

Deliverable 4.6: Report on testing activities at CFs, outcomes and identified optimization actions

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1. Introduction

The focus of WP4 of ACTRIS-IMP is to establish the functionalities of ACTRIS Central Facilities (CFs) as European-wide distributed facilities. This includes the interconnections between CFs, the refinement of the implementation plans, facilitating the connections to other ACTRIS components and the evaluation of selected operation support and services. The latter is addressed in deliverable 4.6. This document reports on the evaluation of the operation of the Topical Centres (TCs), the outcomes of this evaluation and the identified optimization actions. Due to the fact that ACTRIS is still in the implementation phase, with the operation support ramping up but not yet at full capacity, we do not consider this test and its results as being completely relevant for the operations of the Central Facilities. Nevertheless, it is a good exercise for collecting the feedback, an exercise that should be repeated regularly during the operational phase of ACTRIS.

2. The testing methodology

The way of testing the functionalities of the TCs was described in the milestone MS4.7: "Collection of the first feedback on the operation support provided to National Facilities". The milestone also contains the questionnaire. Here, we give only a short summary.

To get feedback on the operation support provided up to now, we chose the testing methodology of a survey. The advantages of this kind of testing methodology are that it can be implemented fast and efficiently, the data is available timely, the data set is homogeneous and it can be extended over large time periods and large communities. Such an online survey is the easiest way to reach all the international members of ACTRIS.

Our survey consists of 4 parts:

- Part 1: General information,
- Part 2: Access and Communication,
- Part 3: Operation Support (HO, DC, TC, Technology/Innovation support) and
- Part 4: Overall assessment.

Part 1 of the survey focused on the type of the CF which granted support, the type of support the user got, and on the group of persons who received the operation support. This information was a necessary prerequisite to classify the feedback given later in part 3.

Part 2 covered information about access and communication. This information was specifically requested in order to assess the "access conditions" the users perceived when getting operation support. The reason behind was that access and the way access is provided is a critical point when the user decides or needs to get operation support. Therefore, the modalities to access the operational support should be as clear and easy as possible.

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Part 3 is the core of the survey. It was divided into four subsections. Section 1 dealt with the "ACTRIS management operation support", so the support granted by the Head Office. Section 2 covered the operation support offered by the Data Centre, Section 3 dealt with the operation support granted by the TCs and, finally, section 4 covered the technology and innovation operation support.

The survey was developed as a collaborative effort of 4 TCs: by the Head Office (HO), the Data Centre (DC), the Centre for Aerosol Remote Sensing (CARS) and the Centre for Aerosol In-Situ (CAIS-ECAC). These TCs were chosen because they provided already operation support. The other TCs were still under construction. The 1st draft was ready in November 2022. The format of the survey was given 4 iterations until the final version. In March 2023, the poll was placed on the ACTRIS website and was open for the ACTRIS community. Due to very limited feedback in the beginning, we gave the survey several rounds. After the 3rd run, we closed the poll.

3. Outcome of the survey

In this section we present first an overview of all results we received from the community. Then we discuss the difficulties we had with the answers. Finally, we describe the feedback received for two individual TCs: CARS and CAIS-ECAC.

3.1 Overview and Problem

In total, we got 46 responses. The participants evaluated the operation support given by the Head Office (HO), the Data Centre (DC), the Centre for Aerosol Remote Sensing (CARS), the Centre for Aerosol In-Situ (CAIS-ECAC), the Centre for Cloud Remote Sensing (CCRES), the Centre for Reactive Trace Gases Remote sensing (CREGARS), the Centre for Cloud In-Situ Measurements (CIS) and the Centre for Reactive Trace Gases In-Situ measurements (CiGas). The number of responses received for each TC is presented in Fig. 1.

Most of the answers were given for operation support provided by CARS, followed by DC and CAIS-ECAC. The majority of the responses were given by senior scientists (71%). Young scientist represented 17% of the participants, while engineers, PhD students and CF/NF managers contributed less than 5% each. The most relevant types of operation support activities identified were QA/QC operation support and data operation support. Technological/innovation operation support and management support were less accessed, as shown in Fig.2. Participants acknowledged that the most effective ways to get information about the existing operation supports (were, when and how to get access), were via an announcement during a workshop (28%) or by a direct e-mail from the respective TC (24%). Communication of the National Contact Person (16%) and the ACTRIS webpage (14%) was considered less popular but still useful means of information by users, as shown in Fig.3. Regarding the quality of the communication, the community was satisfied (52%) or completely satisfied (36%) regarding the way it was organized (Fig.4). Also, the access to the TCs/operation support was evaluated positively as being easy (38%) or very easy (29%).

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Section 3 of the survey dealt with the operation support granted by the TCs. Topics offered to the community were Data QA/QC, general lecture/tutorial/webinar, instrument intercomparison/calibration at TC, on-site intercomparison, instrument operation, consultancy in choice of instrument for implementation, audit and data intercomparison. The most popular topics were the first three with 77%, while only 23% of the responders pointed out the other topics (Fig.5). Questions concerning the management and the procedure of the operation support were answered very positively. The survey participants stated that the time frames for the workshops were very appropriate, the instructors were able to convey the knowledge, and that the participants learned something new and useful.

About 56% of the participants received the support as consultants. 46% of the survey participants received operation support as technology/ innovation operation support. The most frequented topics in this field was data QA/QC, general lectures and instrument operation. The management and the procedure of support was, again, evaluated very positively.

In total, the participants were satisfied or completely satisfied with the contents conveyed, as well as the staff providing the support. The operation support in general was evaluated "very good" and "good" by the majority of the participants, only few criticisms being expressed (Fig. 6).



From which Central Facility did you get support?

Figure 1: Overview of the TCs which were evaluated by the survey

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Which kind of support did you use?

Figure 2: Overview of the type of support accessed



Figure 3: Sources of information for accessing the operation support

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Figure 4: Evaluation of the communication before and after the operation support

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What was the workshop you attended about?

Figure 5: Overview of the type of workshop frequently accessed

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General Satisfaction

Figure 6: Degree of the general satisfaction of the survey participants

Although the results of the survey look very good at a first glance, a certain problem was identified: we asked the survey participants to fill in the survey for each single operation support they received, and to evaluate only one operation support per survey. However, most of the people (57%) ignored this instruction and evaluated different support items within one poll. As a consequence, we got only an average view on the quality of the operation support in most cases. The results shown above reflect mainly the general perspective. Only a few participants adhered to the instruction and filled one survey for one support item. From this minor sample of responses we managed to identify specific feedbacks received for CARS and CAIS-ECAC. The results obtained for these two TCs are analysed in the following sections. For all the other TCs only a single, usable answer was given, therefore the results have no statistical meaning and are not presented in this deliverable.

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3.2 Results for CARS

For CARS, we got 15 meaningful individual answers. The most relevant topics identified for this TC were QA/QC operation support, technological/innovation operation support and data operation support. As in the general part of the questionnaire, the senior scientists composed the largest group of the users (67%). Young scientists and PhD students made up 13% each, and engineers were present with only 7%. The dissemination of information within the remote sensing community seems to be better balanced compared to the whole ACTRIS community: 35% got the information about the possibilities of the operation support by an announcement during a workshop; 27% got the information via an e-Mail directly from the responsible TC; 19% found the relevant points on the ACTRIS webpage; 11% percent were informed by their colleagues and 4% got the information by their national contact point.

The organisational procedure of the operation support provided, meaning the communication as well as the registration, was also evaluated with high satisfaction. One exception here was in the follow-up communication after the operation support, for which 13% declared less satisfied (Fig.7) Unfortunately the two participants who gave this vote did not gave any further comment in the comment field so we cannot figure out what exactly the problem was.

The topics of the operation support were broadly diversified (Fig.8). Most of the topics referred to data QA/QC and general lectures, tutorials and webinars. Again, the questions about content, time frame, usefulness and the knowledge of the trainers were answered in a very positive way (Fig. 9).

The support for technology/innovation operation support was used by a quarter of the participants. The topics addressed were again data QA/QC, general lectures, tutorial and webinars, instrument intercomparison/calibration and on-site audits (Fig. 10).

In total, the operation support provided by CARS was evaluated in a very positive manner (Fig.11). 58% were completely satisfied with the content conveyed. 67% were completely satisfied with the persons providing the support, and the overall evaluation of the support shows with 33% (value 10 - very good) and 50% (value 9 - good) very good results.

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Communication





Figure 8: Workshop types accessed at CARS



Evaluation of the workshops

Figure 9: Evaluation of the workshops at CARS



What was the workshop you attended about?

Figure 10: Requested topics during the technology/innovation operation support at CARS



General satsfaction with CARS

Figure 11: General satisfaction with CARS

3.3 Results for CAIS-ECAC

For CAIS-ECAC we got 5 constructive responses. This was very few, also with regard to statistics. But we decided to have a closer look at these results to get a first feeling of the work done by the TC.

For CAIS-ECAC we found four areas of relevance: (1) data operation support, (2) QA/QC operation support, (3) management operation support and (4) technological/innovation operation support. (1), (2) and (4) were used in the same frequency, each 29%. (3) was used a little bit less, 14%. Again, the senior scientists composed the majority of the survey participants, followed by the young scientists. PhD students and engineers were not present for CAIS-ECAC.

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Related to the announcement of the operation support, most of the people got the information by an announcement during a workshop, 30%. Other information sources (e-mail from the respective TC, National Contact Point, ACTRIS webpage) were less frequent, 20%. Again, the organization of the supports/workshops was evaluated very positively (Fig.12). The main topics of the operation support were instrument intercomparison/ calibration at TC (selected by 38%), general lectures, tutorials and webinars (selected by 25%) and on-site intercomparisons, instrumentation operation and audits (selected by 13% each), Fig. 13. The evaluation of the workshops was also very positive (Fig. 14).

The question "Did you attend a workshop/training for technology/innovation operation support?" was answered with "yes" by 60% (20% said "no" and 20% gave no response). In this field, general lectures were mostly used (Fig.15). The procedure of the workshops was ok with one exception: for 20% of the survey participants the time frame of the workshop/training was not appropriate. Unfortunately, no further explanation was given.

In total, the picture shown for the operational support provided by CAIS-ECAC looks quite good. However, several negative aspects were pointed out in the final assessment, which needs to be addressed (Fig. 16).



Communication

Figure 12: Evaluation of the communication before and after the workshops at CAIS-ECAC

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Evaluation of the workshops

Figure 14: Evaluation of the workshops at CAIS-ECAC



What was the workshop you attended about?





General satisfaction with CAIS-ECAC

number of feedbacks

Figure 16: General satisfaction with CAIS-ECAC

3.4 Conclusions of the survey

At a first glance, the survey showed positive results for the operation of the Central Facilities. The number of responses received, however, does not allow for a clear and accurate evaluation. Also, we have to consider the fact that, being still in the implementation phase, the responses received referred to only a part of the operations, the one that has been put in place in the last year. Therefore, the analysis cannot be considered relevant for the full operation of the Central Facilities.

Furthermore, we have to be aware of the problem mentioned in part 3.1 "overview and problems". Most of the survey participants clustered their answers on more than one operation support. In this way, the significance of feedback was lost and we received only an average opinion by the community. For a very limited fraction we got responses (related to the operation support) which could be used for specific analysis. Considering the confusing elements of the survey, the survey must be reshaped so that all participants are better advised. The lessons learned from this survey show that it could be a good tool for receiving feedback on ACTRIS Central Facilities operation. It has to be repeated regularly during the operation phase of ACTRIS. And it needs to be revised to make it more clear for the participants.

With all the limitations and issues explained above, we used the feedback to get a first evaluation of the operation of the Central Facilities. In total, the result is very positive. Even at the beginning of their operations, ACTRIS Central Facilities managed to communicate properly, to offer high-quality and variate operation support, addressing many topics (QA/QC of the instruments, QA/QC of the data, technology, etc.) and by different means (lectures, workshops, audits, intercomparisons, etc.).

Overall we found that the survey exercise fulfilled its purpose in addressing the points where optimization of the operational support can be achieved . These points are:

- <u>The part of the community engaged</u>: from the evaluation of the results of the survey, it can be seen that mostly senior scientists gave feedback. Young scientists, engineers, PhD students and also CF/NF managers were less active. It is not clear if they have not received operation support or they simply did not answer the survey. Whatever the reason may be, the question is how to reach young scientists and staff directly working with the instruments.
- <u>Communication</u>: according to the responses received, the most useful information source was the direct announcement of an operation support during a workshop or a direct e-mail from the respective TC. A wider spread of information is needed. Public places such as websites, although passive, have the advantage of being accessible by everybody. Therefore, one point that should be considered is to make the information on the operation support more visible on the general information platforms, e.g., the ACTRIS webpage. In this context the motivation of the community to inform itself must be enhanced.
- <u>Comments of the survey participants</u>: several improvement suggestions have been expressed by the participants, and they have to be considered. However, very few comments were specific. The comments of the participants are given as quote in the annex. More emphasis should be put at the next round on encouraging the participants to express their points of view, be specific and to-the-point.

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• <u>The negative feedbacks</u>: the negative answers from the community must be analysed in detail, causes must be identified and remediation actions must be taken. This cannot be done based only on this survey because most of the negative feedback was given without any additional comment. It is therefore required to organize community discussions to clarify where the weaknesses are, and what could be the solutions.

4. Optimization actions

The community feedback is the basic for defining possible optimization actions at this point. To enhance the communication between the TCs and the community, the organization of additional information and trainings events, additional to the operation support, as well as the provision of guidelines and tools are the major points were the TCs see needs for improvement. The suggestions for improvement from the individual units are presented below.

<u>HO</u> is aware of the importance of communication internally and externally to the community and for this reason several communication channels are in place: dedicated mailing lists, recurrent newsletter, updated website, etc. The suggestion of "regularly remind NCPs and NF PIs that lists can be iterated, new people added, etc., will be taken into account to ensure as much as possible the involvement of young researchers and technicians in the official ACTRIS communication channels.

CARS understands that communication before and after the events should be optimized and we are working on this aspect. Dedicated mailing lists are put in place to communicate with: a) the scientific aerosol remote sensing community (aerosol-remote-sensing@actris.imaa.cnr.it); b) the associated private sector (cars-industry@inoe.ro); c) the labelled NFs (cars-nf@inoe.ro). Except point (c) which is invitationonly, the other two mailing lists are registration-based, meaning that the persons have to request to be included. The procedure for registration is, and will be communicated at all CARS events (workshops, webinars, training activities). In addition, CARS has put in place a collaborative environment (https://share.inoe.ro) where documentation and calendar are accessible by all, and each NF has its own restricted space for uploading QA/QC data and downloading the associated technical reports. This collaborative environment will be further developed to enable better communication with the NFs and other parties. In terms of optimizing the organization of events and operation support, there is always room for improvement and there is always a compromise to be made between the available time and the expected impact. Optimization measures regarding the organization of event refer to: a) separating the events based on the target group considered, to avoid overlapping of experienced with non-experienced persons; b) including in the communication a reference to the target group of a certain event; c) announcing well in advance the objectives and the agenda of a certain event; d) long-term storing the materials in the public space of the collaborative environment. Optimization measures regarding the operation support refer to: a) setting up a single-entry point for requesting, scheduling and reporting on the various operation support actions (currently developed for the initial acceptance only: https://carport.inoe.ro/) with tailored access for all relevant parties (CARS, ARES, NFs, HO) – this web

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platform will be linked with the collaborative environment; b) developing easy-to-use tools for lidar raw data and lidar QA/QC test data preparation and submission (OBIWAN and ATLAS tools currently in testing phase); c) maintaining the CARS forum and extending the topics; c) organizing webinars on specific topics at least each 2 months; d) mobilizing more capacity for hands-on training; e) exploring the possibility to organize technical workshops twice per year; f) collecting regularly suggestions and feed-backs from the community.

Following the decision by Interim ACTRIS Council (IAC), the <u>TC for Cloud In-Situ Measurements (CIS)</u> is starting operational activities in 2024. This will include the organization of more frequent CIS community meetings and the provision of further information concerning the NF labelling requirements via the CIS webpage. A new CIS mailing list for enhancing the TC internal communication efficiency was prepared with support from In-Situ DC.

<u>CiGas</u> recognized that the outreach and communication with the users should be facilitated. This has been discussed in the last CiGas Community meeting. As a result, the subscription process to the CiGas mailing list (actris-insitu-tracegas@lists.nilu.no) will be simplified via a link provided on the CiGas webpage. Furthermore, the implementation of a community blog with input from the users has been suggested to improve information exchange in both ways between CiGas and users. More frequent user meetings, which currently take place biannually, are not supported by the community to minimize overall meeting times. Comprehensive measurement guidelines for the in-situ measurement of NOx and VOC have been published by CiGas. As a basic reference, they contain the measurement requirements, but a more concise list of requirements is requested by the users. This will be addressed and be made available via the CiGas webpage. Furthermore, the provision of online tutorials will expand training activities beyond webinars, workshops and hands-on training. The labelling process for CiGas has been an in-depth topic of the last community meetings with valuable but few inquiries from the users. Its presentation will be made available via the webpage.

For <u>CAIS-ECAC</u>, the communication with the community has always been an important point. We are, therefore, working continuously to improve this. As a result of the survey, we are rearranging our website (https://www.actris-ecac.eu/index.html) to make the contact between the community and us even easier. Therefore, we will add a second section inside the existing forum at the CAIS-ECAC website (more topic-related, e.g., for the labelling process) and if possible, a ticketing system to process requests more transparently. At the moment, the labelling process is one big topic in the ACTRIS community. In each aerosol in-situ community meeting (taking place monthly) we give the possibility to talk and discuss labelling issues. Furthermore, we will dedicate an extra page on our CAIS-ECAC website, where we will explain in detail the tasks of the TC within the process and the procedure at CAIS-ECAC. This should create the possibility for direct communication. Related to the labelling process, we established the ECAC server. Here, each NF has its own restricted space for uploading information about the station, data, etc. and downloading associated reports (calibration reports, etc.). In addition to this, the calibration reports will also be placed at the CAIS-ECAC website. Workshop and training sessions are highly interactive and are adapted to the individual level of the participants. In case some troubleshooting is needed, the different

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units of CAIS-ECAC try to address these points within the workshops. However, this is related to the workload during the workshops (number of candidates, problems, level of participants, etc.). Supporting documents, recommendations, guidelines and on-line tools are already available at the CAIS-ECAC website and will be expanded in the future.

5. Summary

In the frame of deliverable D4.6 in ACTRIS IMP a survey was carried out to evaluate the quality of the operation support provided by the Topical Centres (TCs). This survey consists of four parts: (1) general information, (2) access and communication, (3) operation support (HO, DC, TC, Technology/Innovation support) and (4) overall assessment. Within 3 runs the ACTRIS community had the possibility to give their comments to these points. In total, 46 feedbacks were given. At a first glance, the community finds the work conducted by the TCs satisfactory, section 3.1. However, a more detailed analysis will be possible in the next survey where a more detailed questionnaire should guide the participants to evaluate separately each access of operational support services. We managed to identify specific feedback received for CARS and CAIS-ECAC. For these both TCs, the results of the survey showed a high level of satisfaction of the community, sections 3.2 and 3.3. Nevertheless, 4 major points were found where improvements are required: (1) the addressed community, (2) the communication, (3) the comments of the survey participants and (4) the negative feedbacks of the survey participants. Based on these points, the TCs defined optimization actions. These actions are mainly related to the enhancement of the communication between the TCs and the community, to the organization of additional information and training events, additional to the operation support and to the provision of guidelines and tools. The implementation of these actions is individual for each TC. First ideas and concrete measures are described in section 4.

6. Annex

In this section, all the comments, given in the survey, will be inserted as a quote.

- "The data support went very well. However, when I was asking for some support for some collaborative projects, I got no reply/answer."
- "better contact list including direct email / phone on the respective page of the website"
- "Turnaround period for data/formatting support by DC should be shorter. Mantis system is puzzling. It's hard to get an overview of data coverage of a certain station, e.g. in order to identify and fill gaps."
- "Better information about the labelling process would be helpful"
- "Not very easy to find calibration reports back. A web-based folder for each single NF would be useful."

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- "The follow up regarding off-line data submission is completely satisfying, while the follow up regarding NRT data submission is completely unsatisfying."
- "The preparation of the files for QA/QC analyses by CARS is quite demanding and could/should be automatized (actually, work in progress)."
- "A discussion forum like CARS' or CAIS' would be extremely useful."
- "Workshops and training sessions should be planned in order to help the newcomers as well, not only the existing, long trained, community."
- "seperate lectures for different instrument types, (will be more specific and less time consuming)"
- "On-line tools for calculating losses in pipes and bends would be useful to ensure everybody estimates losses in the same way."
- "Webinar frequency should be kept high (at least every 2nd month)"
- "CiGas should have clearer and stricter recommendations (comparable to CAIS' and CARS') to help NF implement trace gas measurements."
- "It should be possible to QA/QC instruments more frequently than every 2nd year AND on-line data QC tools should be made available NOW."
- "Clearer recommendations"
- "I felt more as "giver" of ideas to community but do not feel the follow-up was sufficient."
- "as quite some troubleshooting was needed, in future workshops more time for this may need to be planned in advance"
- "troubleshooting issues available on the forum"
- "I need to spent a lot of time to explain to the new members in my team the opportunities and services offered by ACTRIS. They state that on website there is not enough info, that it is not updated, etc. I think this is due to "mailing lists", maybe HO and CFs could regularly remind NCPs and NF PIs that lists can be iterated, new people added, etc."
- "As before. Add technical personnel, performance of DC seems not to be limited by scientific skill."
- "Better and more efficient handling of customs procedure for sending/receiving sun photometer head"
- "The seminars in the TOF-ACSM workshop were really helpful and it was great to meet the ToF-ACSM community. It was also great to have the possibility to talk to Leah from Aerodyne. Unfortunately, the 2 instruments we have sent (which were working properly before sending them to the workshop), had several issues during and also after the workshop, which caused a very long down-time. Due to these issues, the instruments could also only partly or not at all participate in the intercomparison and the benefit of having sent the instruments is very limited. Some of the issues and delays could have been avoided, if we had installed the instruments ourselves. I think the intention of saving everyone's time by offering the participants to only come for the seminars and not for setting up the instruments was very nice. But due to the abovementioned reason, I suggest for future intercomparison workshops to ask the participants to be there for installation. After the instruments came back to us, one instruments had various issues and it took us several months to get it operational at the site again. Therefore, we suggest to reduce the shipping of TOF-ACSMs as much as possible. We think that it would probably even

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have a larger benefit, if the focus of the workshop would rather be on the training of the personnel on how to calibrate instead of having all instruments on site. We were also facing some issues with the customs handling, which caused additional delay. So maybe in the future, various import/export burocracy should be tackled earlier and more capacity should be planned for this."

• "As already stated, there a huge difference in the support provided for off-line vs. NRT data submission."