CLOUD REMOTE SENSING

Community workshop, September 2021

Objective and context

The Cloud Remote Sensing Community brings together a comprehensive network of researchers, instrument operators, and data managers operating Cloud remote sensing instrumentation, namely to Doppler W- or Ka-band Radars for cloud profiling, Microwave Radiometers for temperature and humidity profiling, Doppler Lidars for wind profiling, ALCs and disdrometers.

The Scientific and technical workshops geared towards the cloud remote sensing community are necessary to keep the community at the forefront of scientific and technical knowledge, through sharing of expertise and promotion of collaboration between participants. These workshops allow the CCRES (ACTRIS Centre for Cloud Remote Sensing) consortium to receive feedback from ACTRIS National Facilities and external users about the support and services provided, and to learn about new developments and methods that have been tested by the community.

The CCRES 2021 Workshop is the fourth CCRES workshop and was held online on the 21st September 2021.
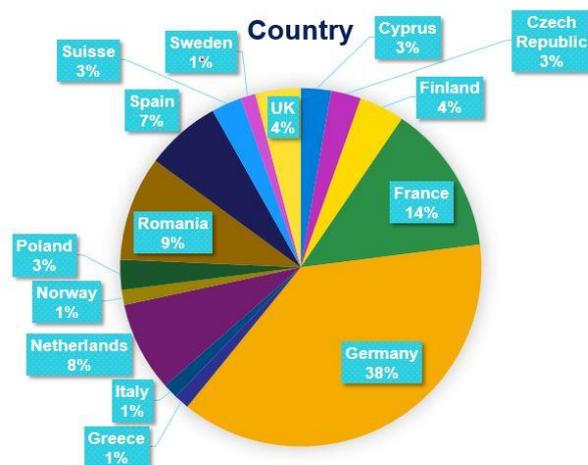
Participants

73	PARTICIPANTS
15	COUNTRIES
25	CRS NF REPRESENTED
3	INSTRUMENT MANUFACTURERS (RPG,METEK)

Country pie chart: Suisse 3%, Sweden 1%, Cyprus 3%, Czech Republic 3%, Spain 7%, UK 4%, Finland 4%, France 14%, Romania 9%, Germany 38%, Poland 3%, Norway 1%, Netherlands 8%, Italy 1%, Greece 1%

Agenda

Schedule	Sessions	Topics	Duration	Description	Speakers
Tuesday 21/09 09:00 – 11:00 CEST	**SESSION 1** Cloud Remote Sensing NFs	State of operation at ACTRIS NFs, higlights and new developments	10 min	Short opening: Presentation of the organisations and people participating, agenda, pad	Martial Haeffelin (CNRS, IPSL)
			1h10	Presentation of NF higlights and new developments (10-min presentations) . SIRTA, Tools and research at LATMOS laboratory . LACROS, CRS Update from the TROPOS team . SIRTA, ABL height . Hyytiala as the platform for linking snow microphysics and remote sensing observations . (...)	NF representatives
			25 min	Overview of station data availability: New permanent stations and campaigns	Ewan O'Connor (FMI)
			15 min	Presentation of the NF final list, instruments, issues and challenges in 2021	Alexandra Froment (CNRS, IPSL)
BREAK					
Tuesday 21/09 11:15 – 12:00 CEST	**SESSION 2** Cloud Remote Sensing DATA CENTRE	Status and plans for the data processing activities	45 min	. CLU processing chain on github . New instruments and individual instrument processing status . Requirements and requests . Quality control . Timeline for new products . Feedback mechanisms	Ewan O'Connor (FMI), Simo Tukiainen (FMI)
LUNCH BREAK					
Tuesday 21/09 13:30 – 15:45 CEST	**SESSION 3** CCRES services	CCRES facilities	10 min	Presentation of the five CCRES facilities	Martial Haeffelin (CNRS, IPSL), Bernhard Pospichal (UCol), Herman Russhenberg (TUDelft), Chris Walden (UKRI)
		DCR calibration strategy	1h20	. Available calibration methods . Research and perspectives . Calibration strategy and calendar	Felipe Toledo (CNRS, LATMOS) Jean-Charles Dupont (CNRS, IPSL)
			15 min	METEK, Sun scans: receiver calibration and pointing accuracy.	Matthias Bauer (METEK)
		MWR calibration strategy	30 min	. Available calibration methods . Research and perspectives . Calibration strategy and calendar	Bernhard Pospichal (UCol)
Tuesday 21/09 15:45 – 16:15 CEST	**SESSION 4** Cloud Remote Sensing DATA CENTRE	Status and plans for the data transfer activity	30 min	. API and data/metadata transfer monitoring . Discussion on housekeeping data and instrument monitoring . Calibration database - Radar-disdrometer monitoring - Manual radar calibration - ALC calibration	Ewan O'Connor (FMI), Simo Tukiainen (FMI)
BREAK					
Tuesday 21/09 16:45 – 17:30 CEST	**SESSION 5** CCRES services	Quality Assurance strategy	15 min	Disdrometers standard procedures and requirements	Jean-Charles Dupont (CNRS, IPSL)
			15 min	ALCs ongoing and future collaborations with associated commnunities and networks	Simone Kotthaus (CNRS, IPSL)
			15 min	MWR working group scientific objectives	Bernhard Pospichal (UCol)
Tuesday 21/09 17:30 – 18:00 CEST	**Conclusion**		30 min	ACTRIS WEEK objectives, planning and community future events	Martial Haeffelin (CNRS, IPSL)

9:00 - 11:00 Session 1. State of operations at ACTRIS NFs

NF planned events for 2021 and 2022: Alexandra Froment: CCRES campaign 4th October-29th October

1) **NF presentations**

- Tools and research at LATMOS, Susanna Jorquera

Is your cloud radar a commercial system? How could it be acquired? By means of a cooperation (as TROPOS is doing for the PollyXT systems)?

> Thank you for your interest. The LATMOS team is always open to stablishing new collaborations. I know BASTA is a commertial system, however, in this case I suggest writing to the project PI Julien Delanoë for more precise information (julien.delanoe@latmos.ipsl.fr). You can mention that you saw our presentation today and ask him your questions. (CC - susana.jorquera@latmos.ipsl.fr)

Thanks, Susana, for the information!

- CRS updates from the TROPOS team, Patric Seifert

- ABL height, IPSL, Martial Haeffelin

Martine Collaud: just surprised to see Payerne in complex topography and not Granada. But very nice results.

> Martial: Granada is both coastal and complex terrain. Do you mean that Payerne is surrounded by complex terrain but in a flat terrain?

I unfortunately missed the first slides of your presentation. Could you please tell me on which retrieval scheme the boundary layer height detection algorithm is based? Any special instrument required?

> Martial: For this testbed we rely on ALC measurements and two algorithms (STRAT-finder and CABAM). See Kotthaus et al. 2020. Remote Sens. 2020, 12, 3259; doi:10.3390/rs12193259

- Hyytiala as the platform for linking snow microphysics and remote sensing observations, Dmitri Moisseev

Martial: At what height are snow measurements made. How is falling snow distinguished from snow blown by wind? Good discussion that can be addressed this afternoon Session 3. A basic requirement of the dual-wavelength studies are good pointing accuracy and close-to-perfect radar calibration. Are there attempts taken within CCRES to create standard procedure documents which would "guide" new users through the most important steps?

Chris: CCRES will be developing procedures for calibration transfer between W-band and Ka-band radars as part of its strategy for calibrating NFs. The idea will be to use a reference radar. The methods will be applicable for cross-calibration of different frequency radars if NF sites have them. CCRES is also developing methods for monitoring pointing accuracy.

Dmitri: Good idea to have a standard procedure. Pointing and matching of beams is tricky, though

Chris: I'm thinking that identification of Rayleigh scatterers should be standardised, using e.g. the DFR plateau method.

Dmitri: We use the Rayleigh plateau method

- New developments at Lindenberg, Ulrich Gorsdorf

- New developments within ACTRIS-CH, Axel Murk

Job opening for ACTRIS-CH CRS at:
https://www.iap.unibe.ch/unibe/portal/fak_naturwis/b_paw/c_iaphy/content/e58456/e726662/e1120147/Job_Opening_UniBe_ACTRIS_2021_eng.pdf

2) **Overview of stations data availability: New permanent stations and campaigns**, Ewan O'Connor (FMI)

We had a campaign in Cabauw on wind retrievals with two scanning cloud radars.

Ewan: Would be great to test how to produce this within the processing chain (or create a separate product on a grid compatible with the vertical data)

Martial: The color-code for availability of data should be revised to communicate more positively about the hard work of the NFs of actually operating all instruments day after day .

Simo: The colors can be changed, but we need to be able to distinguish between legacy and new products, for instance.

You could use different shades of green to provide a more positive impression

Simo: Good idea. But we also want to encourage sites to submit historical raw data so that we can reprocess it.

Saverio: are you planning on accepting data from Parsivel Disdrometer too? Should them be processed (e.g. converted to NetCDF) before sending them?

Simo: Parsivel data can already submittted (many sites do it already) but it's not yet added to the processing chain. The work has been started but not finished yet.

Patric: We need to decide for a standard netcdf format. There's already the hdcp2 Parsivel2 format available. I could upload related code into github.

Saverio: Thanks! we also have done some work on that!

Simo: I would like to receive uniform files from Parsivel if possible. It will be pain if all sites submit different kind of files from a single instrument. That has slowed the implementation.

Patric: I added our disdrometer codes to https://github.com/lacros-tropos/parsivel2tools In order to create this data format directly, your Parsivel2 must be connected to a Linux computer via an RS485-to-USB converter and a specific data telegram must be set-up. See the README.md file for (a few) more details.

Dmitri: At what stage are you reporting the availability of data? After you have received it, or after you have processed it? I have noticed that some of our data is marked as not available, even though we have submitted it

>Simo: After processing, it's not the status of the submitted data.

Saverio: a clarification on the availability of data; do you add the flag "missing some data" when you do not receive LV0 files but just LV1?

>Simo: Even if we get only Lv1 it will be green (OK). The processing does not use LV0 yet.Saverio: thanks Simo. I have noticed the flag "missing some data" for Lutjewad (Ewan's presentation), but I have sent the LV1 data, let us know in case you miss something!

>Simo: I think I processed everything I got from Luljewad but I can double check it. You can always re-submit your whole dataset and see what the API responds. It's hard to know what I'm missing because I don't know the status of instruments on the sites.

11:15 - 12:00 Session 2. Status and plans for data processing activities, Ewan O'Connor (FMI), Simo Tukiainen

Christine: Do you have any future plans for possibilities to submit several observations e.g. refelctivities from two different cloud radars, or LWPs from different MWRs for the processing to provide kind of best estimate products?

>Simo: You can submit all but currently we use only one of them in the processing. This is something to think about in the future (products utilizing dual wavelengths?)

Ewan: We would like to generate dual-frequency products, but what you are suggesting is that we could also generate a single-frequency product for each? This would also be a good way to evaluate how well the processing harmonises data from different instruments. It would be a challenge to display all versions, but this could be done offline - or as a separate quality process.

Bernhard: For MWR, our CCRES unit in Cologne will develop the data quality checks

>Simo: Nice

>Bernhard: In future, all MWR/HATPRO will send raw data to CLU and products (LWP, T-profiles, etc.) will be generated there

>Simo: Good plan. What about PollyXT processing? Also at CLU or on sites?

>Patric: It is planned to be done at CLU. But based on the output from the central PollyNet processing (see https://polly.tropos.de). PollyNet already provides calibrated attenuated backscatter coefficient and volume depolarisation ratio.

- Users of PollyNet (so everyone who operates a Polly) can then decide freely whether to send the PollyNet output files to CLU for conversion into Cloudnet-compatible format.
- The PollyNet conversion routine was already created by Andi Klamt (new data manager at TROPOS) and will be given to Simo for discussion in the course of this week.
- If the calibration procedures which are currently applied within PollyNet are to be done centralized within ACTRIS, it will likely happen within EARLINET (single calculus chain), but not within CLU. The PollyNet processing includes generally all of the standard operation procedures of EARLINET (at least to my knowledge ;)).

Ewan: Will this be the output from the high resolution processor that Holger was looking at?

Patric: Yes.

Great! Would also be part of the synergy efforts too..

Yes, long-term goal should be that the data is transferred to CLU via the EARLINET Single Calculus Chain (optimum synergy! :)). In the meantime, we will take the shortcut via PollyNet.

13:30 - 15:45 Session 3. CCRES services and calibration strategy

- CCRES facilities, CCRES heads of unit

- DCR Calibration strategy, Felipe Toledo (CNRS IPSL), Jean-Charles Dupont (UVSQ, IPSL), Chris Walden (Chilbolton Observatory)

- Calibration tracking based on disdrometer measurements

- Absolute calibration method based on corner reflectors

- Calibration transfer by simultaneous sampling of clouds

Lukas (Cologne) - Here is Jose's Paper about matching a tripple frequency radar data set, Dias Neto et al., 2019: "The TRIple-frequency and Polarimetric radar Experiment for improving process observations of winter precipitation", Earth Syst. Sci. Data, 11, 845–863, 2019, https://doi.org/10.5194/essd-11-845-2019

Chris : Thanks.

- Sun scans: receiver calibration and pointing accuracy, Matthias Bauer (METEK)

- Retrieving antenna miss-pointing for vertical pointing cloud radar and correcting the introduced Doppler velocity errors in the measurements, Lukas Pfitzenmaier (UCol)

- Microwave radiometer calibration strategy, Bernhard Pospichal (UCol)

15:45 - 16:15 Session 4. Status and plans for the data transfer activity, Ewan O'Connor (FMI)

16:45 - 17:30 Session 5. CCRES quality assurance strategy

- Disdrometer Standard Operating Procedures, Jean-charles Dupont
Would not 30 sec be a more appropriate temporal resolution (4.2)?
Have you tried to compute Z bias as a function of D0? Because of the sensitivity to small droplets, there should be dependence on D0
About the Parsivel2 conversion, see also the comment by P. Seifert above
  - ➔ Link to the CCRES Disdrometers SOPs for comments: https://docs.google.com/document/d/1VOidswiZXha-PbaBg2IBRn9zIS1n0grn/edit

- ALCs ongoing and future collaborations, Ina Mattis
  - ➔ Link to CCRES ALCs SOPs for comments: https://docs.google.com/document/d/1PAPNdWc_VXGqcPMvXAO6wZGhNd51Ud7-/edit#heading=h.gjdgxs

- MWR working group scientific objectives, Bernhard Pospichal (UCol)
  - ➔ Link to CCRES MWR SOPs for comments: https://docs.google.com/document/d/1fqgwfrYs9aotUuIaa9G76AOHVYasHyQf/edit#heading=h.gjdgxs