

## Deliverable 5.5: Report on training of NF and RPF operators

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## 1. Introduction

This report details training activities for ACTRIS National Facilities and Regional Partner Facilities understood in a wide sense, from exchange of expertise workshops, including online ones, to hands-on and remote training on instrumentation and procedures.

As stated in the description of ACTRIS IMP WP5 (Facilitating the harmonized operation of the National Facilities), task 5.5 (Exchange of expertise and training of National Facility and Regional Partner Facility operators) aimed “at providing a platform for operators to communicate ACTRIS concepts, share ideas and best practices, discuss user feedback to improve and enhance ACTRIS services, strengthen the exploration of synergies at the NFs and develop new concepts to assure long-term sustainability of service provision”.

To achieve this goal, initially three series of thematic workshops, dealing with remote sensing and in-situ measurements, as well as with atmospheric simulation chamber experiments of aerosol, clouds, and reactive trace gases were intended to be carried out, including the participation of international experts, plus dedicated training events, together with WP4 (Implementation and testing operation of the Central Facilities; see especially sections 2, 3 and 5).

The development of **task 5.5**, and of the project in general, cannot be considered independently of the COVID-19 global health crisis. Actually, the week after the ACTRIS IMP kick-off meeting (2-6 March 2020), generalized lockdowns and travel restrictions started all around the world. What at the beginning could seem only a drawback for the exchange of expertise and training activities, turned out to be (probably more than) balanced by the widespread use of teleconferencing tools, which even though could not completely substitute the face-to-face interaction between people, allowed the community to keep in contact through an “explosion” of online meetings and training activities.

After the gradual release of travel restrictions, more and more face-to-face events have been held, but keeping in general a hybrid option, since online participation (already existing before the lockdowns, but rather as an exception) has also been facilitated in general. In addition, purely online meetings are still being programmed.

Many of the activities have had, as expected, a strong involvement of the different Topical Centres and of the corresponding units of the Data Centre. This has been due to both the internal organization of ACTRIS around Central Facilities and the current implementation phase with the Central Facilities nucleating many of the training activities. However, the setting up of the National Facility Technical and Scientific Forum (NFTSF) in May 2022, should complete the framework to define the needs for training and exchange of expertise. In fact, since its implementation, the NFTSF has created a number of working groups, some of them having already held meetings in early 2023 to address several topics of interest for the progress of scientific and technical issues of the infrastructure. Both the Topical Centres and NFTSF are represented

in the Research Infrastructure committee, which is the main advisory body to ACTRIS ERIC Director General (fig. 1).

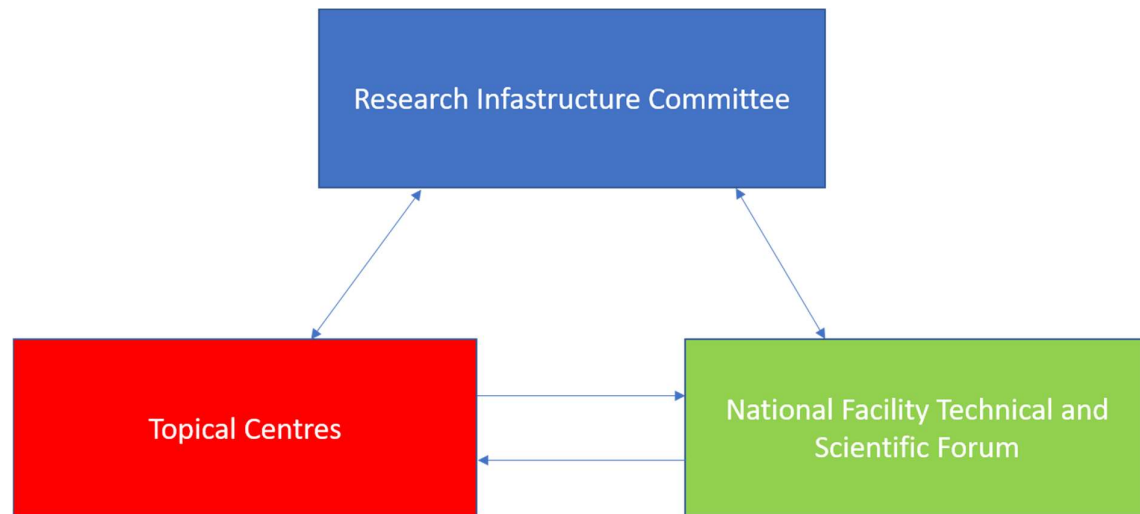


Fig. 1. Training activities and needs are defined by the dialogue between the Topical Centres and the National Facility Technical and Scientific Forum, both represented in the Research Infrastructure Committee.

The activities reported in this deliverable were in general not restricted to ACTRIS IMP partners, linked third parties, associated partners, and Regional Partner Facilities, but were kept as open as possible.

The deliverable is organized as follows:

- Section 2 details the thematic workshops held along the project, most of them online (when it is not the case, the place is indicated). The workshops that took place within the four ACTRIS Weeks, which, at least for the hybrid 3<sup>rd</sup> and 4<sup>th</sup> ACTRIS Week, favoured the interaction between communities, are highlighted.
- Section 3 mentions short meetings and webinars of the different ACTRIS communities and working groups that, for some ACTRIS components, namely the aerosol in-situ, the aerosol remote sensing and the trace gas remote sensing, were almost monthly.
- Section 4 lists courses and training activities organized by ACTRIS, ACTRIS IMP participants, or with ACTRIS participation in the organization and teaching.
- Section 5 details campaigns of instrument intercomparison and cross-check.
- Section 6 describes exchange of expertise and interaction with external scientists that has occurred in science sessions in some ACTRIS Weeks and in the ACTRIS Science Conference.

Note that training and exchange of expertise related to atmospheric simulation chambers (except when it took place within an ACTRIS Week) is not included in this deliverable, as it is already reported in the H2020 EUROCHAMP-2020 project.

## 2. Thematic workshops

The following workshops and meetings have taken place in close connection with the corresponding topical centres:

1. 6-8 July 2020. CARS-ARES workshop hosted by the University of Warsaw bringing together the aerosol remote sensing (ARS) National Facilities, the Centre for Aerosol Remote Sensing (CARS) and the Data Centre's Aerosol Remote Sensing (ARES) unit on the lidar near real time campaign carried out in May 2020 encompassing the final period of strict lockdowns in most of Europe and the early relaxation phase.
2. 8 October 2020. Doppler Cloud Radar working group meeting on data monitoring to develop best practices and harmonized procedures to monitor the Doppler cloud radar calibration constant with disdrometers.
3. 1st December 2020. 1st Cloud in situ community meeting.
4. 2-4 March 2021. CIS implementation workshop and community meeting
5. 20-21 April 2021. CIGAS workshop on the quality assurance of NO<sub>x</sub> and VOCs measurements.
6. 22 April 2021. ACTRIS aerosol in situ meeting on the labelling process, ongoing specific activities and studies related to aerosol in situ measurements and data submission, hosted by CAIS-ECAC.
7. 19 May 2021. 19 May 2021. Aerosol in situ community workshop on data QC and data submission organized by CAIS-ECAC.
8. 17 June 2021. Aerosol in situ community workshop: 1st part of preliminary recommendations for aerosol in-situ sampling, measurements, and analysis.
9. 21 September 2021. Cloud Remote Sensing community workshop.
10. 21 September 2021. Cloud in situ workshop.
11. 25 September 2021. Aerosol in-situ community workshop: 2nd part of preliminary recommendations.
12. 13-14 October 2021. Aerosol Remote Sensing workshop.
13. 1 February 2022. ACSM community workshop.
14. 8-9 February 2022. Reactive Trace Gases in-situ community workshop.
15. 5 April 2022. ACTRIS ACSM Data Submission workshop.
16. 27 – 29 April 2022. ACTRIS NO<sub>x</sub>/VOC Quality Assurance workshop.
17. 3-5 May 2022. CCRES online workshop.
18. 31 August -2 September 2022. Workshop on ground-based microwave radiometer operation (In presence at Research Centre Jülich).
19. 27 – 30 September 2022. ACSM Technical/Calibration workshop (Quad-ACSM).

20. 2 – 4 November 2022. ACSM Technical/Calibration workshop (ToF-ACSM).
21. 14-15 November 2022. Cloud Remote Sensing workshop (SIRTA Observatory, Palaiseau, hybrid format).
22. 15-16 November 2022. Center for Cloud Ice Nucleation workshop.
23. 22 – 23 March 2023. Data submission workshop for ACSM Quad and ToF.
24. 26 May 2023. Cloud Remote Sensing workshop.
25. 31 May 2023. Center for Cloud Water Chemistry workshop.

In addition, workshops of the different ACTRIS components have taken place within the four ACTRIS Weeks held in the ACTRIS IMP time span, namely:

1. 1<sup>st</sup> ACTRIS Week (26 - 29 October 2020, online event):

- Aerosol remote sensing workshop (26 - 27 October 2020)
- Cloud remote sensing workshop (26 – 27 October 2020)
- Reactive trace-gas remote sensing workshop (27 October 2020)
- In situ workshop, including the atmospheric simulation chamber community, and covering aerosol and reactive trace gases measurements (26 -27 October 2020)

The minutes of these 1st ACTRIS Week thematic workshops constitute milestone MS24.

2. 2<sup>nd</sup> ACTRIS Week (27 – 29 October 2021, online)

- Aerosol in-situ community meeting (27 October 2021)

3. 3<sup>rd</sup> ACTRIS Week (24 – 27 October 2022, Prague, Czech Republic, hybrid)

- CARS – ARES workshop (27 October 2022)
- CAIS -ECAC workshop (27 October 2022)
- CIS workshop (27 October 2022)
- CiGas workshop (27 October 2022)
- 27 October 2022)

4. 4<sup>th</sup> ACTRIS Week (24 – 27 October 2023, Heraklion, Greece, hybrid)

- CCRES workshop (26 October 2023)
- CARS – ARES workshop (26 October 2023)
- CAIS – ECAC workshop (26 October 2023)
- CREGARS workshop (26 October 2023)
- Atmospheric Simulation Chamber workshop (26 October 2023)
- CIS workshop (26 October 2023)

- CiGas workshop (26 October 2023)

### 3. Short meetings and webinars

Short meetings or webinars have been organized by CAIS-ECAC (9 meetings) and in a quasi-monthly basis by CARS and ARES (18 webinars) with the purpose of dealing with particular issues raised by the National Facilities served by these Topical Centres and to provide a quick training on good practices to the respective communities. Likewise, the trace-gas remote sensing community has met also with approximately monthly periodicity around GREGARS.

In addition, the microwave radiometer working group has gathered regularly the E-profile community and ACTRIS National Facility operators and users to define data formats. Similarly, the Automatic Lidar and Ceilometer (ALC) working group has organized meetings with the PROBE Cost Action and National Facility operators and users to work on ALCs procedures and best practices. To these, the meetings organized by the NFTSF working groups must be added.

### 4. Courses and training

We include here courses organized by ACTRIS, as well as courses not formally within it, but closely connected to ACTRIS and with ACTRIS members among the organizing institutions and the instructors:

1. 3 – 10 May 2021. Course on Atmospheric observation of aerosols, clouds, and trace gases (online, organized by University of Helsinki).
2. 18 – 29 October 2021. Hyytiälä Autumn School (organized by University of Helsinki with the collaboration, among others, of ACTRIS).
3. 2 – 10 May 2022. ACTRIS training course Atmospheric observations of aerosols, clouds and reactive trace gases (online, co-organized by ACTRIS, the Institute for Atmospheric and Earth System Research (INAR) of the University of Helsinki, and the Atmosphere and Climate Competence Center (ACCC) constituted by the University of Helsinki, Tampere University, University of Eastern Finland, and the Finnish Meteorological Institute)
4. 16 – 22 April 2023. ACTRIS CAIS-ECAC Aerosol In-Situ Course: Fundamentals & Methods for Aerosol Sampling and Physical & Chemical In-Situ Measurement (National Atmospheric Observatory Kosetice, Czech Republic).
5. 12 – 17 June 2023. AGORA Aerosol Training Course - Characterization of Atmospheric Aerosol using In-situ and Remote Sensing Techniques (organized by AGORA atmospheric observatory, University of Granada, Spain, in collaboration with ATMO-ACCESS and ACTRIS).
6. 27 – 29 June 2023. ATLAS hands-on training (organized by CARS at Magurele, Romania)

7. 11 July 2023. Capabilities of the discrete dipole approximation for simulating optical properties of atmospheric aerosols (seminar by Dr. Maxim Yurkin (Özyeğin University), organized by CARS and NOA).
8. 30 October – 3 November 2023. Autumn School: Atmospheric measurements using drones and mini sensors (organized by The Cyprus Institute, Nicosia, Cyprus)
9. 6 – 10 November 2023. Atmospheric and Environmental Research Infrastructure Online Training (organized by National Atmospheric Observatory Kosetice, Czech Republic, in collaboration with ATMO-ACCESS)

## 5. Instrument intercomparison and cross-check campaigns

Training has also been carried out through intercomparison and cross-check campaigns allowing both National Facility operators and Topical Centre staff to improve the instruments and the operating procedures. Although hampered at the beginning of the project by travel restrictions associated to COVID-19 pandemic, the following campaigns took place:

1. 3 – 7 May 2021. Microwave radiometer intercomparison campaign (Lindenberg, Germany).
2. 20 September – 1 October 2021. Calibration, intercalibration and training workshop for aerosol particle counters (<10 µm) (ACTRIS Cluster Calibration Center (CCC), Kumpula campus, Helsinki, Finland).
3. 17 January – 31 March 2022. ACTRIS -ECAC-ERLAP OC-EC 2022 inter-laboratory comparison (organized by ERLAP, JCR).
4. 12 – 20 September 2022. First reference lidar intercomparison at CARS (Magurele, Romania).
5. 21 November – 5 December 2022. First CIS intercomparison for Liquid Water Content (Austria)
6. 27 February – 10 March 2023. ACTRIS intercomparison campaign of chemical ionization mass spectrometry to measure condensable vapours (organized by TROPOS and University of Helsinki, TROPOS, Leipzig, Germany).
7. 19 – 30 June 2023. First ACTRIS NO/NO<sub>2</sub> intercomparison campaign (Forschungszentrum Jülich, Germany).

## 6. ACTRIS Science Conference and sessions in ACTRIS Weeks

Specific sessions in ACTRIS Weeks and the ACTRIS Science Conference have been a forum for communicating results and exchange of expertise both intra-ACTRIS and to and from the ACTRIS community and the scientific community external to ACTRIS. The following activities have taken place in the ACTRIS IMP duration:

1. 1st ACTRIS Week (26 – 28 October 2021):
  - Scientific session on ACTRIS and COVID-19 (27 October 2021).



- Scientific and technical session on synergies between ACTRIS components (28 October 2021).
2. 1st ACTRIS Science Conference (11 – 13 May 2022) with sessions on:
- Climate change
  - Air quality
  - ACTRIS science with other environmental research infrastructures
  - Measurement technologies and innovation
  - Results from exploratory platforms
3. 2nd ACTRIS Week (27 – 29 October 2022):
- ACTRIS Science session (28 October 2022).