Cloud Remote Sensing

Labelling process : Step 1B documentation

Performance evaluation of the National Facility

Version	Date
1	13.02.2026
2	25.02.2026

1. ACTRIS labelling process

A multi-step process has been established by ACTRIS to track the progress of the National Facilities (NFs) and validate compliance with the requirements of each Topical Center (TC).
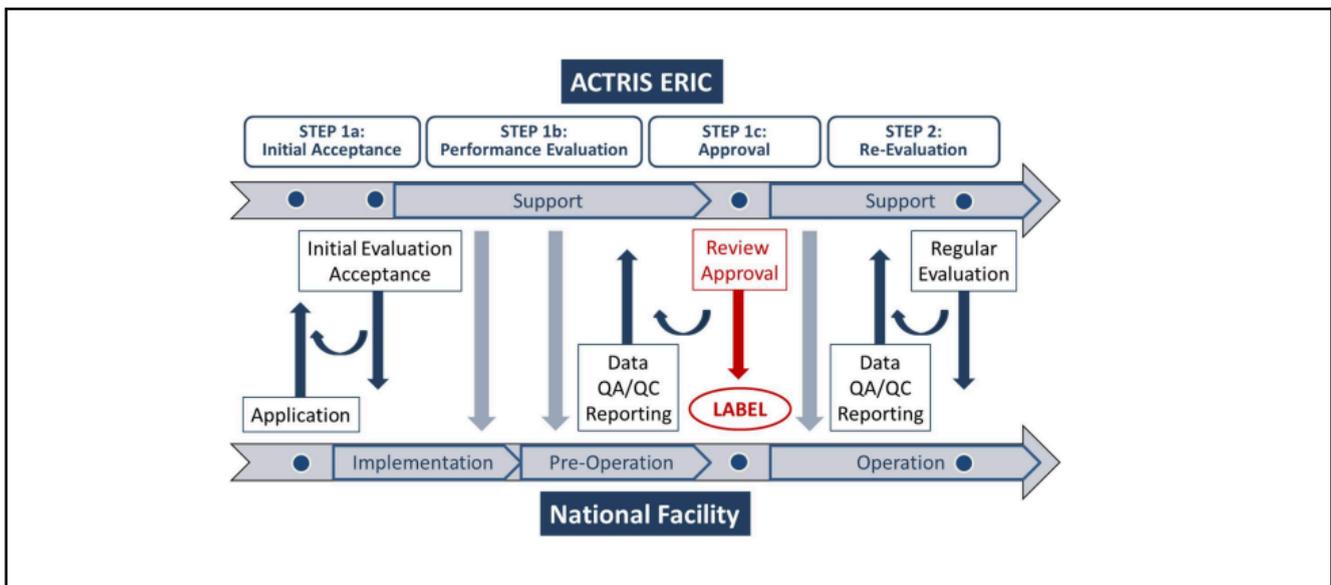

Figure 1: Diagram of the different ACTRIS steps

Step 1a: Initial Acceptance *(Duration: up to each NF)*

This initial step involves a general feasibility check of the proposal. During this phase, CCRES collects essential information regarding the variables, instruments, and personnel involved. The step concludes with the verification of the compliance with CCRES/CLU requirements.

Step 1b: Performance Evaluation *(compliance period: 24 months within 36 months)*

This stage focuses on evaluating the NF's performance over a compliance period requiring 24 months of validated data within a 36 month period. During this phase, a data flow and operational support schedule are established, while NF data compliance is continuously monitored. Facility upgrades may be conducted if necessary, potentially extending the evaluation timeline. The step concludes with a verification of compliance with CCRES/CLU data requirements (further details are provided in Section 2). Once 24 months of compliance are achieved, the NF is eligible for Step 1b certification. The full label is expected to be awarded within five years from the initial acceptance (Step 1a).

Step 1c: Approval

This final stage confirms the successful completion of the preceding evaluation phases. Upon approval, the Full Label is granted to the facility. This step is formalized by the signature of the ERIC and NF agreement.

2. Step 1B labelling process : overview

a. Overview

Once a station has been granted the labelling initial acceptance (step 1a), CCRES submits an annual evaluation assessing the number of months of compliant operation to the Head Office at the beginning of each calendar year, attesting that during the previous year, the National Facility has followed CCRES and CLU recommendations for their **nominal instruments**, regarding :

- Implementation of the Standard Operating Procedures (SOPs)
- Implementation of the upgrade plan (if needed)
- Calibration procedures
- Maintenance and regular check-ups of the instruments
- Availability and quality of data

b. General rules for all Topical Centers : principles established by the ACTRIS Head Office

75% Data coverage rule

The minimum 75% data coverage rule applies to the required dataset. Periods during which external factors prevent the acquisition of valid data (e.g., instrument maintenance, unsuitable

weather conditions, …) are excluded from the assessment.

Furthermore, coverage is assessed per variable, not per individual instrument. Therefore, for the coverage to be counted, all required instruments must be operational simultaneously to provide the complete variable data set.

Note for mobile facilities

All components should be labelled simultaneously. Audits will be conducted by each Technical Committee (TC), followed by subsequent recommendations. The formal Step 1b statement will be provided by the Mobile Platforms Coordination Group (MPCG).

Final evaluation

Once 24 months of compliance is reached in a 36 months period, a NF receives a certificate of step 1b completion and is thus approved for step 1c. Note that full step 1b label is expected to happen within 5 years from the initial acceptance.

3. Adapted CCRES procedure

The following tools will be used to verify that the National Facility has followed CCRES and CLU recommendations for their **nominal instruments**:

Criteria for step 1b	Validation
Implementation of the SOPs	Logbook[1]
The implementation of the upgrade plan	Conformity matrix
Calibration procedures	Logbook
Maintenance/regular check-ups of the instruments	Logbook
The availability and quality of data	CCRES and CLU tracking

a. Conformity matrix

This tool provides a **yearly overview** of key aspects of the Step 1b labelling process and facilitates continuous discussion **between the NF, CCRES, and CLU**. Note: It does not include data availability or quality assessments. It is structured like the Step 1a CCRES conformity matrix and has to be filled both by the PIs and the TC (CCRES and CLU).

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[1] Please refer to the CCRES to-do list

A table for each calendar year will be implemented.

								NF info	Validated	Blocking	
	Germany					Latest update by CCRES :	14/11/2025				
	Date of initial acceptance:	**23/05/2023**				Latest update by NF:			Not validated	Not considered	
	Facility PI :	Volker Lehmann									

					NF		**CCRES & CLU**				
		Instruments information			**Upgrade plan**		**SOPs compliance**				
Code	Instruments	Model	PID		Planned upgrade for the instrument	Implementation status	1. Maintenance	2. Calibration		3. Check-up		
A	Doppler Cloud Radar	Metek GmbH MIRA 35	https://hdl.handle.net/21.121 32/3.d6cc3d73f9dd4d4b		Renewal of Metek MIRA	OK	Radome change (RPG)					
B	Microwave Radiometer	RPG HATPRO G5	https://hdl.handle.net/21.121 32/3.442ec2ea9a24440e		None	N/A	Radome change (RPG)	LN2 calibration (RPG)	MWR 50% vertical pointing	MWR receiver T°C stability	MWR ambient target T°C stability
C	Automatic lidar & ceilometer	Lufft/Ott HydroMet CHM15k	https://hdl.handle.net/21.121 32/3.cdf99c536bd04146		None	N/A	TODO list			Laser status	State optics
D	Doppler Lidar	Halo Photonics/Lumibird Streamline XR	https://hdl.handle.net/21.121 32/3.423d89c1b5114af7		None	N/A					
E	Disdrometer	OTT HydroMet Parsivel2	https://hdl.handle.net/21.121 32/3.1b0966f63b2d41f2		None	N/A	TODO list				
F	Weather Station	DWD standard weather station	https://hdl.handle.net/21.121 32/3.ffb25f43330f4793		None	N/A					
G	Raingauge	Lambrecht rain[e]H3	https://hdl.handle.net/21.121 32/3.3292ee29e461405a		None	N/A					

Table 1 : Example for Lindenberg NF (version 02.2026)

The PI fills in the **"upgrade plan"** columns after having informed CCRES/CLU, who approves the changes when CLU confirms that the data is being sent to CloudNet.

The **SOPs implementation** is conducted by CCRES based on the actions reported by the National Facility (NF) throughout the year via the logbook. Compliance is confirmed if maintenance, calibration, and check-ups have been performed at the required frequency. Any missing actions are also documented.

CCRES and CLU will apply the following color code to the cells in the evaluation table:
- Green: Validated - Information filled or approved by CCRES and CLU
- Orange: Blocking - An issue has been identified.
- Blue: Information provided by the NF regarding the upgrade plan.
- Grey: Not considered - Element is not applicable or excluded from evaluation.

b. Logbook

The logbook will enable CCRES and CLU to assess the frequency and type of actions required for each instrument over a calendar year. The NF informs CCRES/CLU every time an action is done on an instrument, through the logbook.
The frequency and type of actions required are detailed in the CCRES to-do list available here:
📄 CCRES_NF_to-do_list.pdf
For more details please refer to each instrumental SOP.

These actions aim to ensure compliance with the SOPs, calibration procedures, maintenance protocols, and regular instrument check-ups.

c. CCRES/CLU tracking of data availability and quality

An evaluation of both data availability and data quality is performed.

- **Data availability** is calculated directly from the daily products available on Cloudnet using a data coverage metric (information available via the Cloudnet API).
  - A predefined sampling interval is expected, e.g., at least one measurement every 30 seconds.
  - The full day is divided into fixed-length time bins (e.g., 30 s), and the ratio of non-empty bins to total bins is computed.
  - The expected sampling resolution depends on the instrument type.
  - Daily data coverage is then retrieved, and a monthly average is computed for each product.
- **Data quality** evaluation is performed using the ReOBS tool (https://doi.org/10.5194/essd-10-919-2018). ReOBS aims to synthesize all Cloudnet products into a single NetCDF (.nc) file with a temporal resolution of one hour and a uniform vertical grid. Additional Quality Control (QC) procedures are applied (generally involving more restrictive flags/status than those associated with the initial products). A full documentation on the Quality Assurance (QA) and QC applied for each product is available here: 📕 REOBS-ATBD_DOC_CCRES_20260226_v1.docx.pdf
  - A set of core variables is defined for each product (e.g., reflectivity and Doppler velocity for radar). The quality evaluation proceeds as follows:
  - For each hourly time step, the presence of at least one valid value across relevant dimensions (e.g., height, velocity, diameter) is checked.
  - If at least one valid value is found, the time step is considered valid.
  - The ratio of valid hourly time steps over the total is computed, yielding a daily percentage of potentially valid quality data.
  - A monthly average is then calculated, following the same approach as for data availability.

#	Instrumental Products	Geophysical Products
1	**Disdrometer**	**Categorize**
2	Doppler Lidar (Vertical Stare)	**Classification**
3	Doppler Lidar (VAD/DBS)	DER
4	**Lidar**	Doppler Lidar (TKE)
5	**MWR - L1c (brightness temp.)**	Drizzle
6	**Radar**	IER
7	Rain-gauge	IWC
8	Weather station	LWC
9		MWR-multi (temperature profiles,

		...)
10		**MWR-single (LWP, ...)**

Table 2: List of step 1b considered products (18 maximum).

Products shown in **bold** in Table 2 are evaluated for Step 1b assessment (data availability and quality).

d. Approval of step 1b by CCRES

At the end of a calendar year, CCRES edits an annual report and submits it to the Head Office. The report attests whether the NF is compliant or not (the conformity matrix is all green). After 24 months of compliance within a period of 36 months, the NF is approved to enter step 1c through a final evaluation edited by CCRES and submitted to the Head Office.

4. Specific CCRES/CLU step 1b requirements

a. Instrumental

If the logbook was not yet available during the evaluated period, please provide the following information for each **nominal instrument**. Note: Analyses of Housekeeping Data conducted via Grafana can assist in the assessment of operational status.

Doppler Cloud Radar (DCR)
- Maintenance: RPG radars require radome replacement every six months. The minimum acceptable frequency for replacement is once per year.
- Check-up: vertical pointing compliance. At least 50% of the data collected within any given hour must correspond to vertical pointing observations

Microwave radiometer (MWR)
- Maintenance: RPG MWRs require radome replacement every six months. The accepted minimum frequency is once per year.
- Calibration: LN2 calibrations are recommended every six months. The accepted minimum frequency is once per year. Detailed instructions are provided in a separate document: LN2 Calibrations for RPG-MWR-HATPRO in ACTRIS. After each calibration, LOG files need to be sent to CCRES: actris-ccres-mwr@uni-koeln.de
- Check-up: MWR stability monitoring based on thresholds from RPG (independent from calibration):
    - The receiver temperature stability should be better than 0.03 K for both receivers.
    - Ambient target temperature difference should be below 0.3 K.

Automatic Lidar Ceilometer (ALC)
- Check-up:

- No more than 25% of the operational time should include periods where the laser status is below 70%.
        - No more than 25% of the operational time should include periods where the optics state is below 70%, excluding periods with precipitation (as indicated by the sky condition index).
- Note: High-power lidars are considered compliant if labelled by CARS; otherwise, they undergo an individual evaluation by CCRES.

b. Data availability and quality

As outlined in Section 2.b, an average data coverage of 75% for each variable must be validated for data availability. Regarding data quality, an average of 75% of "validated" data for each variable is considered the acceptable threshold.

These rules **must be validated** for each of the following **7 products**:
1. Radar
2. MWR-L1C (brightness temperature)
3. MWR-single (LWP)
4. Lidar
5. Disdrometer
6. Categorize
7. Classification