



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



Tools for monitoring : storing HKD

- InfluxDB (<u>https://www.influxdata.com/</u>)
 - Timeseries database (1D data exclusively)
 - Optimized for measuring change over time
 - Can aggregate or downsample over time
 - \circ 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 (<u>https://grafana.com/grafana</u>)
 - 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

CRFS

- 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

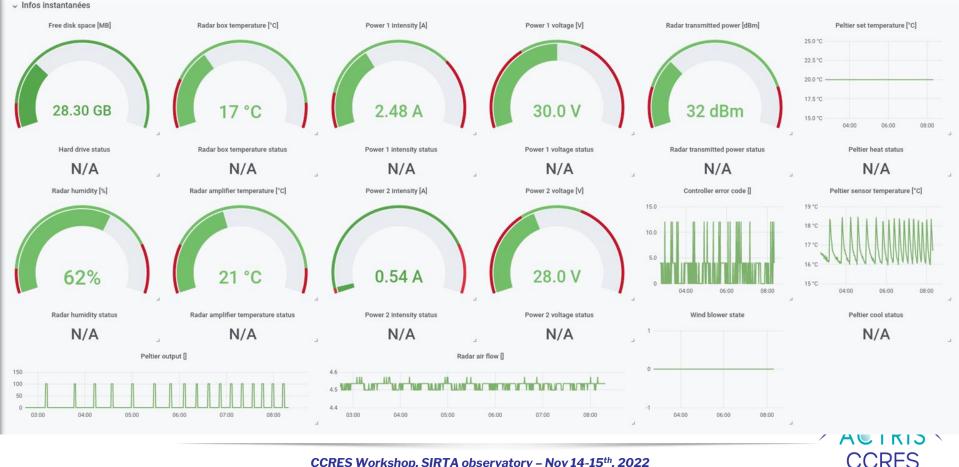
6. How long a problem need to last to trigger an alert?

- 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

Status example for BASTA DCR



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Alerts examples for BASTA DCR





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Status Example for HATPRO G2 MWR



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Alerts example for HATPRO G2 MWR



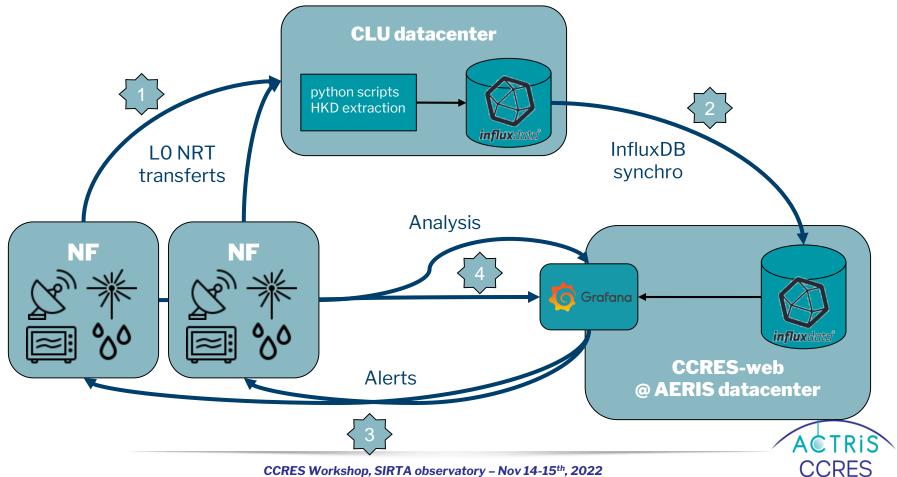


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Example of alerts summary

Système	s OK	Systèmes avec problèmes
BASTA Free disk space [MB] OK for 24 days		HATPRO* Ambient target stability ALERTING for 3 years
BASTA Radar amplifier temperature [°C] OK for 3 months		missing ratio low mode alert ALERTING for a year
BASTA Radar box temperature [*C] OK for 2 months		
BASTA Radar humidity [%] OK for a year		
BASTA Radar transmitted power [dBm] OK for 2 months		
CHM15K Error ext OK for 6 days		
CL31 Température du laser [°C] OK for 2 years		
CL31 Transmission de la fenêtre [%] OK for 6 months		Systèmes état transitoire
CL31 Énergie du laser [%] OK for 2 years		
HATPRO Quality flags OK for 2 years		
HATPRO Alarm flag OK for 2 years		No alerts
HATPRO Hum profiler OK for 2 years		
HATPRO Hum profiler diode OK for 2 years		
HATPRO Hum profiler stability OK for 6 months		
		AČTRI
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Proposed data flux

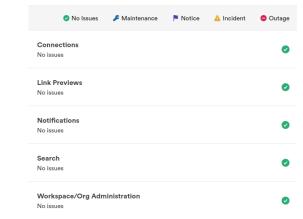


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Planned services for NF

•	Unlimited retention of HKD
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- 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

Ri

CRES



Thank you. Questions?

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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



Synergistic remote sensing during MOSAiC

KAZR

Ka-band cloud radar

KAZR (ARM)

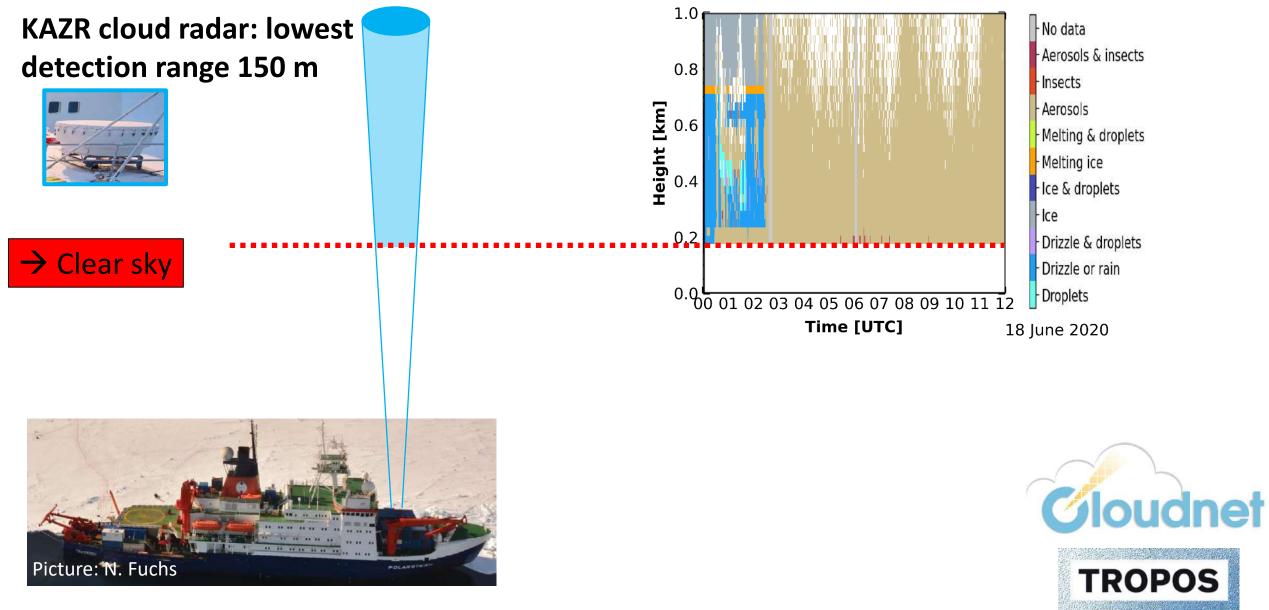
Triple-wavelength Raman lidar PollyXT (TROPOS)

Cloudnet

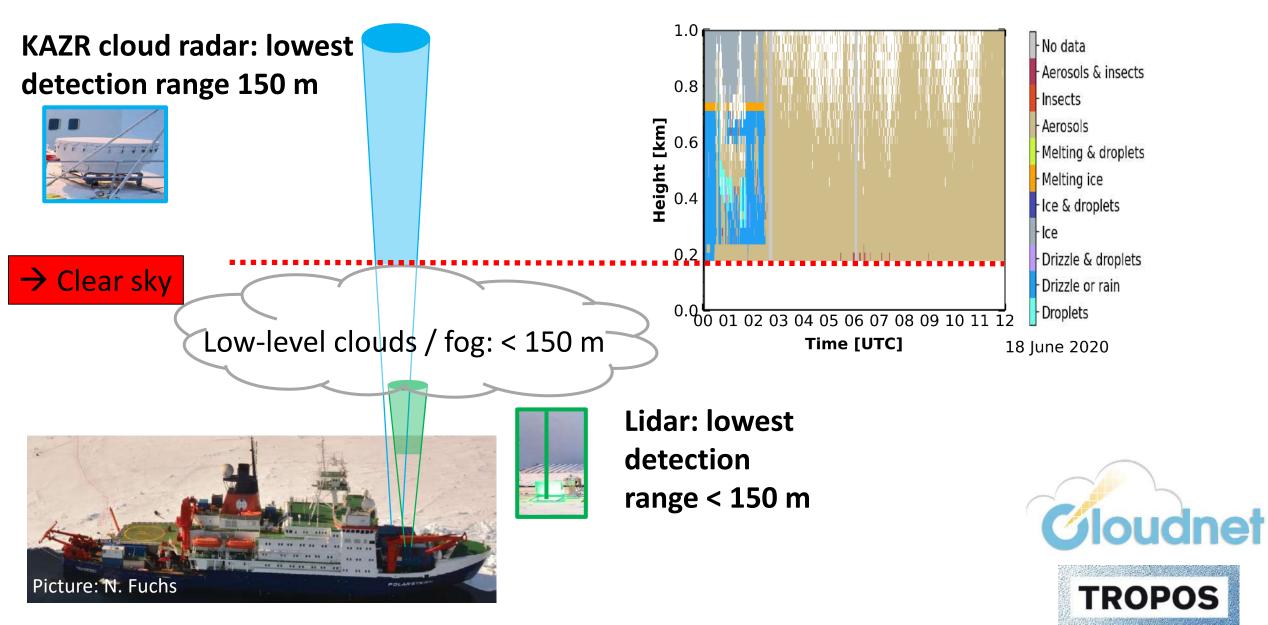
Microwave Radiometer HATPRO (TROPOS) + MIRAC-P (Uni Collogne)

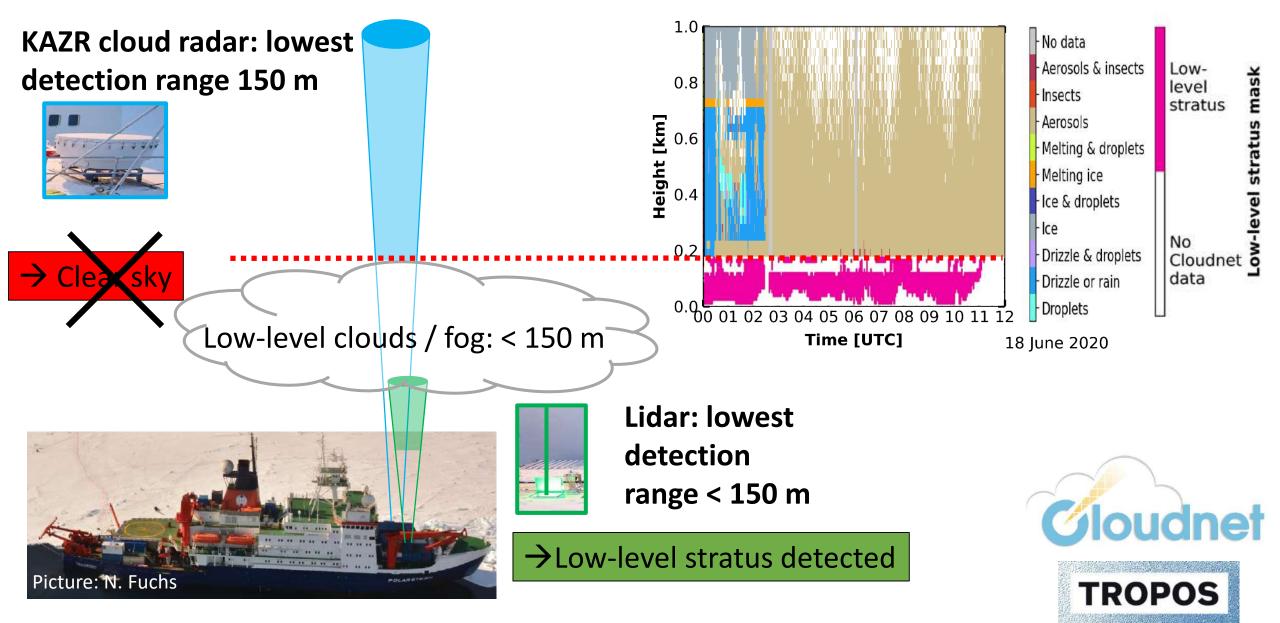
OCEANET-ATMOSPHERE + MIRAC-P

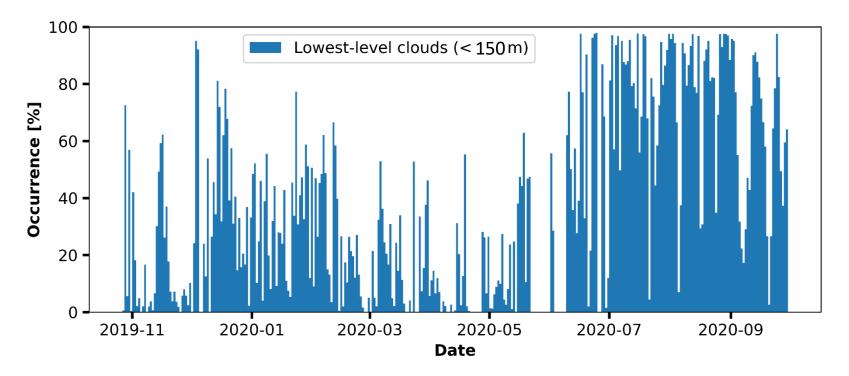
Foto: Michael Gutsche



Griesche, Hannes, CCRES Recent updates on Cloudnetpy







Occurred during 40% of observational time

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

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

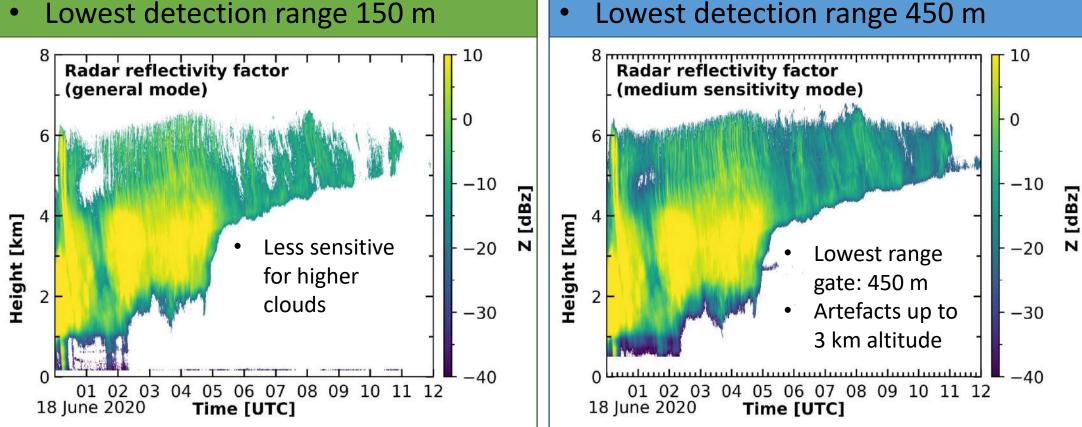
- Synergistic retrievals may fail to detect liquid water
- Problematic, e.g., for radiative transfer simulations



KAZR cloud radar:



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



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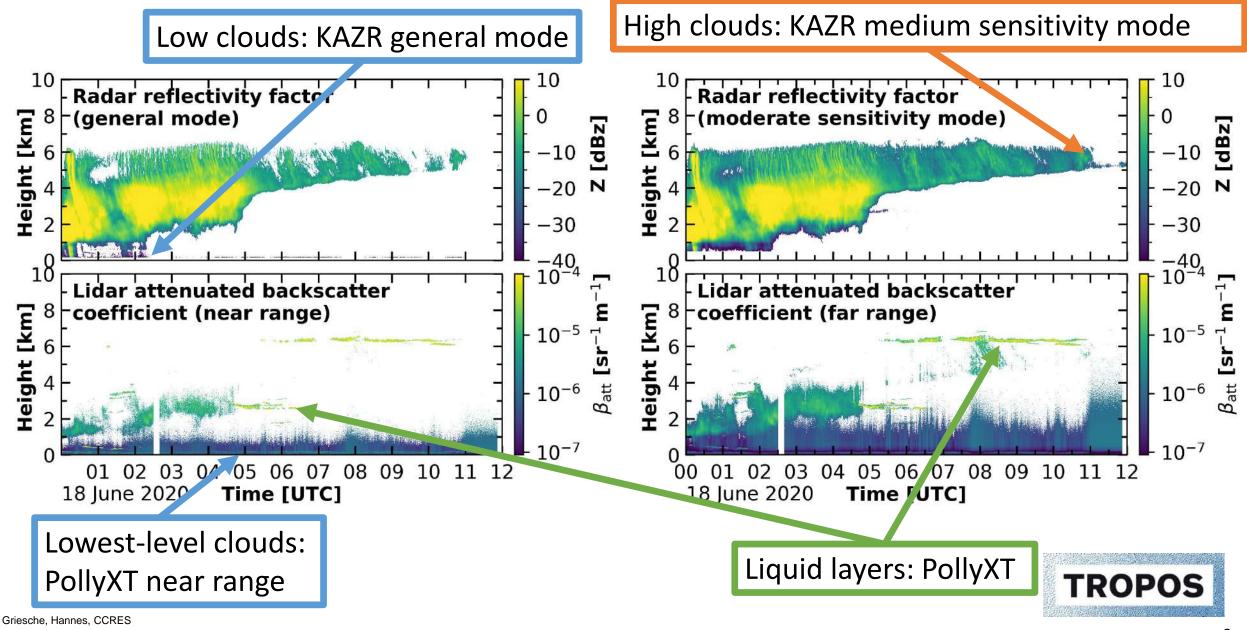
•

Medium sensitivity mode (MD)

KAZR reflectivity for 18 June 2020



Challenges of Arctic Clouds



Recent updates on Cloudnetpy

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:

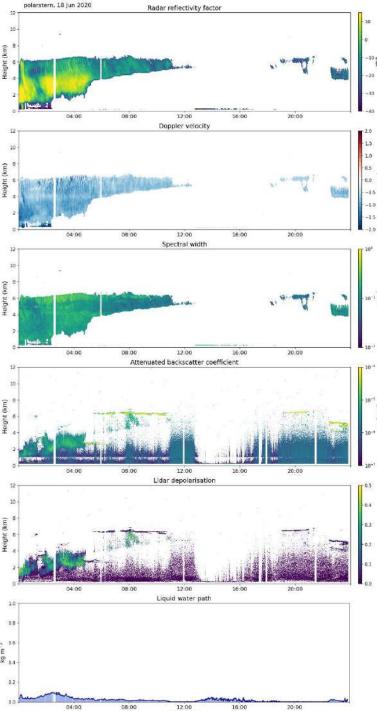
PollyXT near range (below 1 km)

- 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)
 <u>KAZR moderate</u> <u>sensitivity mode</u> (above 3 km)





Time (UTC)

Processing issues

2.0

1.5

1.0

276.0

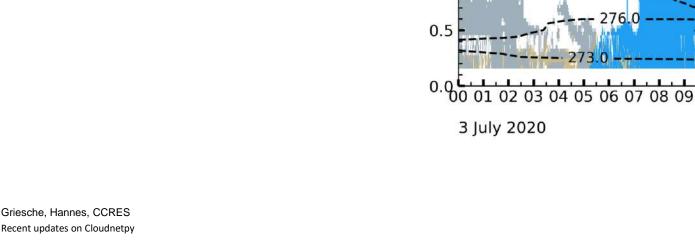
Height [km]

270

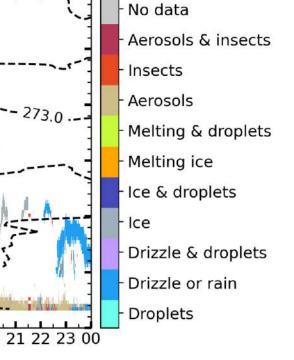
276.0

Time [UTC]

- Temperature at surface < 0°C
- In higher altitudes > 0°C
 - ➢ Whole column classified ₃.0 as ice
- GitHub issue created
- Workaround: check for highest altitude where T > 0°C









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19 20

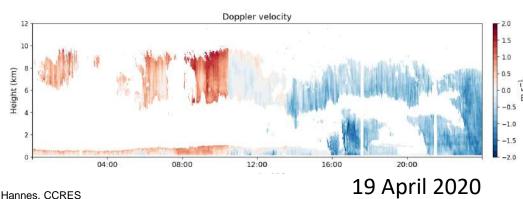
16

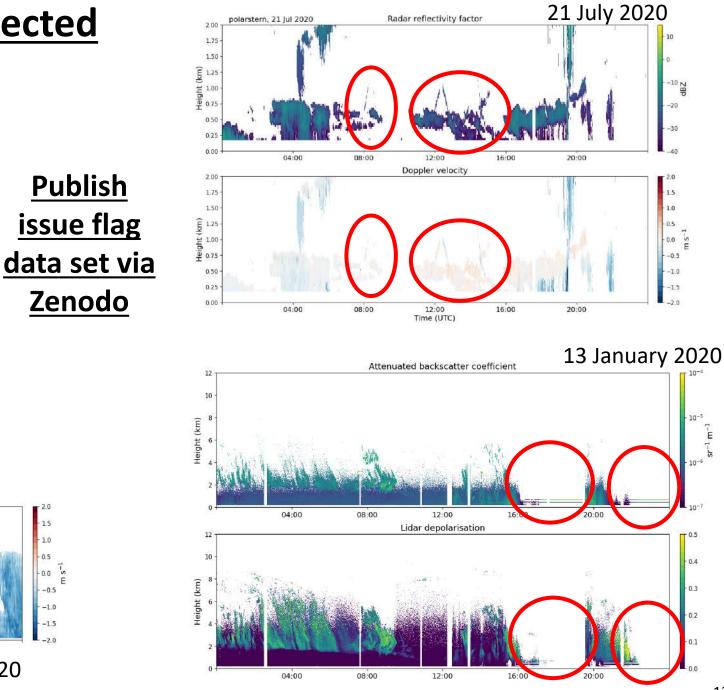
Data issues detected

Publish

Zenodo

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





Griesche, Hannes, CCRES Recent updates on Cloudnetpy

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 \rightarrow model input?
 - So far radiosonde used
 - GDAS1 available
 - How to handle ECMWF stream?

Thank you!





ACTRIS-Cloudnet

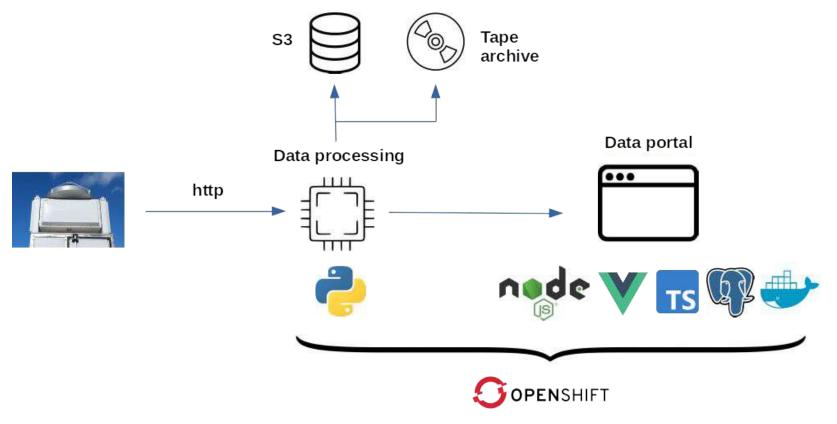
Simo Tukiainen, Tuomas Siipola, Niko Leskinen, Ewan O'Connor, Lauri Kangassalo[†], Anniina Korpinen[†]

ACTRIS Data Centre - CLU unit Finnish Meteorological Institute

Cloudnet services

- Data portal
- Data processing
- PID service
- Databases
 - \circ 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
 - o <sitename>:<password>
 - Still works

- Now: User-specific
 - <username>:<password>
 - {"site" = ...} in submission metadata

• Request credentials from <u>actris-cloudnet@fmi.fi</u>

Instrument database

- <u>https://instrumentdb.out.ocp.fmi.fi/</u>
 - Landing page and PID
- Information via form:
 - <u>https://docs.google.com/forms/d/1QIhNSf9YzUMzAL36B_lo_08C8jHin7k5yRjWhX_M6B8/</u>
- Stores location and PI
 - Check that information is correct
 - Inform us if the instrument moves / PI changes!

USE PIDs IN METADATA SUBMISSION

- o {"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.e7fe5a4f26ac4717
INOE MIRA-35	Bucharest	https://hdl.handle.net/21.12132/3.d98/6/d2bec94e5e
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/21.12132/3.38/97c8dce064e02
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/21.12132/3.191564170I8a4686
Uni Köln CHM15k	Jülich	https://hdl.handle.net/21.12132/3.324507c6ce8e489c
Uni Köln HALO	Jülich	https://hdl.handle.net/21.12132/3.48bd7da035b941fd
Uni Köln HATPRO-G5	Jülich	https://hdl.handle.net/21.12132/3.1668271e8d364263
Uni Kôln 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	Kenttārova	https://hdl.handle.net/21.12132/3.133e53dddde44495
FMI HALO 146	Kenttārova	https://hdl.handle.net/21.12132/3.a93d1483110742ff
FMI RPG-FMCW-94-DP	Kenttārova	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/21.12132/3.922bd0a8c7/34064
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

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
- Inear 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	Kenttårova
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

201	12	05	-23	-	

Ewan O'Connor

🐱 📵

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



Edit JSON XML

Microwave radiometer data from Galați (Actris) Volatile

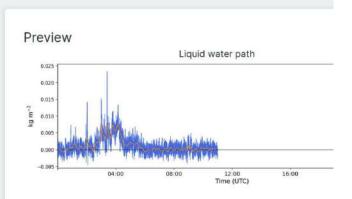
8 November 2022

Data sources

SUMMARY VISUALISATIONS QUALITY REPORT

Туре	Microwave radiometer	
Level	16 (definition)	
Instrument	DJUG HATPRO-G5 microwave radiometer	
Timeliness	Near Peal Time (NPT)	
Quality control	Osome 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 问	
Last modified	2022-11-08 11:12:44 UTC	
Licence	CC BY 4.0	

n/a



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

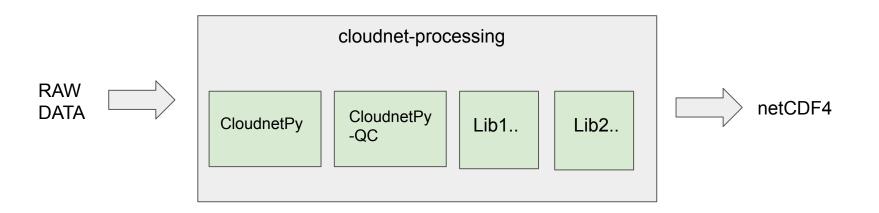
Citation

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
 - <u>https://github.com/actris-cloudnet/cloudnetpy</u>
- cloudnet-processing
 - <u>https://github.com/actris-cloudnet/cloudnet-processing</u>



Software

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

Quality control

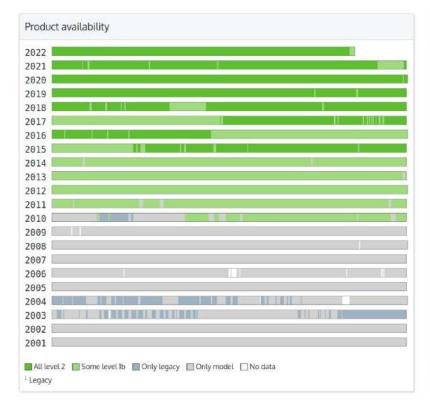
- https://github.com/actris-cloudnet/cloudnetpy-qc
- Evaluates the overall quality of a processed file

< Quality report

		QC SUMMARY		FILE INFORMATION	
1		Number of tests:	13	Filename:	20221106_ny-atesund_cl51.n
		Number of errors:	0	Processed:	2022-11-07 11:18:58 UTC
	92%	Number of warnings:	1	CloudnetPy version:	1.39.0
				Processing version:	27.6
	Test			Issues	
0	Data coverage Test that file contains e	nough data.		• 13% of day's data is mi	ssing,
0	Attribute outliers Find suspicious values	in global attributes.			
0	CF conventions Test compliance with t	ne CF metadata conventi	ons.		
	Data types Check that variables ha	ve expected data types.			
0	Global attributes				
	Check that file contains	required global attribut	es.		
	Instrument PID				
	Test that valid instrume	ent PID exists.			
-	Long names				
	Check that variables ha	we expected long name:	6		

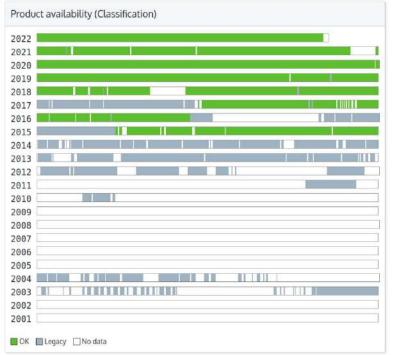
Range correction

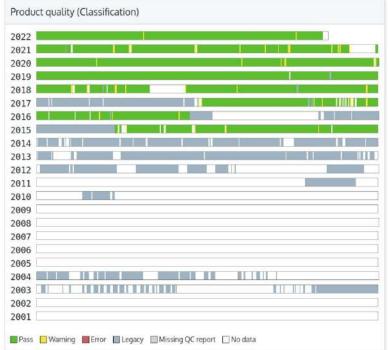
Overall availability / quality



2022					1 11 1	1111			
2021								11	
2020									
2019				1111	TUN	111			П
2018									
2017	4.1								
2016							1.0		
2015	1		1			11	1111		11
2014				1	1				
2013								1 11	11
2012	1 11				1				
2011									
2010									
2009									
2008									
2007									
2006	1	0							
2005									
2004				N.					
2003					-				
2002	1								
2001									

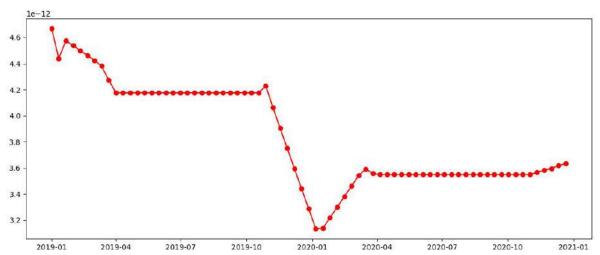
Individual products





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

assification da https://doi.org/10.0000/10.000000000000000000000000000	ta from Palaiseau (Actris) (Volatile) SUMMARY	VISUALISAT	IONS QUALITY REPORT	🛓 Download
Product		JSON	Preview	
Туре	品 Classification		Target classification	
.evel	2 (definition)			Ne data Arroadt & Intects
Imeliness	Near Real Time (NRT)		W Withheadth	Armols
Juality control	O Pass		and here a	Netting & douglets Noting ISP
leasurement date	2022-10-25		E.	tre & droptets tre Dritzle & droptets
ocation	Palaiseau, France		2 All all and a second and a se	Diszle or rein Ovoptets
File PID Filename	n/a 20221025_palaiseau_classification.nc		Be aware that this data is volatile and may be updated in the future	θ.
ormat ize	HDF5 (NetCDF4) 157.9 kB		Citation	BIDTeX FIS
Hash (SHA-256)	e371b3f (*)		Citation	DIDTEX HIS
ast modified	2022-10-27 09:13:14 UTC		Dupont, J. C., Kotthaus, S., Delanoë, J., O'Connor, E., and Haeffelin from Palaiseau on 25 October 2022", ACTRIS Cloud remote sensing the sensing sensitive	
licence	CC BY 4.0		https://cloudnet.fmi.fi/file/89f66215-58fc-48ef-aba4-1034356621	
Drigin			Please include the following information in your publication. Y suit publication standards.	ou may edit the text to
ata sources	👪 Categorize			
ersions	n/a		Data availability	
Software	Cloudnet processing 2.7.6 CloudnetPy 1.39.0		The data used in this study are generated by the Aerosol, Clouds a Infrastructure (ACTRIS) and are available from the ACTRIS Data Ce https://cloudnet.tmi.fl/file/88166215-5816-48et-aba4-103435b621	ntre using the following link:
			Acknowledgements	
			We acknowledge ACTRIS and Finnish Meteorological Institute for p	roviding the data set which
			is available for download from https://cloudnet.fmi.fi/.	

Citation

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

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

Citation

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Citation

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Lidar Radar MWR Model Site

NF labelling PI API

AGTRIS Labelling For

Log in

Leaflet | © OpenStreetMan

48.710°N 2149°E 160 m m.s.l

Site Instrumental de Recherche par Télédétection Atmosphérique (SIRTA)

Location

+

-

Туре

Observational platform

Country France

Hosting institutes

- Atomic Energy and Alternative Energies Commission (CEA)
- École Polytechnique
- French National Centre for Scientific Research (CNRS)
- Versailles Saint-Quentin-en-Yvelines University (UVSQ)

Website

https://www.sirta.fr

Contacts

Martial Haeffelin Facility Pl

Description

Observational platform, peri-urban site in Paris, suburban background

Components

Component type	Labelling status
Aerosol in situ measurements	Planned for 2021
Reactive trace gases in situ measurements	Planned for 2021
Aerosol remote sensing	Planned for 2021
Cloud remote sensing	Planned for 2021

JSON	Raw Data	Headers		
Save	Copy Collapse All	Expand All	🗑 Filter JSON	
▼ 0:				
f	irst_name:	"Martial"		
m	iddle_name:	null		

API



the second s
"Haeffelin"
"https://orcid.org/0000-0001-9889-1507"
"pi"
"Institut Pierre-Simon Laplace"

acronym:

"IPSL"

last name:

orcid id:

v organization:

ror id:

name:

role:

"https://ror.org/02haar591"

Instrument PI API

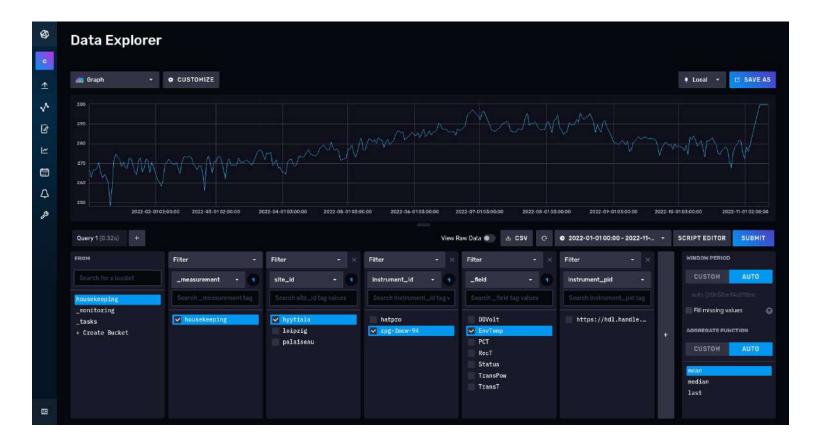
UH CL61		
ONCLO		
PID		
https://hdl.handle.net/21	.12132/3.241bda142975460b	
OWNER		
University of Helsinki (U	H) ROR	
MANUFACTURER		
Vaisala ROR		
MODEL		-
Vaisala CL61-D		Statement of the local division of the local
INSTRUMENT TYPE		
ceilometer		
MEASURED VARIABLES		
 volume linear depolari 		
 attenuated backscatte 	r coefficient	
LOCATION		
2021-06-01 -	Hyytiälä	
PRINCIPAL INVESTIGATOR		
2021-06-01 -	Dmitri Moisseev	a (0)
SERIAL NUMBER		
T2011180		
	ct or outdated information, plea	

API

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

JSON Raw Data	Headers
Save Copy Collapse	e All Expand All 🛛 Filter JSON
▼ 0:	
<pre>first_name:</pre>	"Dmitri"
last_name:	"Moisseev"
orcid_id:	"0000-0002-4575-0409"
<pre>start_date:</pre>	"2021-06-01"
end date:	null

Housekeeping data



ACTRIS Vocabulary

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