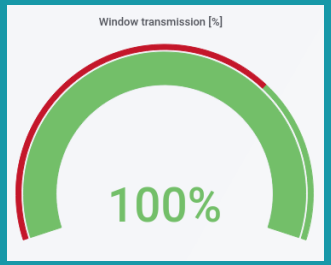
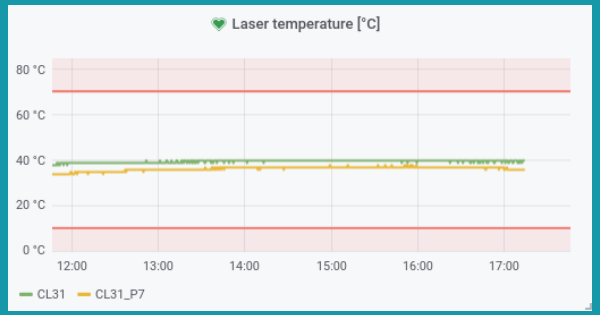




ACTRiS CCRES

HouseKeeping Data Monitoring

M.-A. Drouin, IPSL

CCRES Workshop, SIRTA observatory – Nov 14-15th, 2022

This project receives funding from the European Union's Horizon 2020 research and innovation programme under grant agreements No 871115

HouseKeeping Data : what and why ?

- Instrumental parameters
  - Provided in data files or in ancillary files

- Examples :
  - ALC : Laser energy, window transmission, status flags …
  - DCR : Internal temperature, intensity, voltage …
  - MWR: Ambient target stability, alarm/quality flags …
  - DWL : internal temperature …
  - DD : Instrument status …

- Goals
  - Allowing more **efficient instrument failures detection**
    - Curative maintenance
  - Ensure **optimal performances** of sensors
  - Ensure **long term high quality** geophysical data

- **Analysis of HKD** data will be done for NF **labelling**

ACTRiS CCRES

Tools for monitoring : storing HKD

- InfluxDB (https://www.influxdata.com/)
  - Timeseries database (1D data exclusively)
    - Optimized for measuring change over time
    - Can aggregate or downsample over time
  - First release in 2013, now in version 2.4
  - Most interesting functionalities for us are free and opensource
  - Used in lots of projects
  - Good documentation and lots of examples
  - Most functionalities are open source and free
  - Simple to install and configure
  - Packages available in most languages to provide data
    - Compatible with python pandas package
  - Can also collect data by itself
    - ex : REST API, download CSV
  - Several databases can be synchronized in NRT

Tools for monitoring : visualisation and alerting (1/2)

- Grafana (https://grafana.com/grafana)
  - Web application for timeseries data
    - Querying
    - Visualisation
    - Alerting
  - Open Source and free
  - First release in 2014, now in version 9
  - Compatible with lot of data sources
    - Among them influxDB

- Visualisations
  - Creation of interactives dashboards
  - “Understand” units
  - Lots of plugins (+300)
    - Data sources and visualization

Tools for monitoring : visualisation and alerting (2/2)

- Alerts management
  - Alert rules
    - What variable(s) to check
    - What period to check
    - How often to check
    - Preprocess data: min, max, mean, count, sum ….
    - Define severity of problem
  - Notifications
    - Different contact points can be defined per alert
    - Several channels : emails, slack …
    - Can depend on severity level
    - Quicklooks are sent with notifications

Tools for monitoring : Creating an alert in grafana

1. **What variable from which instrument** ?
   - Window transmission of CHM15K
   - Precipitation from weather station
2. **What period are we analysing** ?
   - The last 90 minutes
3. **What processing** ?
   - Mean of window transmission (WT)
   - Sum of precipitation (PRECIP)
4. **What condition to trigger an alert** ?
   - Mean < 50% and PRECIP = 0
5. **How often are tests done** ?
   - Every 15 minutes
6. **How long a problem need to last to trigger an alert** ?
   - 30 minutes
7. **Who to contact in case of missing data** ?
   - Marc-Antoine by email
8. **Who to contact in case an alert is triggered** ?
   - Jean-Charles by email and Leonardo by slack

ACTRiS CCRES

Status example for BASTA DCR

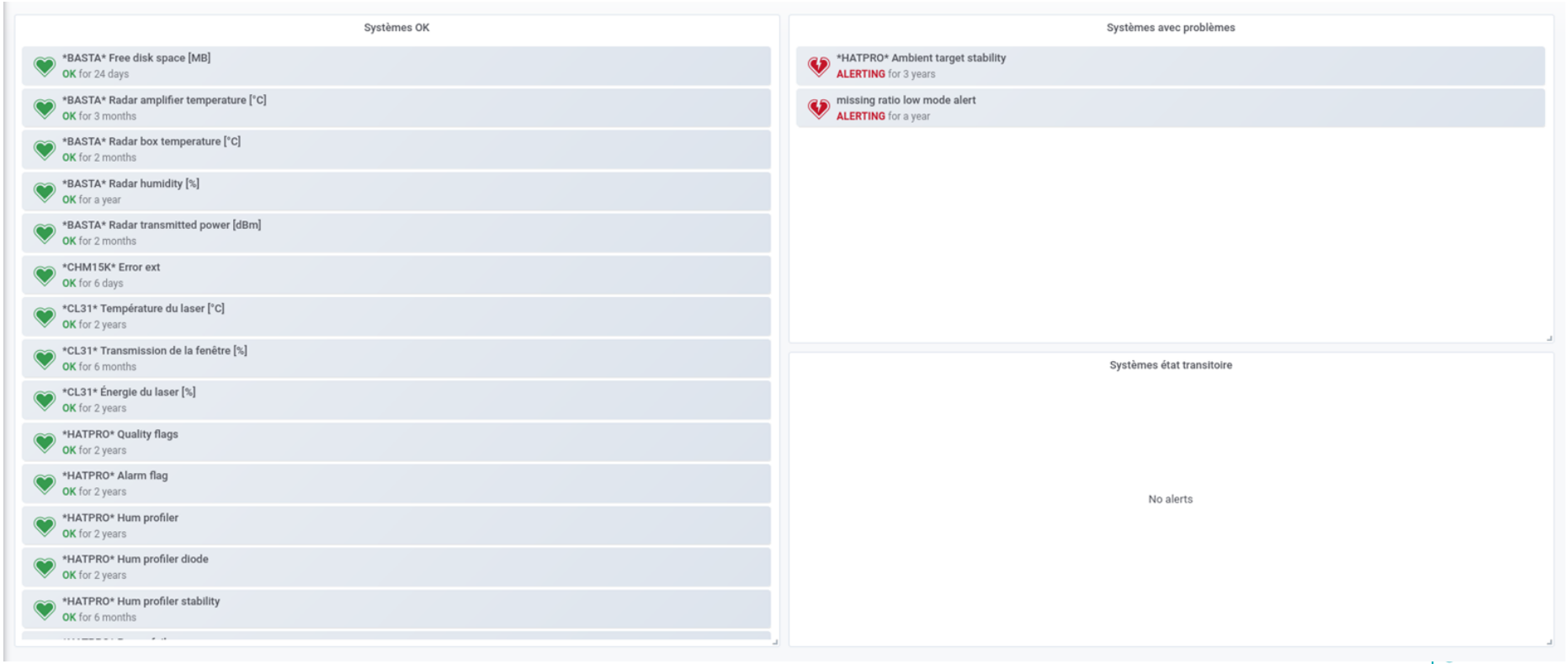
Alerts examples for BASTA DCR

Status Example for HATPRO G2 MWR

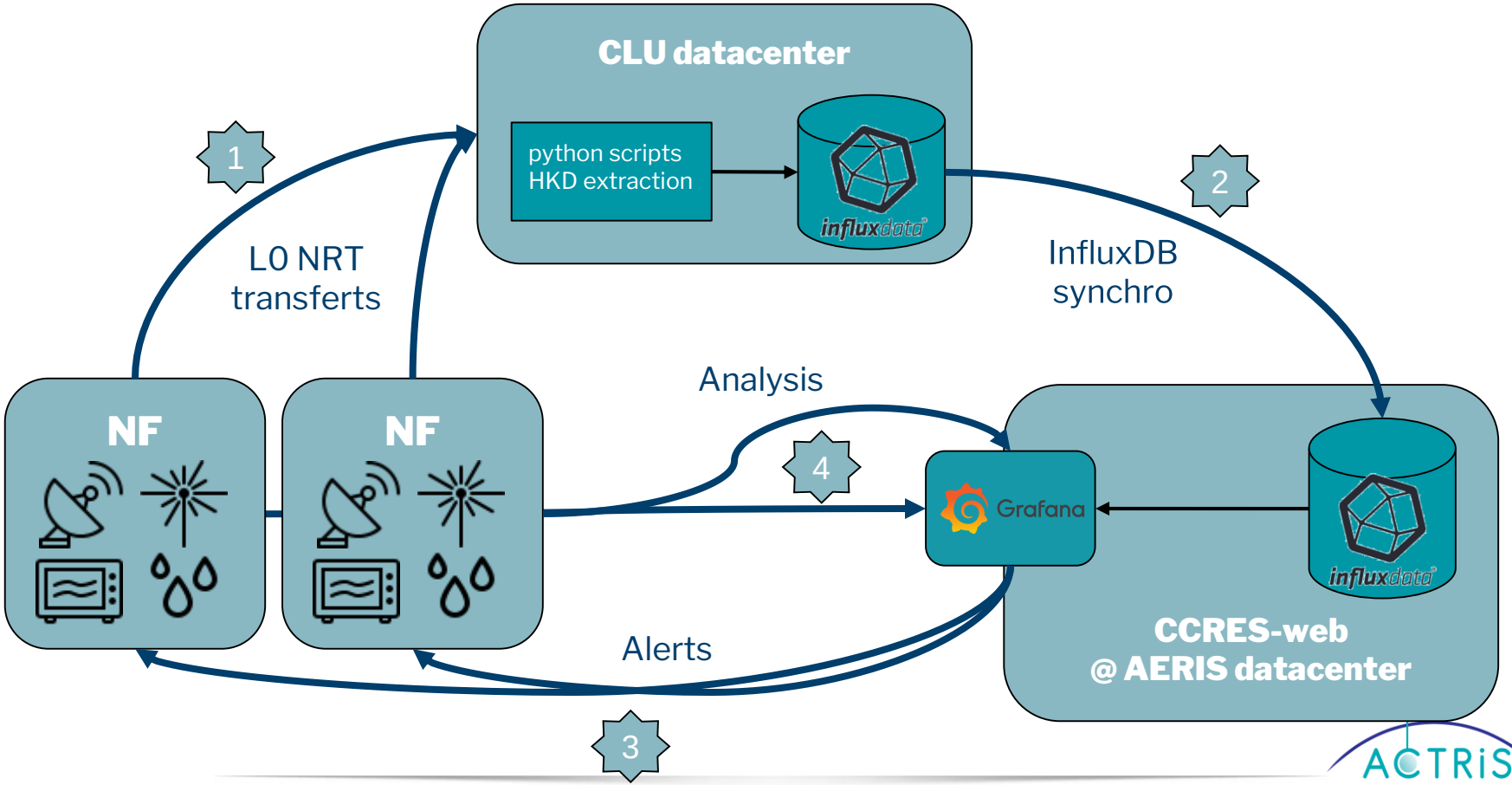
ACTRiS CCRES

Alerts example for HATPRO G2 MWR

Example of alerts summary



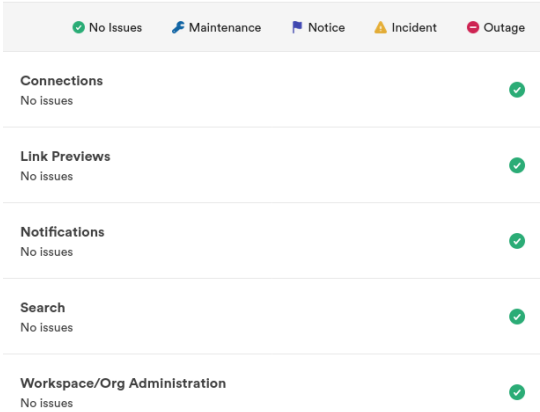
Proposed data flux



ACTRiS CCRES

Planned services for NF

- Unlimited retention of HKD
- Grafana
  - Access to Grafana
  - Dashboards
    - For each type of instruments
    - Summary of recent alert status
  - Alerts each time a problem is detected to defined NF contacts
- Monthly summary of NF instrument status



CCRES plans for HKD

- Installation of influxDB and grafana dedicated to CCRES
- Identify for each type/model of instrument
  - The parameter that need to be checked
  - How to checked them
  - Mostly done for DCR and ALC
  - To be done for DD, MWR and DWL
- Create the scripts to extracts the HKD from instruments files
  - Codes will be available on ACTRIS-CCRES github
- Create templates of dashboard for each type of instrument

What we will need from NF

- Provide list of contact for each instrument
- Provide HKD file to CLU for instrument when it is in an ancillary file
  - ex: HATPRO

Thank you.
Questions ?

Recent updates on Cloudnetpy
One year of shipborne Cloudnet

Hannes Griesche, Patric Seifert, Johannes Bühl, Ronny Engelmann, Martin Radenz, Julian Hofer, Dietrich Althausen
griesche@tropos.de

Cloud Remote Sensing Community workshop
Monday 14 November 2022

Member of the Leibniz Association

MOSAiC

FLUXES CLOUDS TRANSPORT SURFACE ARCTIC AMPLIFICATION (AC)³

ARM

Cloudnet

TROPOS
Leibniz Institute for Tropospheric Research

Synergistic remote sensing during MOSAiC

OCEANET-ATMOSPHERE + MIRAC-P ⟷ KAZR

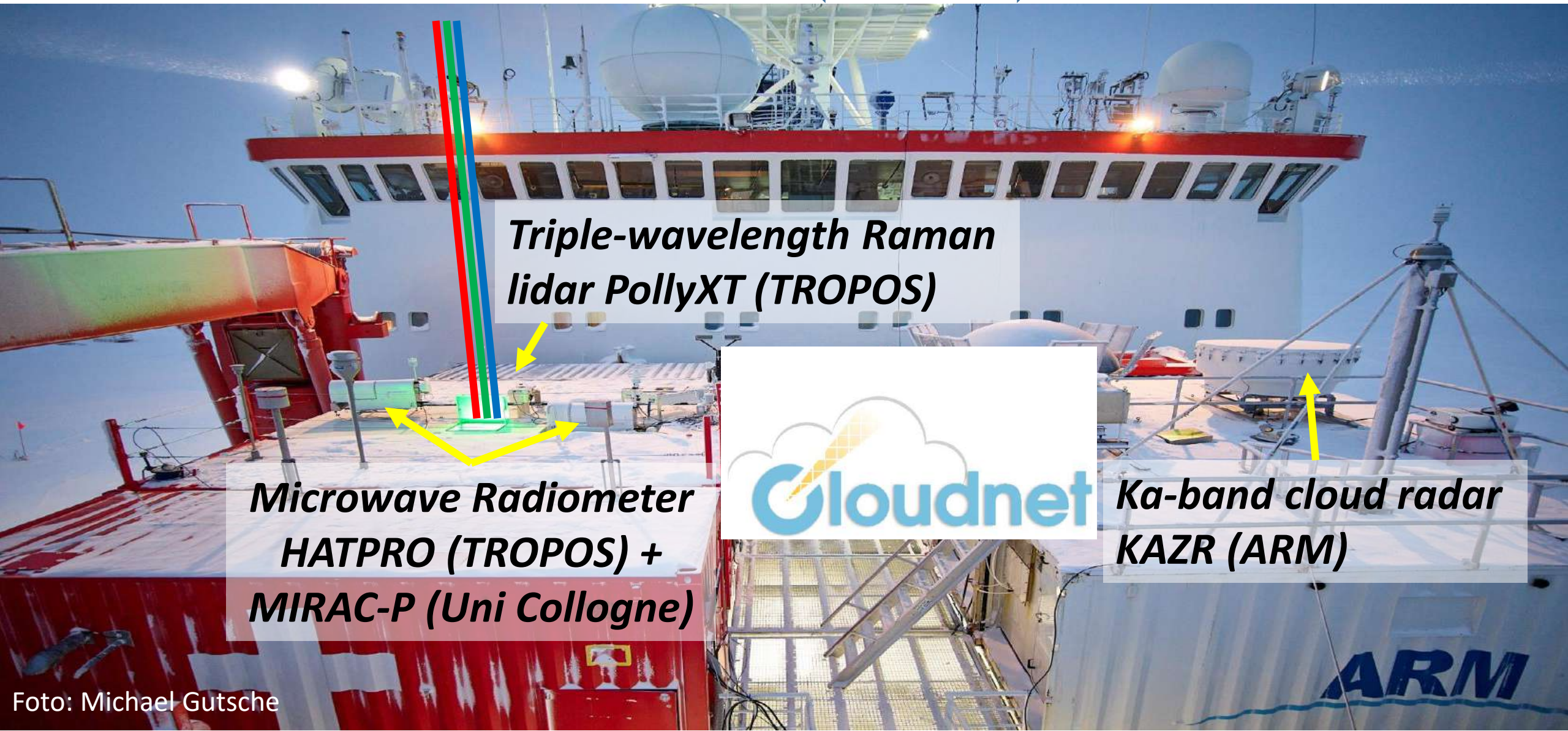
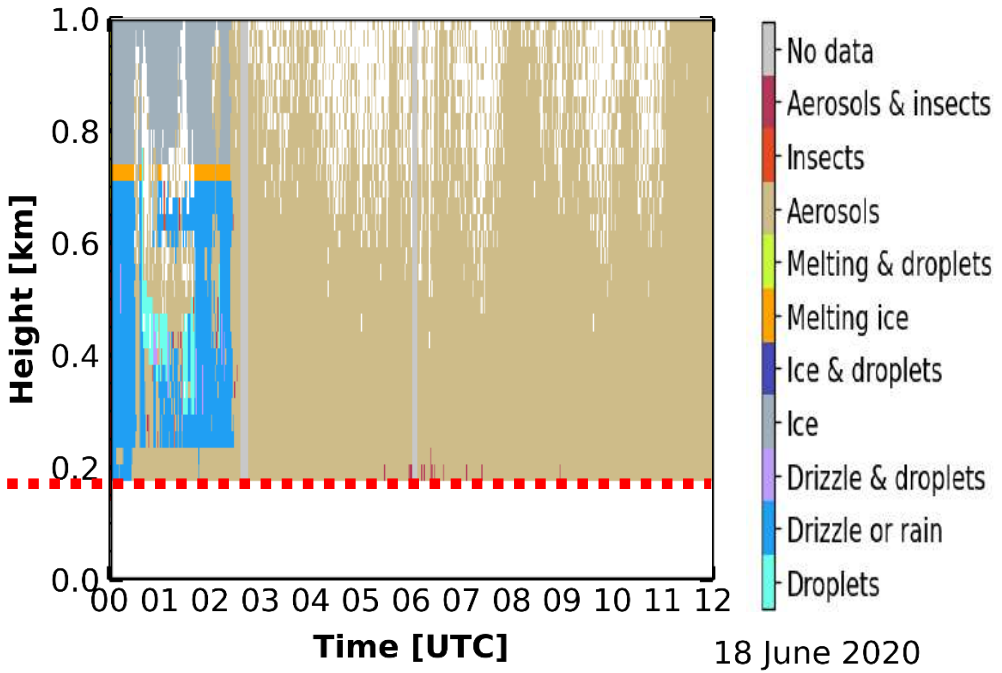


Foto: Michael Gutsche

Challenges in the Arctic: Observations of lowest-level clouds

KAZR cloud radar: lowest detection range 150 m

→ Clear sky

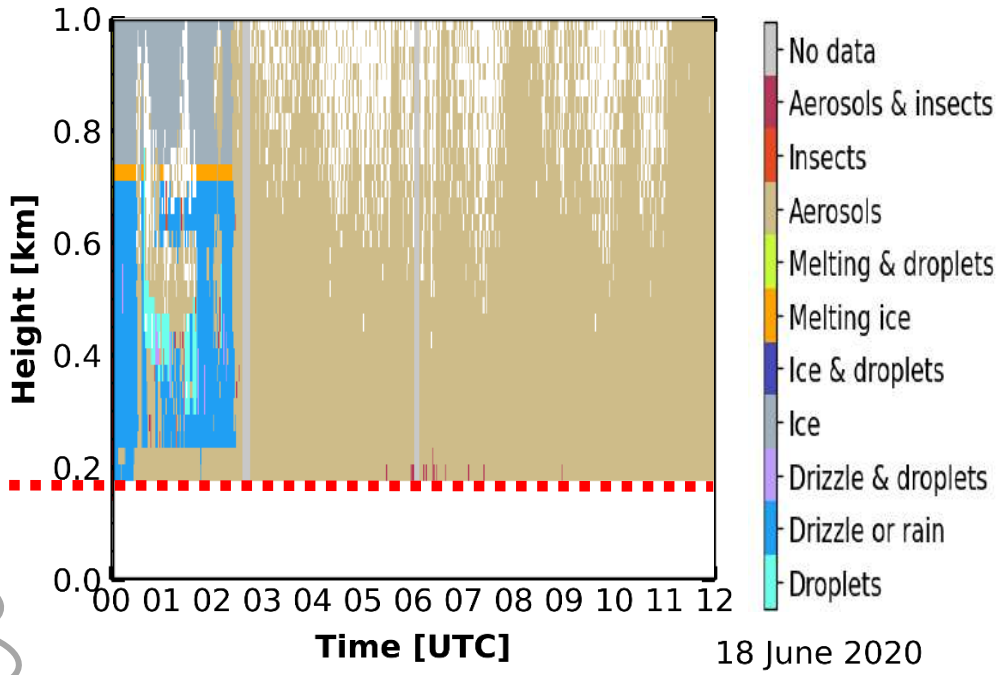


Challenges in the Arctic: Observations of lowest-level clouds

KAZR cloud radar: lowest detection range 150 m

→ Clear sky

Low-level clouds / fog: < 150 m




Picture: N. Fuchs

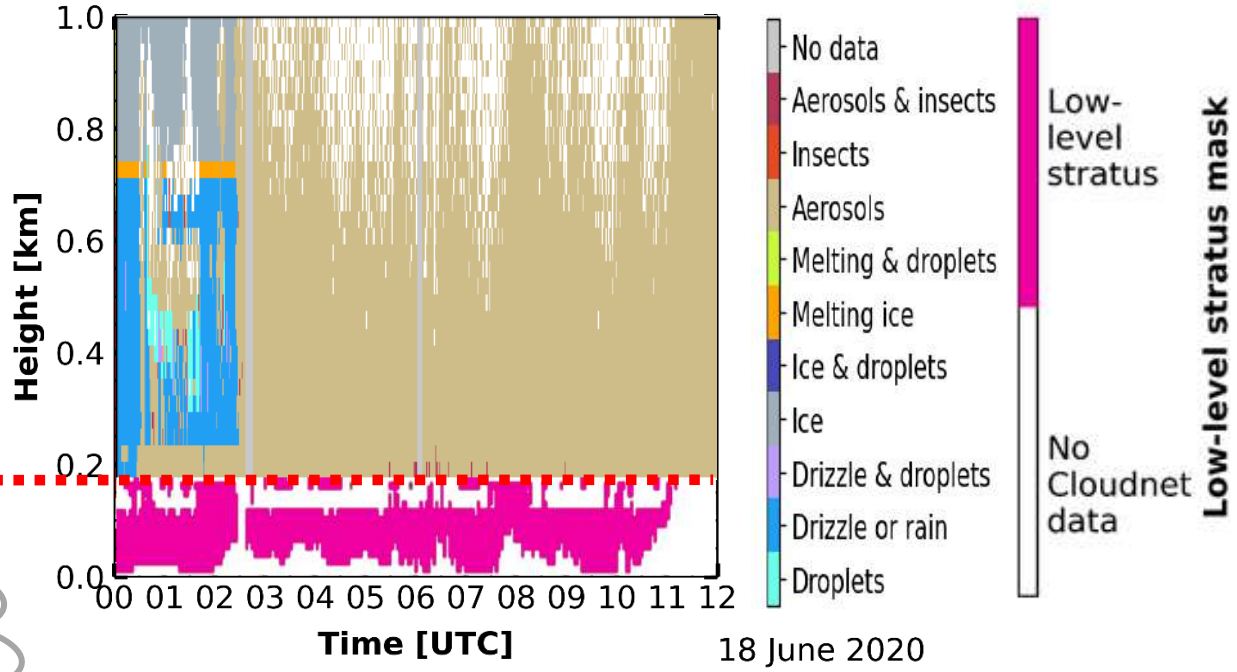
Lidar: lowest detection range < 150 m

Challenges in the Arctic: Observations of lowest-level clouds

KAZR cloud radar: lowest detection range 150 m

→ Clear sky

Low-level clouds / fog: < 150 m



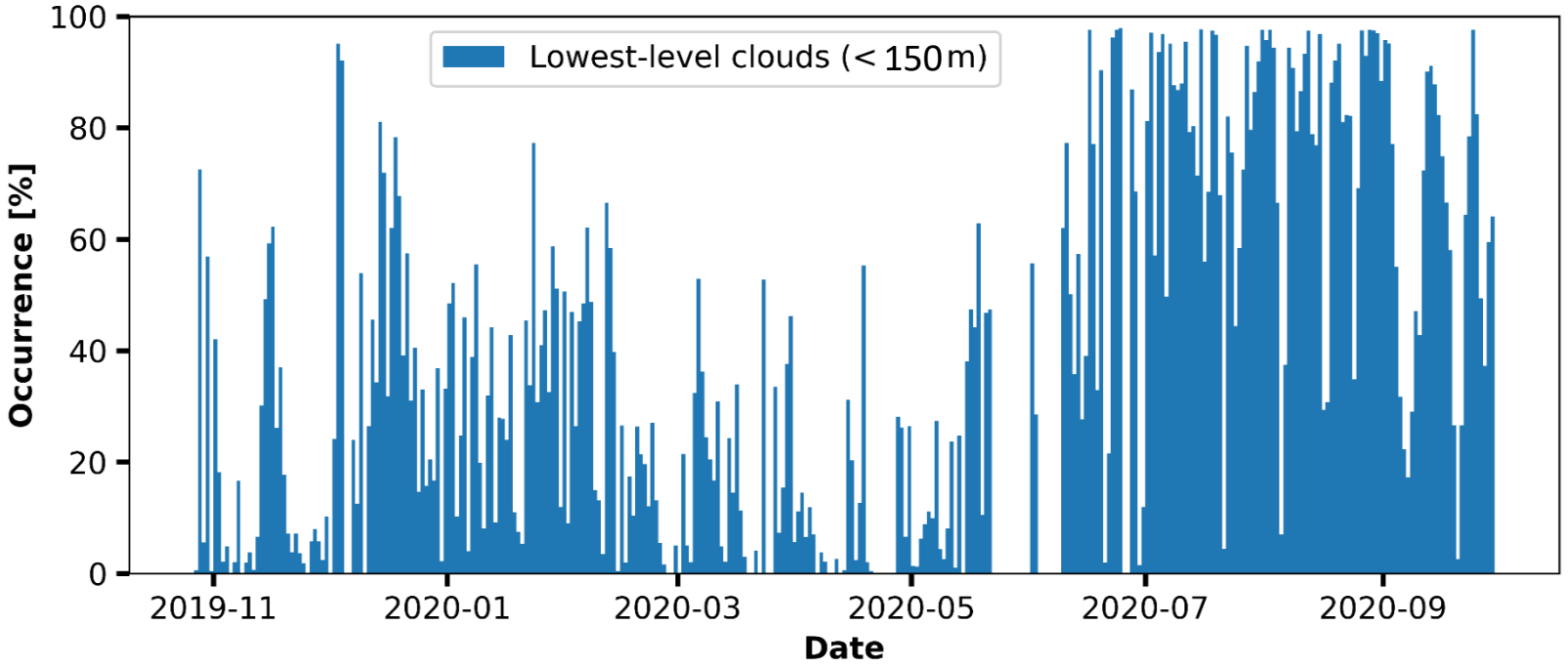
Lidar: lowest detection range < 150 m

→Low-level stratus detected

Cloudnet

TROPOS

Challenges in the Arctic: Observations of lowest-level clouds



Occurred during 40% of observational time

Lowest-level Arctic clouds missed by most remote-sensing instruments (ground-based + satellite)

- Likely underrepresented in cloud statistics → **mind instrument limitations!**

Can cause complete lidar signal attenuation below lowest detection limit of cloud radar

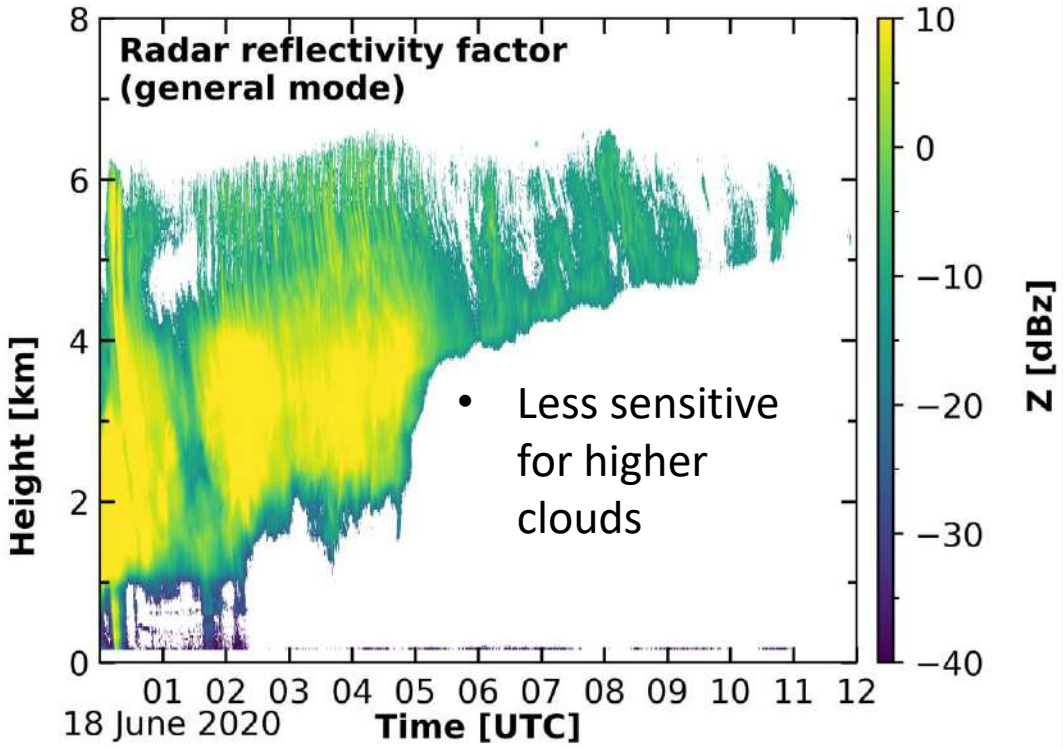
- Synergistic retrievals may fail to detect liquid water
- Problematic, e.g., for radiative transfer simulations

TROPOS

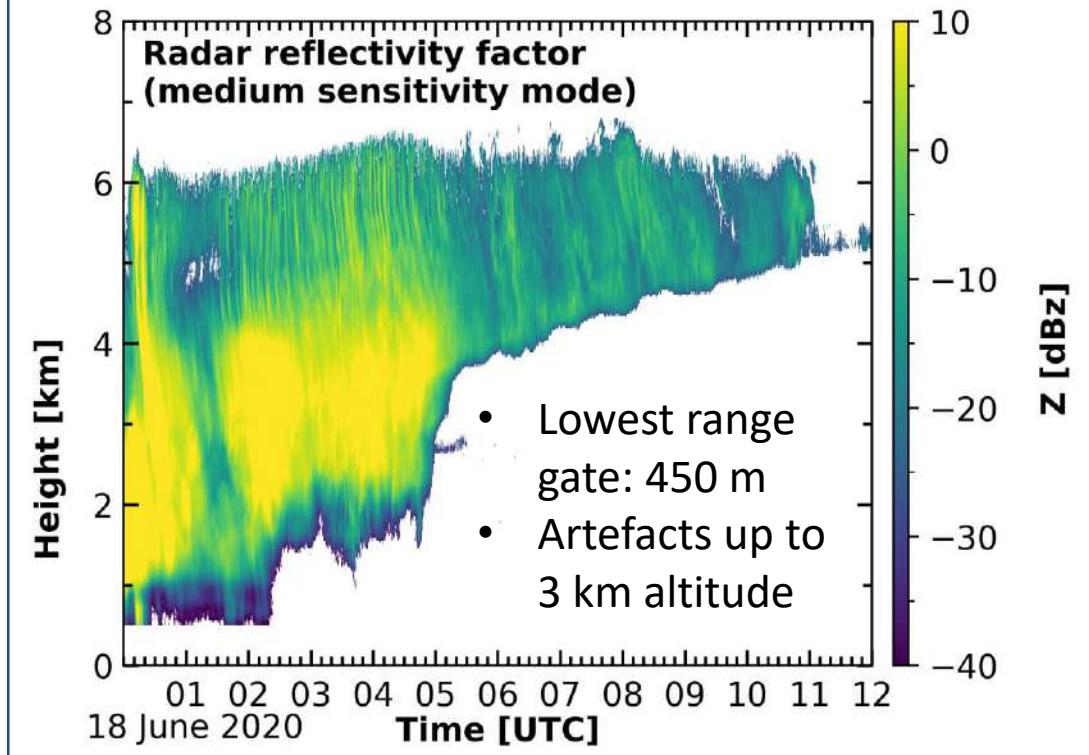
Challenges in the Arctic: Observations of high-level clouds

KAZR cloud radar:

- **General mode (GE)**
- Lowest detection range 150 m



- **Medium sensitivity mode (MD)**
- Lowest detection range 450 m



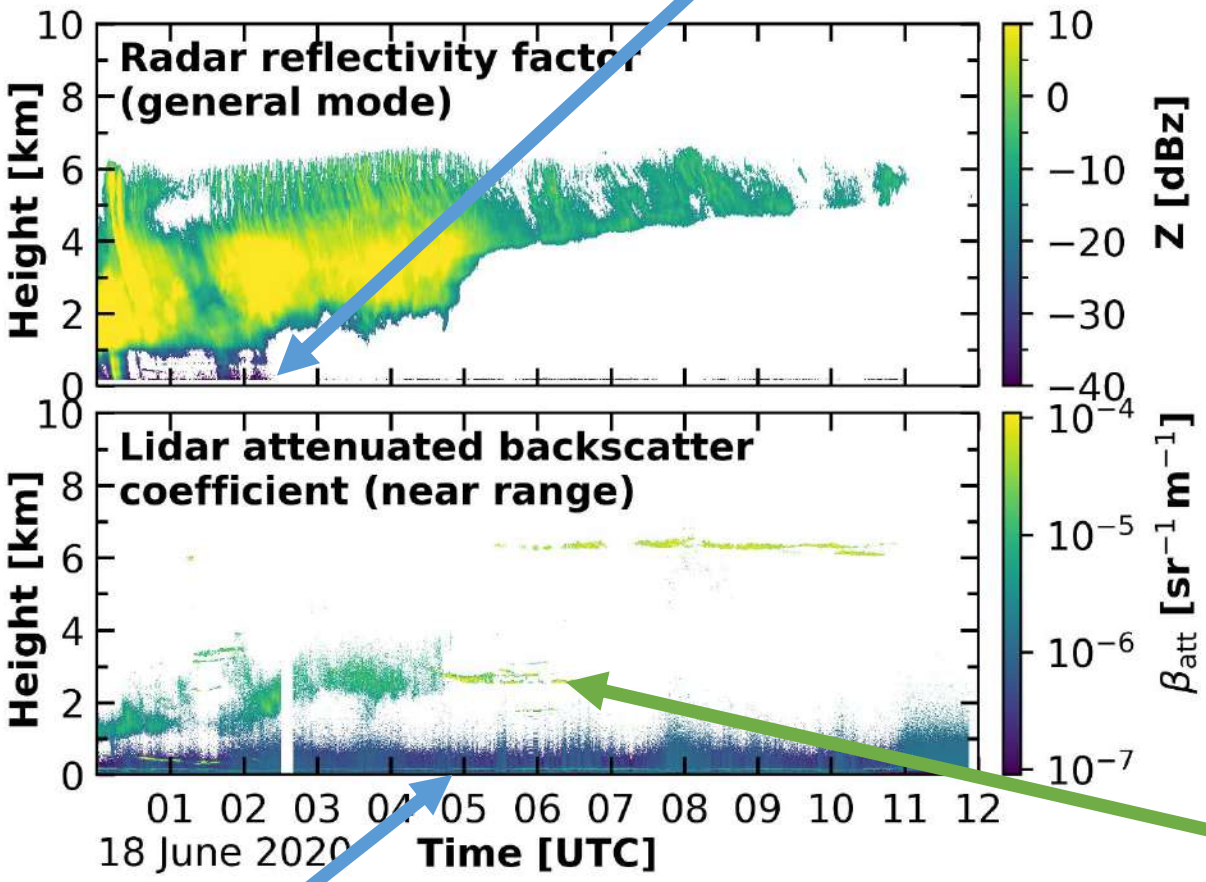
KAZR reflectivity for 18 June 2020

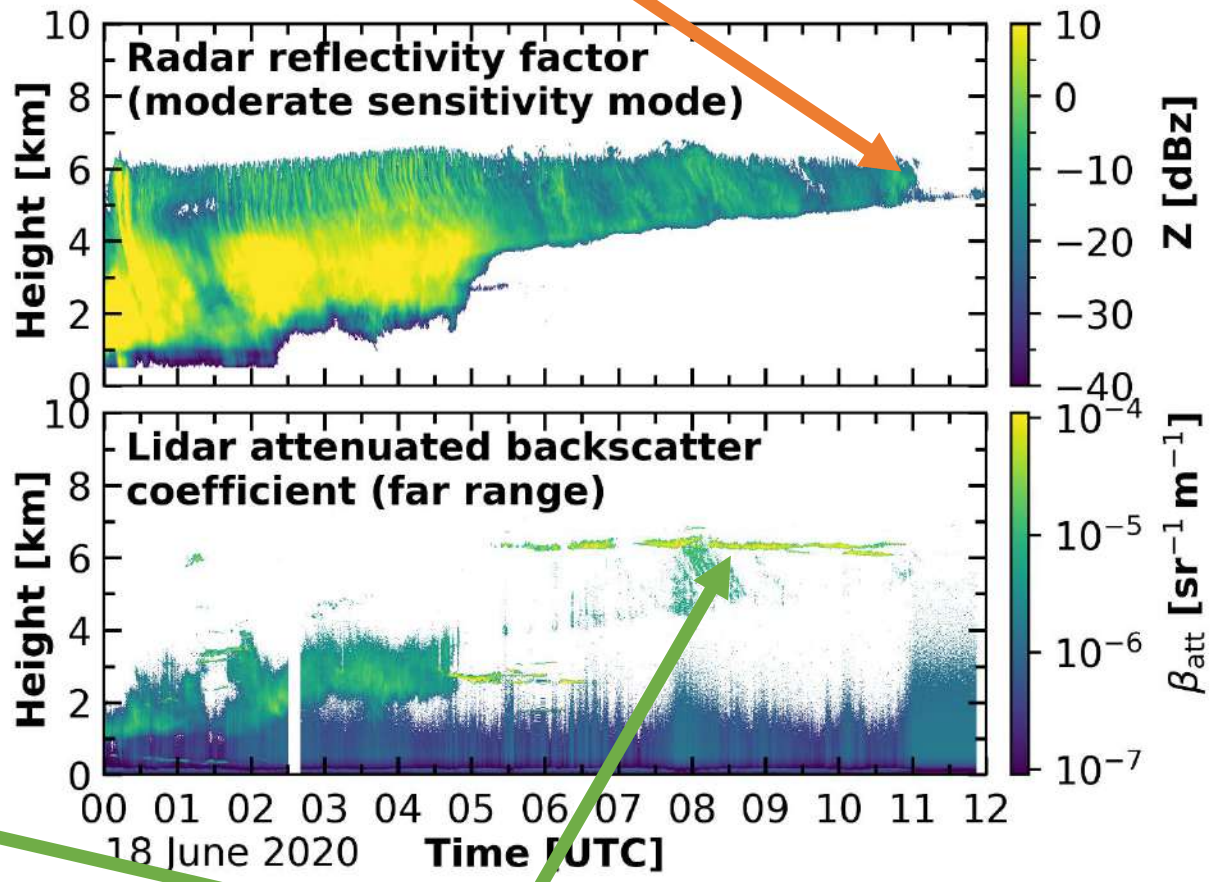
TROPOS

Challenges of Arctic Clouds

Low clouds: KAZR general mode

High clouds: KAZR medium sensitivity mode





Lowest-level clouds:
PollyXT near range

Liquid layers: PollyXT

TROPOS

Approach: Combination of instrument assets

- **Frequent occurrence of low level stratus clouds:**
  - ➢ PollyXT near range
  - ➢ KAZR general mode

- **High clouds:**
  - ➢ PollyXT far range
  - ➢ KAZR moderate sensitivity mode

- **Lofted aerosol layers:**
  - ➢ PollyXT far field

Merged data set:

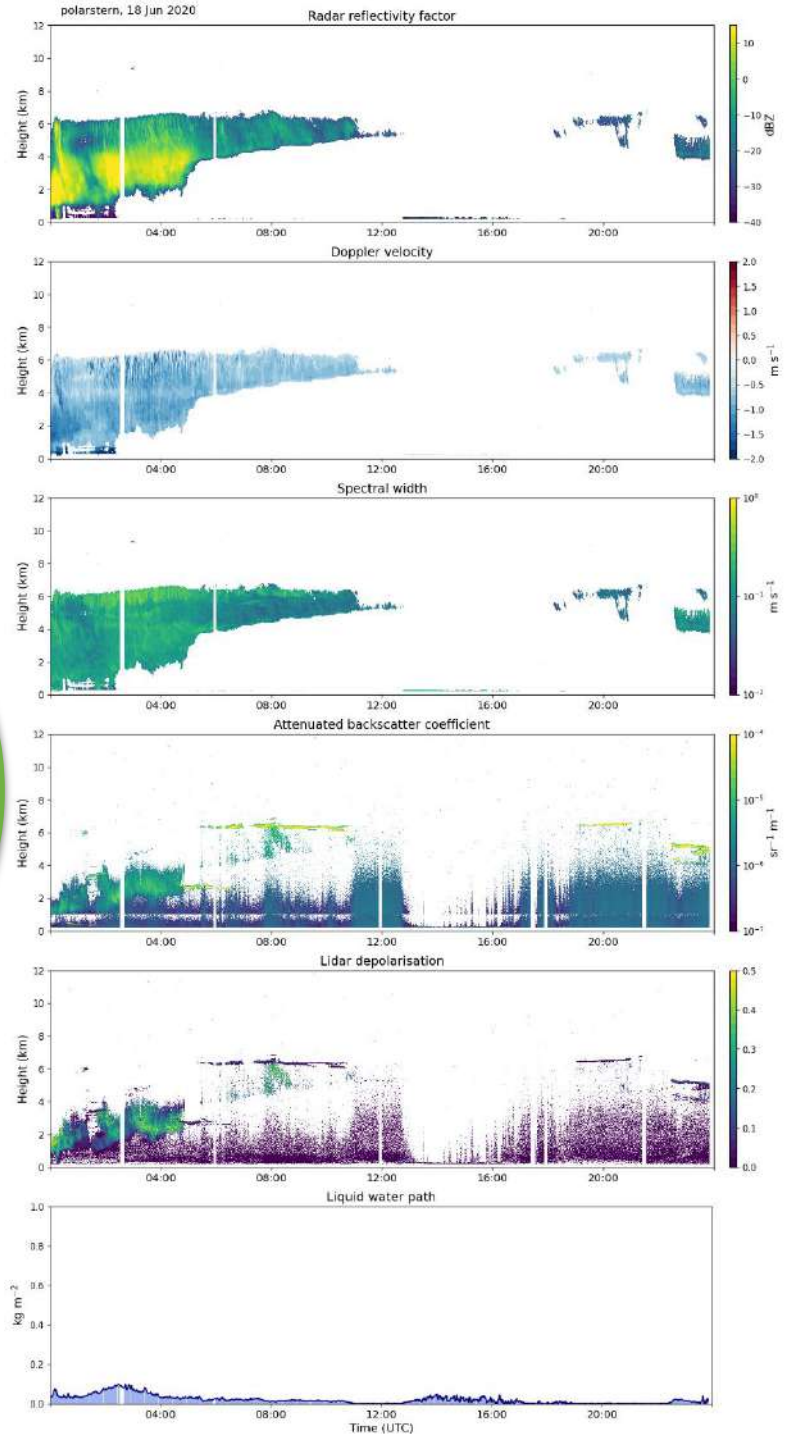
- ➢ PollyXT **near range** (below 1 km)
- ➢ KAZR **general mode** (below 3 km)
- ➢ PollyXT **far range** (above 1 km)
- ➢ KAZR **moderate sensitivity** mode (above 3 km)

Merged Cloudnet data set for MOSAiC

- PollyXT **near range** (below 1 km)
- KAZR **general mode** (below 3 km)

- PollyXT **far range** (above 1 km)
- KAZR **moderate sensitivity** mode (above 3 km)

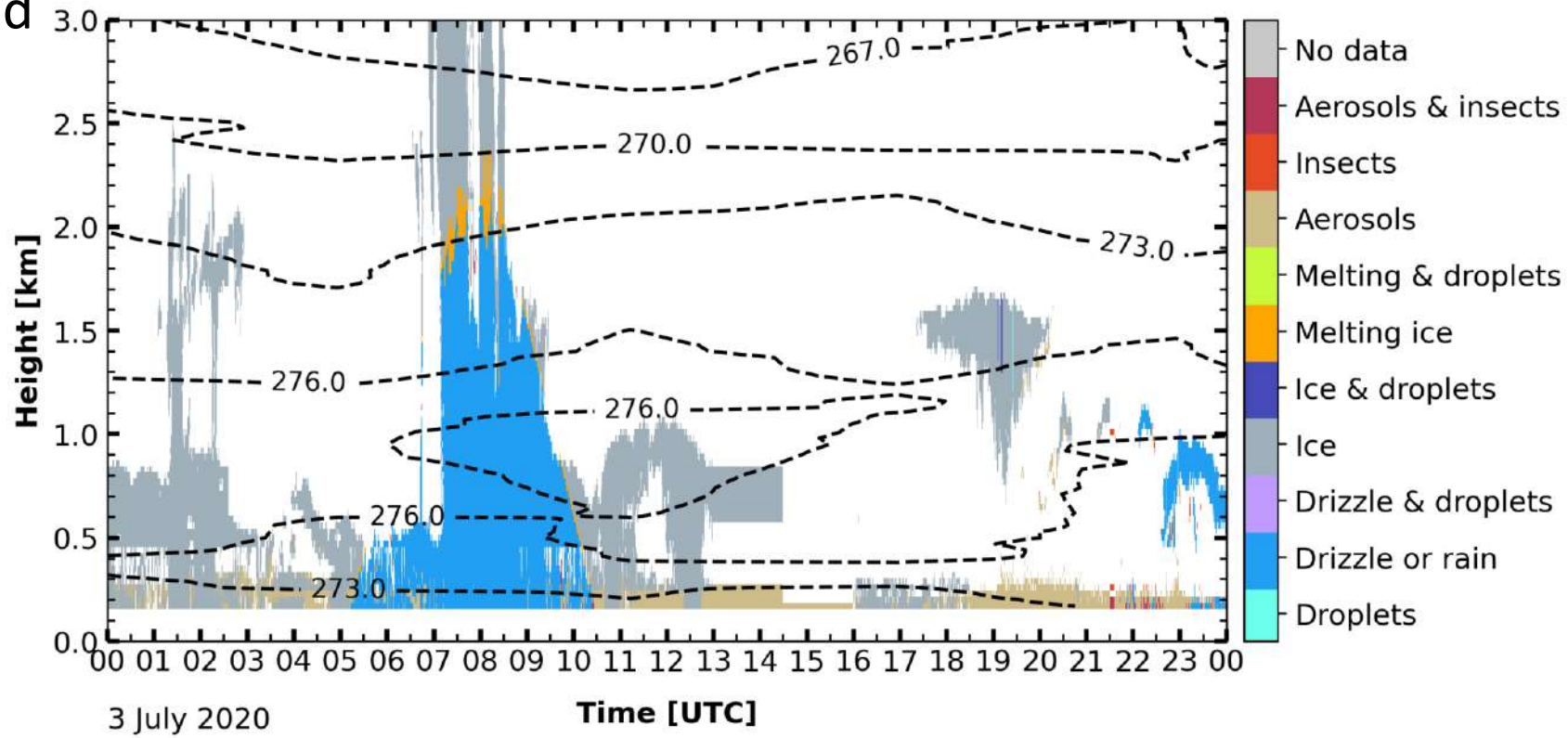
Soon available via the Cloudnet data portal



Processing issues

- Temperature at surface < 0°C
- In higher altitudes > 0°C
  - ➢ Whole column classified as ice

- GitHub issue created
- Workaround: check for highest altitude where T > 0°C

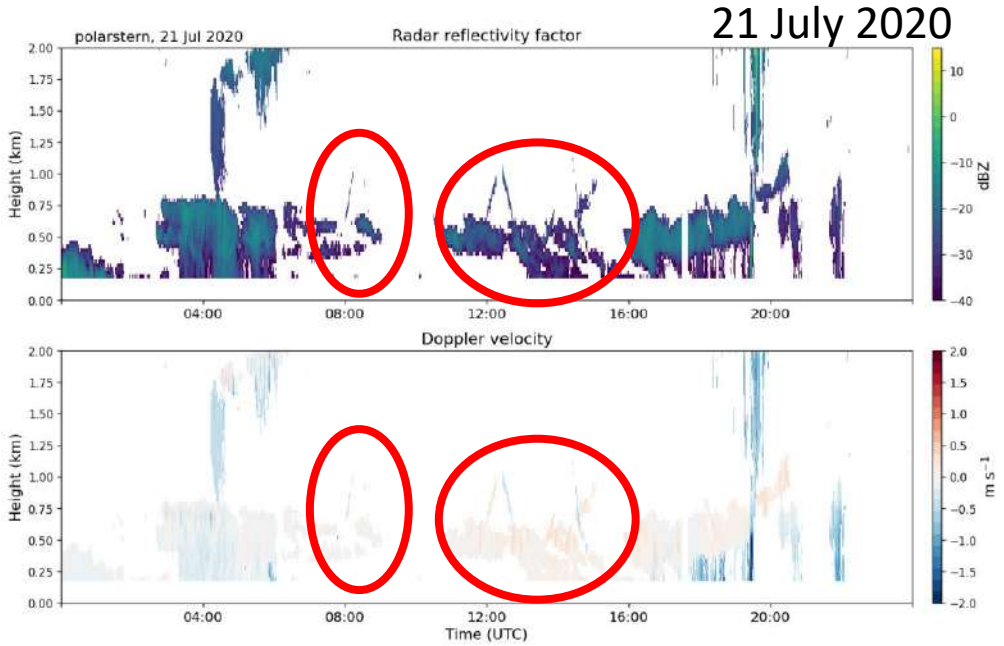


Data issues detected

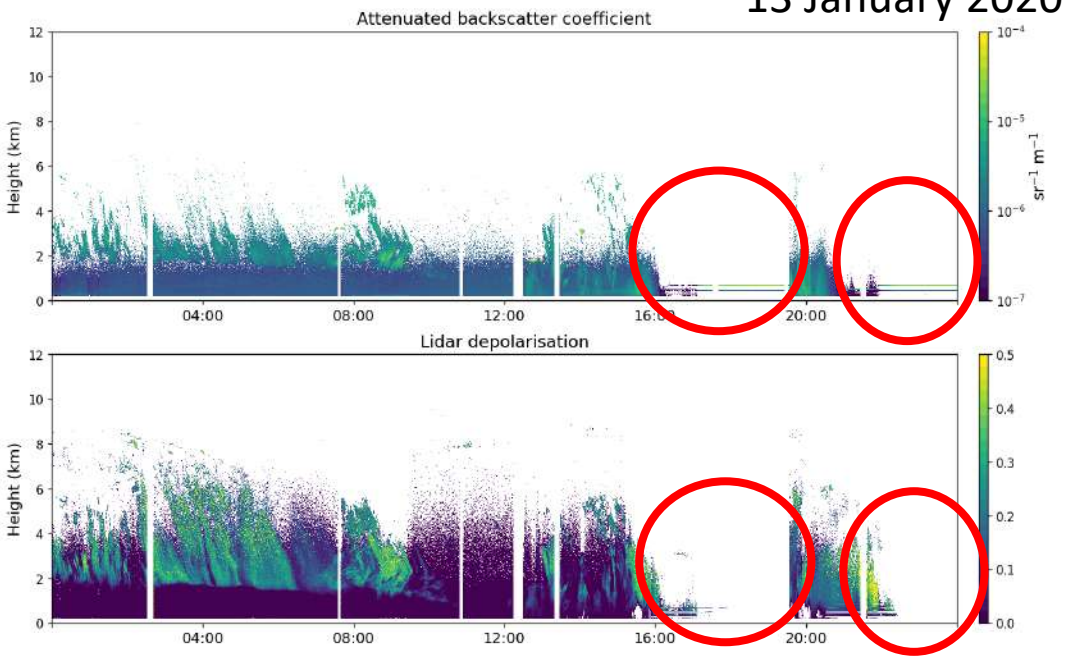
- Tethered balloon artefacts
- Blowing snow
  - ➢ Lidar signal attenuated
- Occasionally misspointing of cloud radar due to ships orientation
  - ➢ Incorrect Doppler velocity

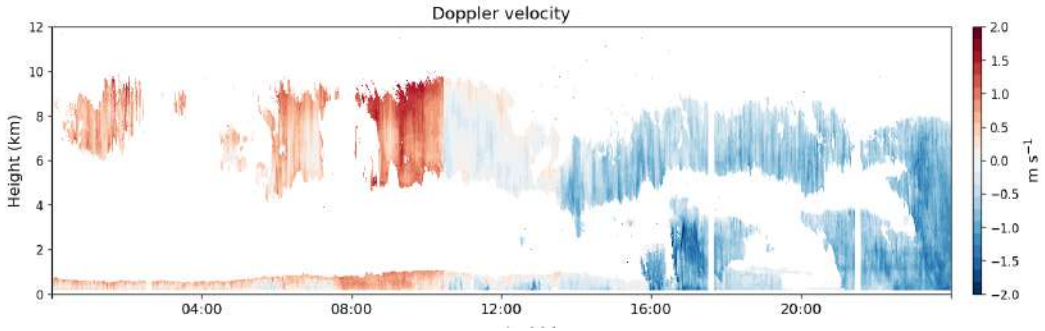
Publish issue flag data set via Zenodo

21 July 2020



13 January 2020





19 April 2020

Challenges of a shipborne Cloudet data set in the high Arctic

- Liquid detection fails if temperature at surface < 0°C but above > 0°C
  - GitHub issue

- Frequently complex cloud situation
  - Polly near range
  - KAZR general mode + medium sensitivity mode
  - Issue data set

- Moving platform → model input?
  - So far radiosonde used
  - GDAS1 available
  - How to handle ECMWF stream?

Thank you!

ACTRIS-Cloudnet

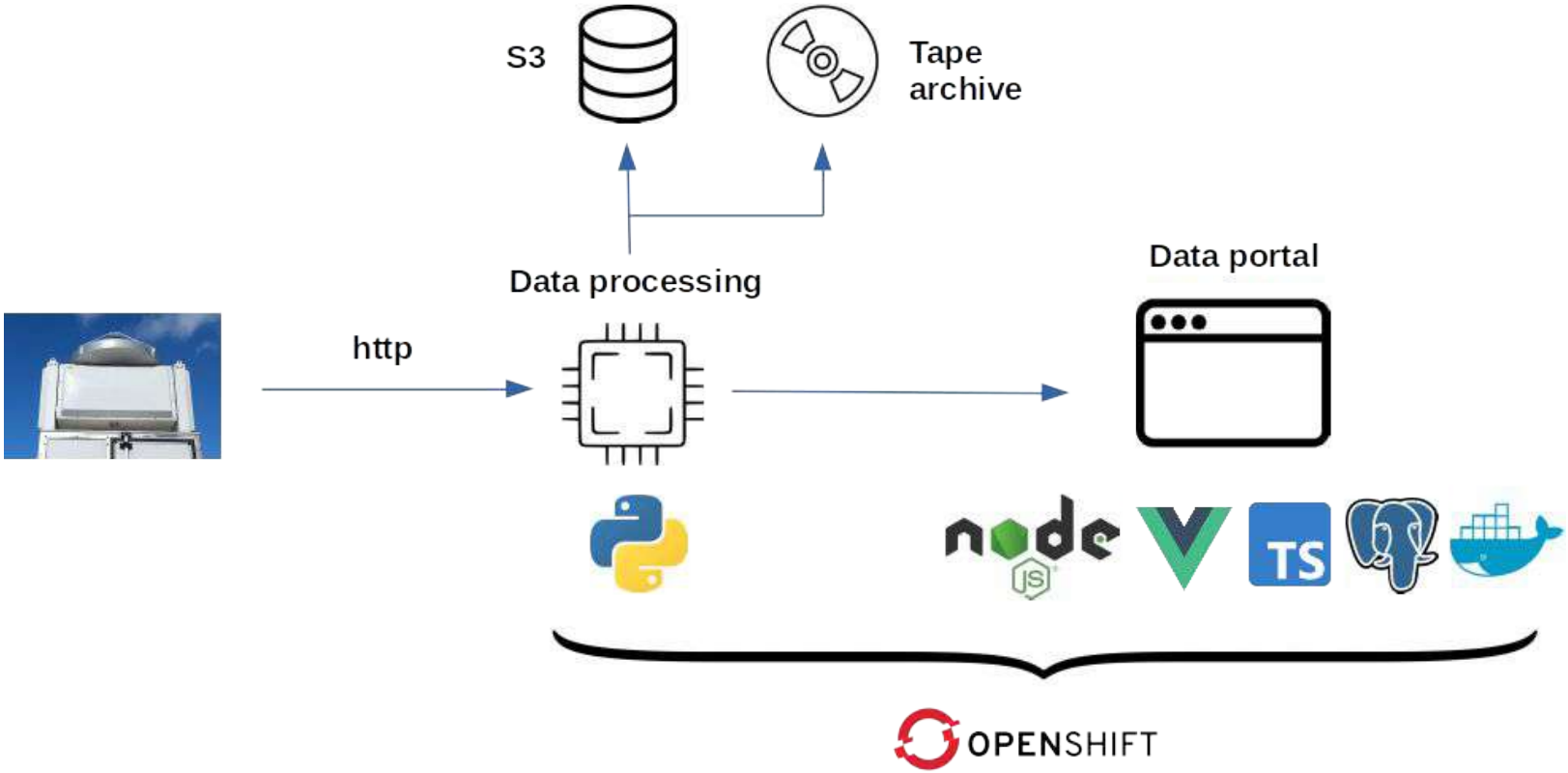
Simo Tukiainen, Tuomas Siipola, Niko Leskinen, Ewan O'Connor,
Lauri Kangassalo ✝ , Anniina Korpinen ✝

ACTRIS Data Centre - CLU unit
Finnish Meteorological Institute

Cloudnet services

- Data portal
- Data processing
- PID service
- Databases
  - Instruments
  - Calibration
  - Housekeeping

Architecture



Data submission to Cloudnet

- 29 sites
- ~2 300 000 raw files
- ~48 TB of data
  - 75% RPG Level 0

- Recommended submission tool: https://github.com/actris-cloudnet/cloudnet-submit
  - pip install cloudnet-submit

Authentication

- **Earlier**: Site-specific
  - <sitename>:<password>
  - Still works

- **Now**: User-specific
  - <username>:<password>
  - {“site” = …} in submission metadata

- Request credentials from actris-cloudnet@fmi.fi

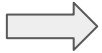
Instrument database

- https://instrumentdb.out.ocp.fmi.fi/
  - Landing page and PID
- Information via form:
  - https://docs.google.com/forms/d/1QIhNSf9YzUMzAL36B_lo_08C8jHin7k5yRjWhX_M6B8/
- Stores location and PI
  - Check that information is correct
  - Inform us if the instrument moves / PI changes!
- **USE PIDs IN METADATA SUBMISSION**
  - {“instrumentPid”: … }
  - Soon mandatory!

Instruments

Add instrument

Name	Current location	PID
INOE CHM15k	Bucharest	https://hdl.handle.net/21.12132/3.c60c931fac9d43f0
INOE HALO	Bucharest	https://hdl.handle.net/21.12132/3.db58480f58ca49ad
INOE HATPRO-G5	Bucharest	https://hdl.handle.net/21.12132/3.e7le5a4f26ac4717
INOE MIRA-35	Bucharest	https://hdl.handle.net/21.12132/3.d98f6fd2bec94e5e
INOE Parsivel2	Bucharest	https://hdl.handle.net/21.12132/3.a75d4215f338412e
DJUG CHM15k	Galați	https://hdl.handle.net/21.12132/3.079cdfced7a7438e
DJUG HATPRO-G5	Galați	https://hdl.handle.net/21.12132/3.38f97c8dce064e02
DJUG RPG-FMCW-94-DP	Galați	https://hdl.handle.net/21.12132/3.71dad3ea36ab476a
UH CL61	Hyytiälä	https://hdl.handle.net/21.12132/3.241bda142975460b
UH HATPRO-G5	Hyytiälä	https://hdl.handle.net/21.12132/3.f360a2375f3e4e4f
UH RPG-94-FMCW	Hyytiälä	https://hdl.handle.net/21.12132/3.191564170f8a4686
Uni Köln CHM15k	Jülich	https://hdl.handle.net/21.12132/3.324507c6ce8e489c
Uni Köln HALO	Jülich	https://hdl.handle.net/21.12132/3.48bd7da035b94ffd
Uni Köln HATPRO-G5	Jülich	https://hdl.handle.net/21.12132/3.1668271e8d364263
Uni Köln MIRA-35	Jülich	https://hdl.handle.net/21.12132/3.0366fa69504f4bd6
Uni Köln Parsivel2	Jülich	https://hdl.handle.net/21.12132/3.2a1ca46ed70c4929
FMI CL61	Kenttärova	https://hdl.handle.net/21.12132/3.f33e53dddde44495
FMI HALO 146	Kenttärova	https://hdl.handle.net/21.12132/3.a93d1483110742ff
FMI RPG-FMCW-94-DP	Kenttärova	https://hdl.handle.net/21.12132/3.e44e1ffac7954538
TROPOS CHM15kx	Leipzig	https://hdl.handle.net/21.12132/3.cd3578e9f68b42c0
TROPOS HALO (shaun)	Leipzig	https://hdl.handle.net/21.12132/3.be50699171b24e17
TROPOS Parsivel2	Leipzig	https://hdl.handle.net/21.12132/3.922bd0a8c7f34064
TROPOS PollyXT	Leipzig	https://hdl.handle.net/21.12132/3.9e05dc8968ed434f
TROPOS RPG-FMCW-94-DP	Leipzig	https://hdl.handle.net/21.12132/3.fa39ba9928544aae
TROPOS RPG-HATPRO-G5	Leipzig	https://hdl.handle.net/21.12132/3.a217d3ec6e6b47dd
DWD CHM15k	Lindenberg	https://hdl.handle.net/21.12132/3.cdf99c536bd04146
DWD HATPRO-G5	Lindenberg	https://hdl.handle.net/21.12132/3.442ec2ea9a24440e
DWD LNM	Lindenberg	https://hdl.handle.net/21.12132/3.ddeab96e6197478a
DWD MIRA-35	Lindenberg	https://hdl.handle.net/21.12132/3.d6cc3d73f9dd4d4b
DWD RPG-FMCW-94-DP	Lindenberg	https://hdl.handle.net/21.12132/3.70dd09553d13484d
ESA RPG-FMCW-94-DP	Mindelo	https://hdl.handle.net/21.12132/3.90b1e5245b11487d
TROPOS HALO XR (timmy)	Mindelo	https://hdl.handle.net/21.12132/3.738143791c524103



Instruments

Edit JSON XML

FMI MIRA-35

PID
https://hdl.handle.net/21.12132/3.3bfbb6e37acc41a3

Owner
Finnish Meteorological Institute (FMI) ROR

Manufacturer
Metek GmbH

Model
MIRA 35

Instrument type
cloud radar

Measured variables
- radar reflectivity factor
- spectral width
- linear depolarisation ratio
- Doppler velocity

Description
Scanning 35 GHz cloud radar

Locations

2019-09-18 – 2020-01-30	Kenttärova
2018-02-28 – 2019-09-16	Hyytiälä
2017-08-23 – 2018-01-20	Kenttärova
2016-11-26 – 2017-07-28	Hyytiälä
2016-01-20 – 2016-10-28	Vehmasmäki
2015-10-06 – 2015-12-08	Kenttärova
2014-11-06 – 2015-08-11	Vehmasmäki
2012-05-23 – 2014-05-12	Sodankylä

Principal Investigator

2012-05-23 –	Ewan O'Connor

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

Microwave radiometer data from Galați

Actris Volatile

8 November 2022

SUMMARY VISUALISATIONS QUALITY REPORT

Product

JSON

Type	Microwave radiometer
Level	1b (definition)
Instrument	DJUG HATPRO-G5 microwave radiometer
Timeliness	Near Real Time (NRT)
Quality control	Some issues, see report
Measurement date	2022-11-08
Location	Galați, Romania

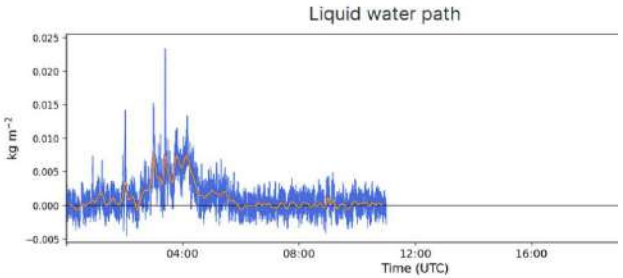
File

PID	n/a
Filename	20221108_galati_hatpro.nc
Format	HDF5 (NetCDF4)
Size	149.7 kB
Hash (SHA-256)	1bdc7b7
Last modified	2022-11-08 11:12:44 UTC
Licence	CC BY 4.0

Origin

Data sources	n/a

Preview



Be aware that this data is volatile and may be updated in the future.

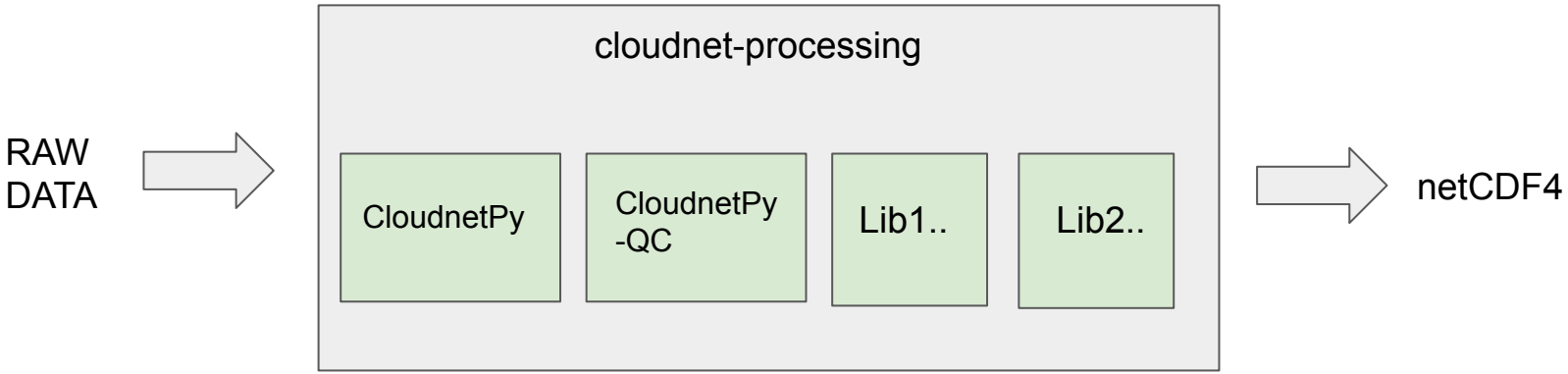
Citation

Constantin, D., and Voiculescu, M. "Microwave radiometer data from Galați on
2022", ACTRIS Cloud remote sensing data centre unit (CLU), https://cloudnet.
/file/1728dce8-2970-4e4b-b02a-62d2cb41feb1, 2022

Please include the following information in your publication. You may ec
suit publication standards.

Cloudnet processing

- CloudnetPy
  - pip install cloudnetpy
  - https://github.com/actris-cloudnet/cloudnetpy
- cloudnet-processing
  - https://github.com/actris-cloudnet/cloudnet-processing

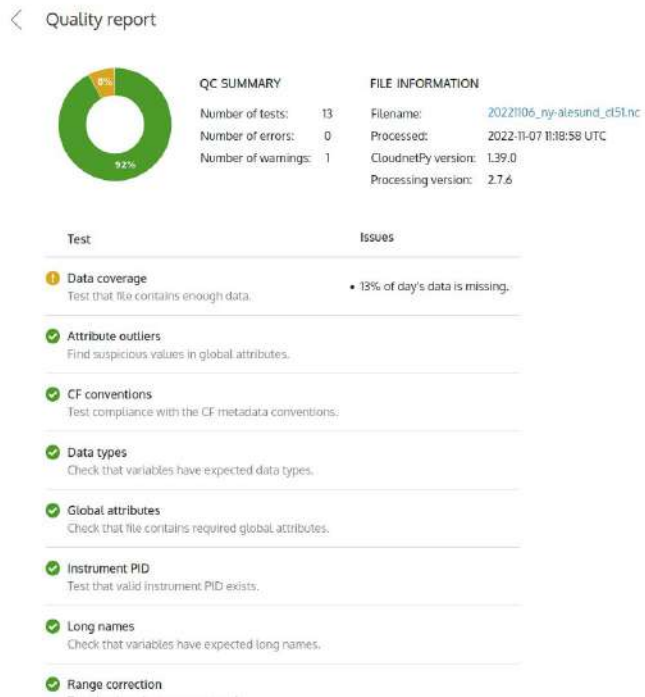


Software

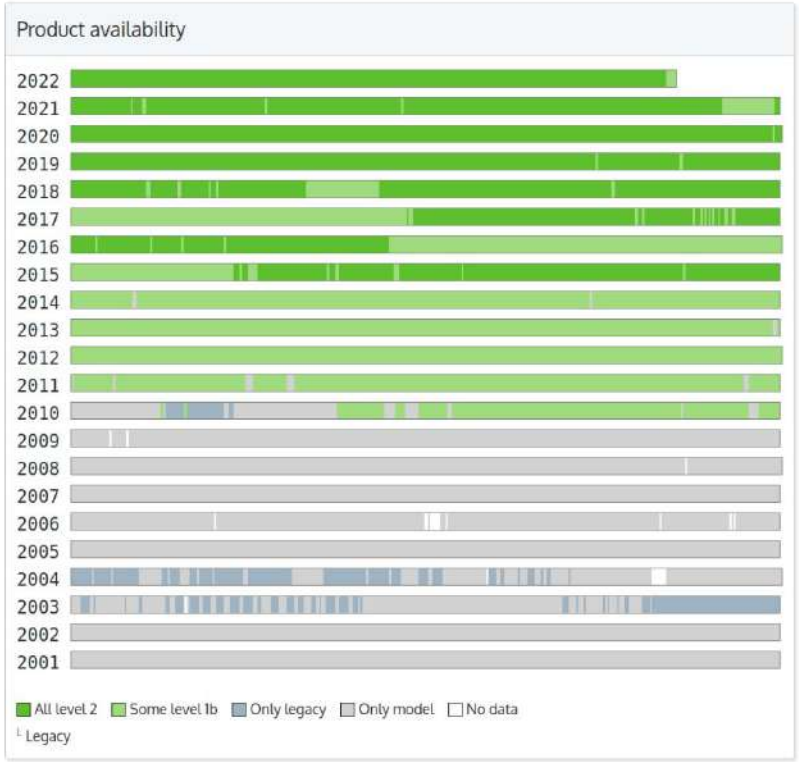
- CloudnetPy
  - https://github.com/actris-cloudnet/cloudnetpy
  - Main processing library for Cloudnet Level 1b / 1c / 2 products
  - 91 releases (v1.39.0 latest)
- RpgPy
  - https://github.com/actris-cloudnet/rpgpy
  - Cython reader / netCDF converter for PRG cloud radar Level 0 / 1
  - RPG file version 1.0, 2.0, 3.5, 4.0
- HALO Doppler Lidar processing code
  - Under development…

Quality control

- https://github.com/actris-cloudnet/cloudnetpy-qc
- Evaluates the overall quality of a processed file



Overall availability / quality

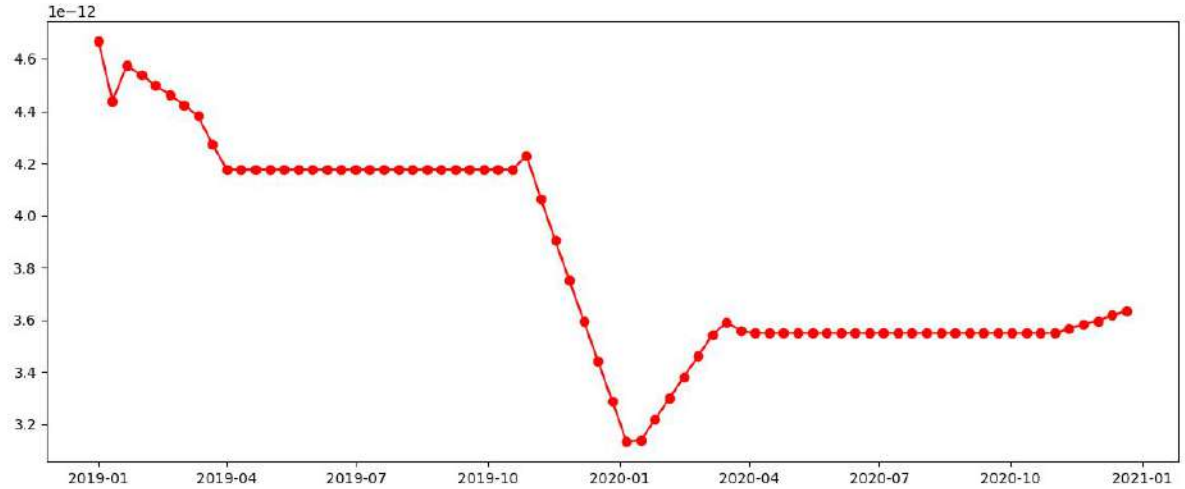


Individual products

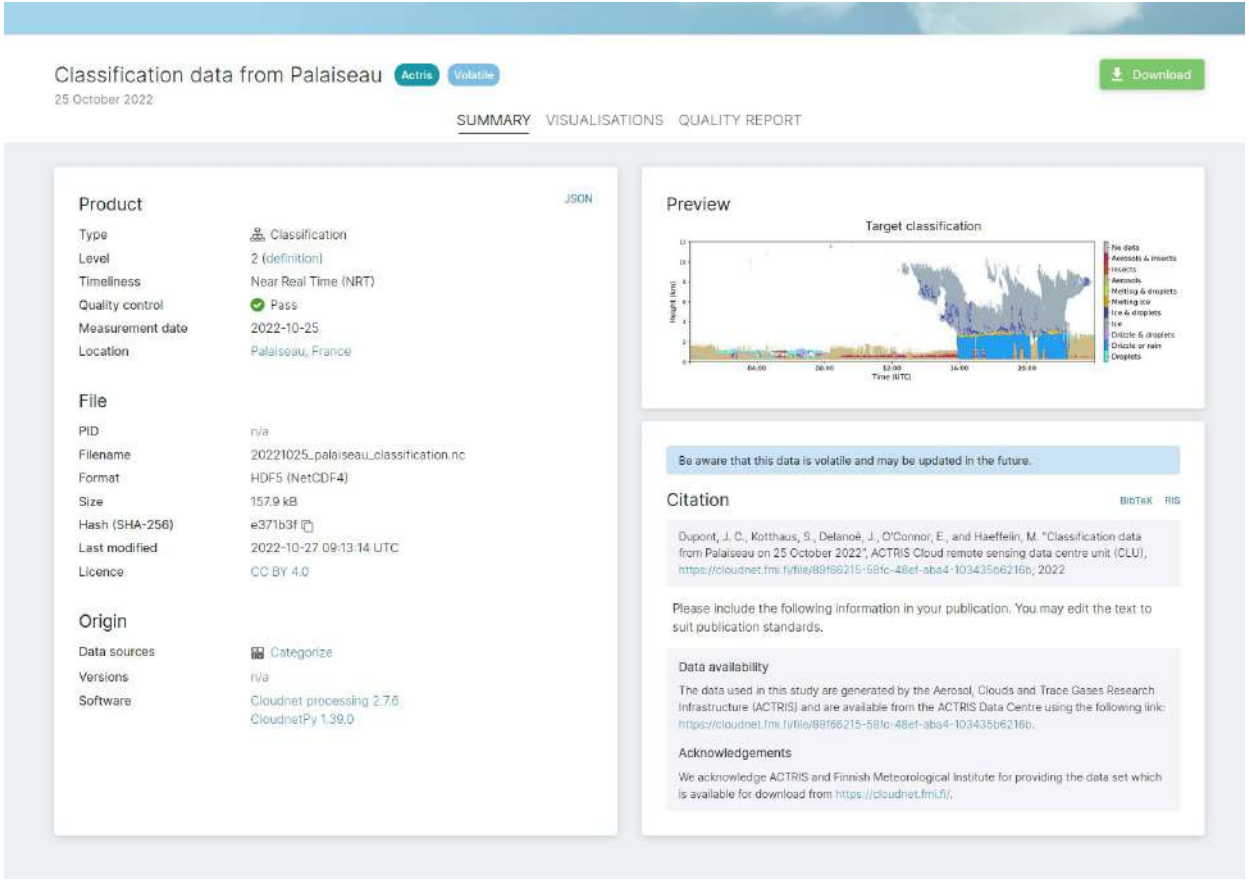
Calibration

- Database and API (GET, POST) for calibration data
- Currently **1 number / instrument / site / day** but can be expanded
- Change to use instrument PID

TROPOS CHM15kx calibration factor



Landing pages

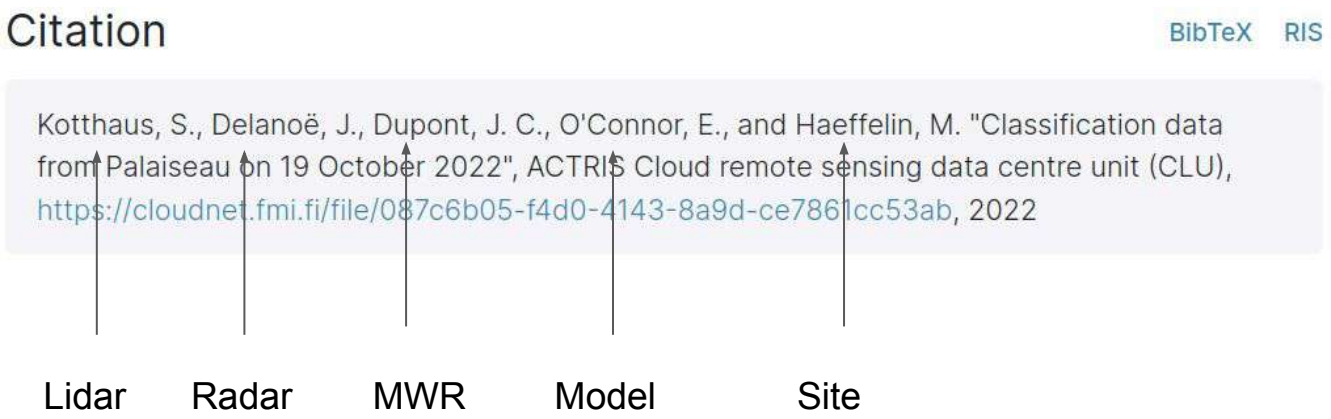


Citation

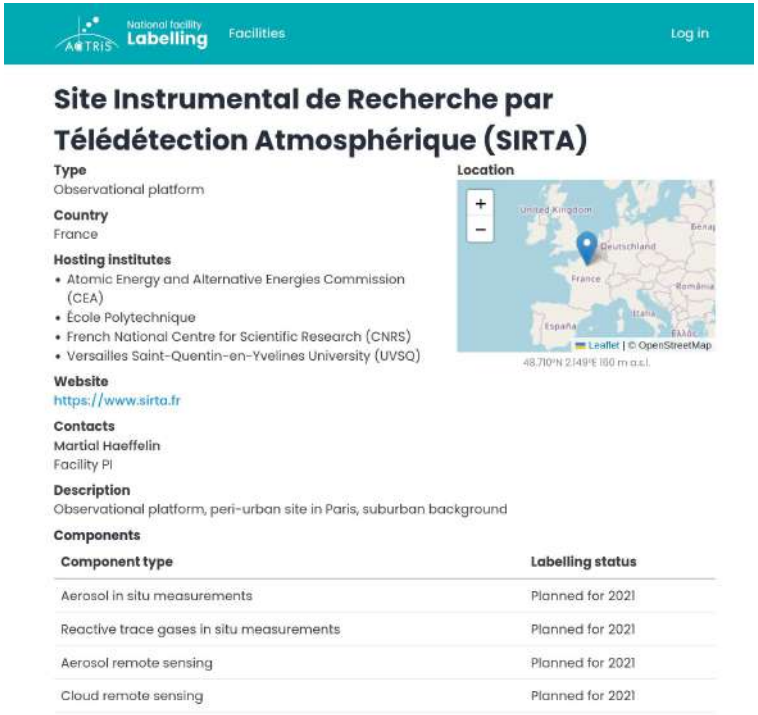
- Authors:
  - Instrument PI(s) recursively
  - National Facility PI

Citation

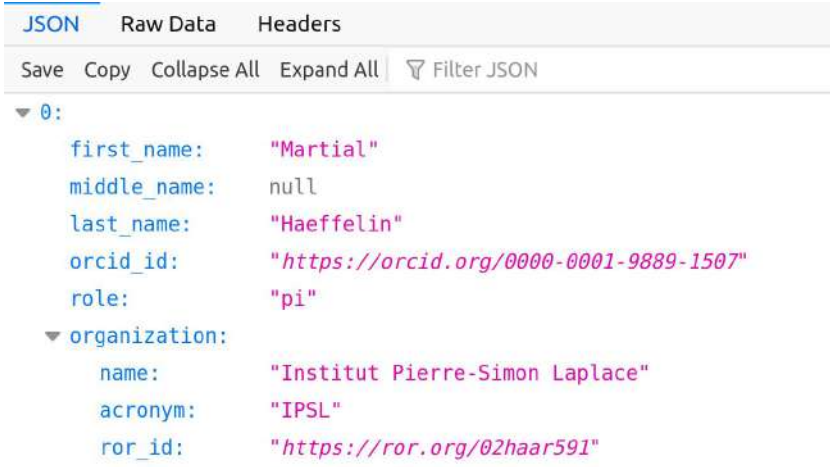
- Authors:
  - Instrument PI(s) recursively
  - National Facility PI



NF labelling PI API



API



Instrument PI API

Instruments Edit JSON XML

UH CL61

PID
https://hdl.handle.net/21.12132/3.241bda142975460b

Owner
University of Helsinki (UH) ROR

Manufacturer
Vaisala ROR

Model
Vaisala CL61-D

Instrument type
ceilometer

Measured variables
- volume linear depolarisation ratio
- attenuated backscatter coefficient

Location

2021-06-01 –	Hyytiälä

Principal Investigator

2021-06-01 –	Dmitri Moisseev

Serial number
T2011180

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

API

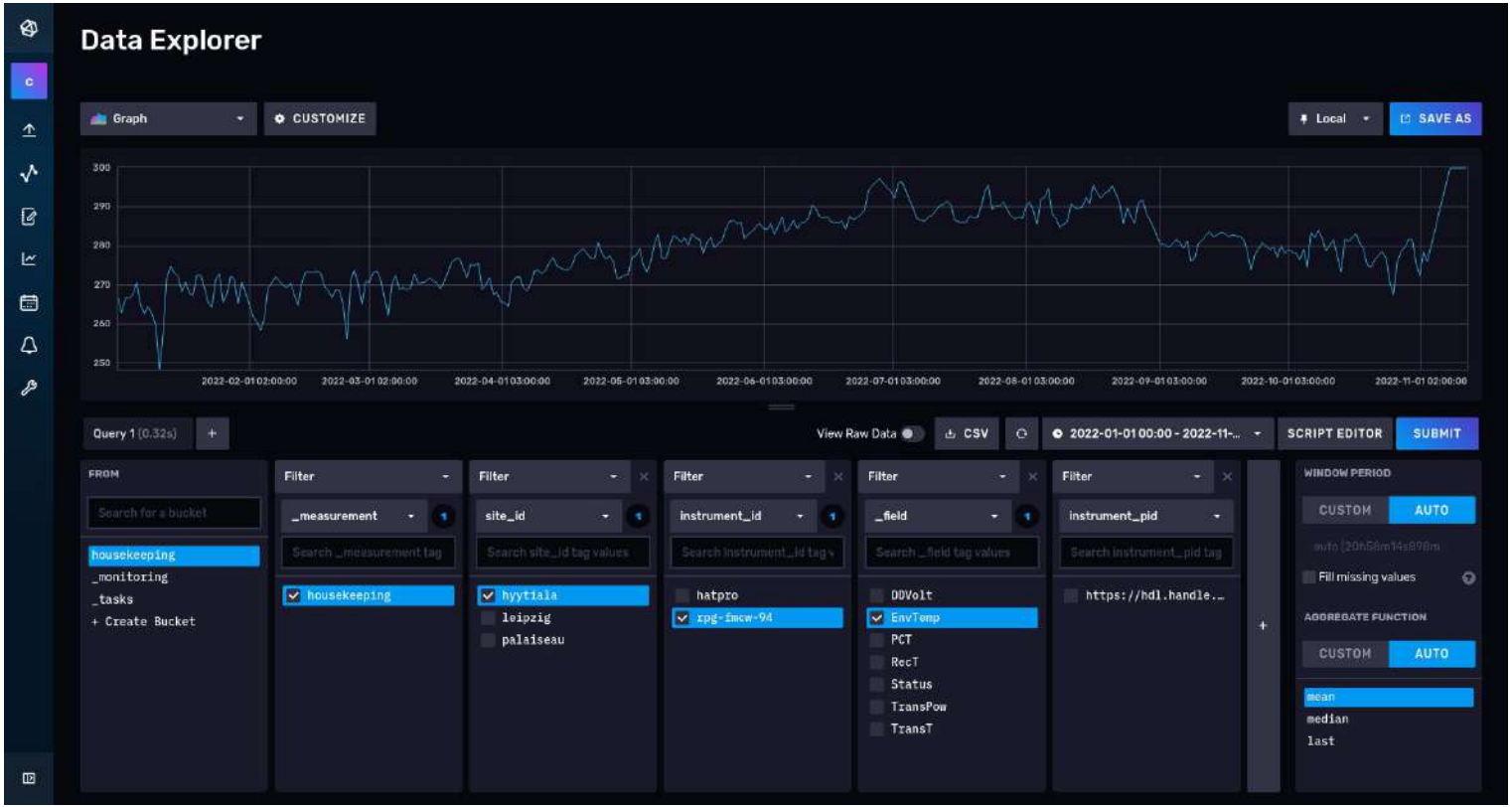
<uuid>/pi/?date=yyyy-mm-dd

JSON Raw Data Headers

Save Copy Collapse All Expand All Filter JSON

```
▼ 0:
    first_name:   "Dmitri"
    last_name:    "Moisseev"
    orcid_id:     "0000-0002-4575-0409"
    start_date:   "2021-06-01"
    end_date:     null
```

Housekeeping data



ACTRIS Vocabulary

- https://vocabulary.actris.nilu.no/skosmos/actris_vocab/en/
- Many missing items
  - Some instruments
  - Radar variables
  - Etc.
- Important for ACTRIS statistics / KPIs