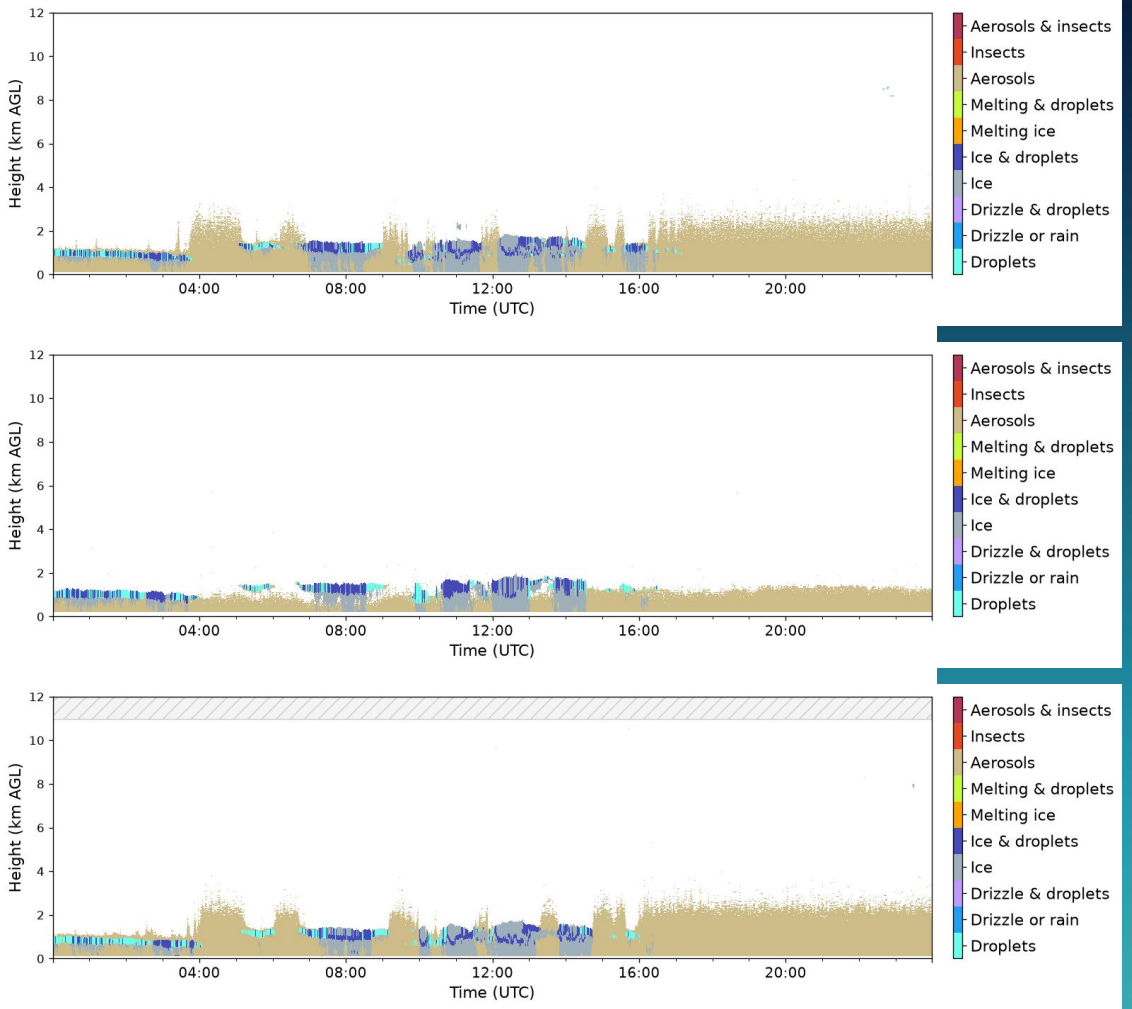
Invercargill, New Zealand
2026-10-05



Pallas campaign (PaCE 2026)

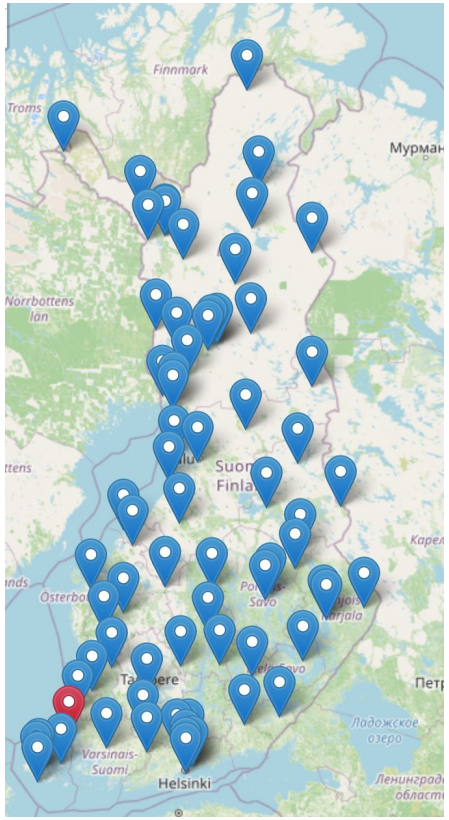
- Three Cloudnet stations nearby, six weeks of measurements
- Instruments from Granada, Cabauw, Jülich, Hyytiälä, Vehmasmäki (and Kenttärova)
- Supplemented with cloud in situ drone and balloon measurements

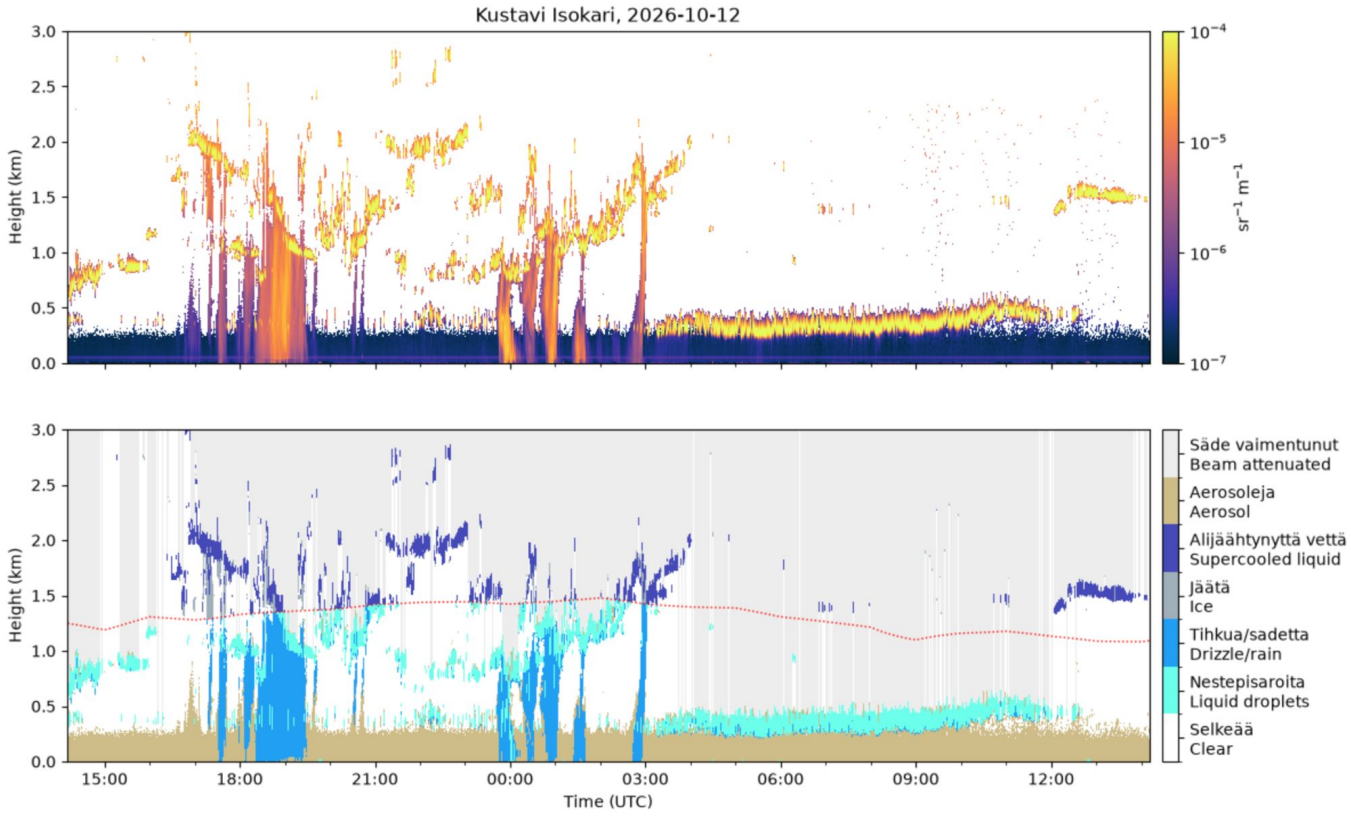




2026-10-10

Ceilometer classification





- Adaptive threshold for aerosols / hydrometeors

  → works with any lidar & site

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

Ongoing / future

- Implementation of deliasing
  - Status of SLDR retrieval?
- Ceilometer corrections
- Improved EarthCARE validation / comparison
  - DIVA5 project
- Model evaluation
  - In production or offline?
- Towards spectral processing..
  - peakTree?!

ACTRIS

CCRES

Thank you !