

Milestone 5.5: First series of NF technical workshops on new developments for the observation of aerosol, clouds and reactive trace gases performed

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1 Introduction

Originally a series of technical workshops for the whole ACTRIS community was planned. During the course of the ACTRIS IMP project it turned out, that due to the big variety of instruments and measurement methods smaller workshop within each Topical Center are much more efficient. The structure of this document reflects this unforeseen change.

2 Scope of this document

This document summarizes the ongoing technical discussion with regard to NF's. There is a chapter for each of the six Topical Centre. The documentation of the discussions in the form of meeting minutes, meeting agendas, presentations and action items is also divided in six corresponding folders. Almost all meetings were held virtually.

3 Summary of NF technical workshops

Technical discussions in ACTRIS comprise the following topics:

- Terms of procedure including specification of instrument calibration
- Details of the labelling procedure
- Data formats
- New hardware developments
- New retrieval algorithms

There have been numerous workshops and meetings within each Topical Center (TC). The main topics of each TC are briefly described in the following subsections. The corresponding documents (meeting minutes, talks, ...) are available in the related folders here: https://drive.google.com/drive/folders/1B2YqSsgiVVASzfx_Pz90nw4kd7B4Nw16?usp=sharing

3.1 CIS - Centre for Cloud In Situ

CF Leader: Kristina Höhler

CIS is the least mature Topical Centre of ACTRIS. Therefore, the organisation and allocation of responsibilities of the CIS units and the future CIS National Facilities dominated the agenda of the CIS meeting on 1 December 2020 with the aim to accelerate the implementation process. However, technical details and planned new developments have been discussed right from the beginning. For example, the instrument development with regard to usage on drones is an intensively discussed topic. The development and commercialisation of a European PVM (Particle Volume Monitor) instrument, as the American manufacturer is currently unable to supply equipment and spare parts is another project.

In the networking event between 2 March 2021 and 4 March 2021 labelling procedures, measurement variables and instruments calibrations have been addressed.

Ice Nucleating Particles (INP) and the related instruments and QA/QC procedures have been targeted by the workshop on 21 September 2021.

3.2 CARS – Centre for Aerosol Remote Sensing

CF Leader: Doina Nicolae

Between 16 February 2021 and 8 February 2022 eleven virtual meetings were carried out. Topics discussed related to new developments were:

- Rotational Raman Lines (RRL) and interference filters (IFF)
- An empirical method to correct for temperature-dependent variations in the overlap function of CHM15k ceilometers
- Solutions for overlap correction
- Lidar Inversions with Pure-Rotational Raman channels as an alternative to Vibro-Rotational channels
- Backscatter calibration (examples & discussions) and best resolution and full range optimization
- The influence of the dark signals on lidar products
- Alignment optimization and overlap function estimation in stepper-motor controlled lidars
- Need of opto/mechanical advises on the COPLid upgrade (full overlap issue + add of a new polarised channel)

There have been several research projects planned using different ACTRIS related funding schemes, such as:

- Scanning aerosol lidar for lowermost layers
- Development of a compact mobile aerosol Lidar
- New bistatic lidar with Pandora and CCD cameras

3.3 CAIS-ECAC – Centre for Aerosol in situ

CF Leader: Alfred Wiedensohler

Already 6 Aerosol in situ workshops took place between 22 April 2021 and 27 January 2022. A calibration, intercalibration, and training workshop for <10µm aerosol particle counters have been organized between 20 September and 1 October in Helsinki. The main topic of the Community meeting (1 February 2022) was the measurement standardization and data submission protocol for aerosol particle mass spectrometry based on aerosol chemical speciation monitor (ACSM) products.

Apart from typical implementation issues like harmonisation of the ACTRIS measurements with existing networks like GAW (Global Atmospheric Watch) and the discussions concerning the labelling process of NF, new developments and related research like the lockdowns' impact on new particle events across Europe have been discussed.

3.4 CREGARS – Centre for Reactive Trace Gases Remote Sensing

CF Leader: Martine De Maziere

On the one hand, the discussions within the Cregars community aimed at harmonising the measurements with the existing networks

On the one hand, the discussions aimed at harmonising the measurements with the existing networks (NDACC - Network for the Detection of Atmospheric Composition Change, ESA - European Space Agency, PGN – Pandora Global Network), on the other hand, concrete research ideas of the individual units were jointly planned. Therefore representatives of NDACC, ESA and PGN and GRES (Trace gases remote sensing data centre unit - <https://gres.aeris-data.fr/>) participated in the regular CREGARS meetings on 17 December 2020, 19 October 2021 and 23 December 2021. Two new developments are already planned in detail:

- SWING - a compact imager prototype for airborne measurements of NO₂ and SO₂
- Pandora-CST - a camera based solar tracking Pandora

3.5 CiGas – Centre for Reactive Trace Gases In Situ

CF Leader: Ralf Tillmann

CiGas will focus on the implementation of the following compound analytical techniques (ordered by implementation times):

- Non-Methane-Hydrocarbons as measured by thermal desorption GC-FID/MS; NO_x by Chemiluminescence detection
- oxygenated volatile organic compounds by PTRMS and TD-GC-MS
- NO₂ Detection by Iterative Cavity Enhanced DOAS
- Formaldehyde Detection by Laser Absorption Spectroscopy and Condensable Vapors by Chemical Ionization-Atmospheric Pressure Inlet-Mass Spectrometry

The first CiGas Community workshop took place on 8 and 9 February 2022. 54 participants actively joined the event.

Furthermore, a data quality assurance workshop took place. Numerous management meetings were carried out in addition. Minutes of these meeting are not presented here, since the focus of this document is on new developments. However, for implementing new techniques in a coordinated manner, such meetings are indispensable.

3.6 CCRES - Centre for Cloud Remote Sensing

CF Leader: Martial Haeffelin

The most crucial topic at the moment in CCRES is the labelling of the NFs. We have developed instruments requirements for all CCRES instruments: Doppler Cloud Radar (DCR), Microwave radiometer (MWR), Doppler lidar, ceilometers and disdrometers. With these recommendations we also have distributed Standard Operating Procedures to the NFs for each instrument to ensure the best quality of the measurements. At the moment we are working on the calibration strategy for the DCR and MWR of the NF network. However, despite the focus on the operational procedures, NF highlights and new developments have been presented at each meeting. Furthermore, we have been testing some methods and new procedures during our calibration campaign in fall 2021 and we are hoping to start the calibrations soon in order to start the labelling process. CCRES physical meetings took place on 29 and 30 November 2018 in Paris, on 18 and 19 November 2019 in Rome and virtually on 21

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September 2021, 11 January 2022 and 17 January 2022. The last meetings focused on planning and evaluating the CCRES calibration campaign.