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ACTRIS

Aerosol, Clouds and Trace Gases Research Infrastructure

The Aerosol, Clouds and Trace Gases Research Infrastructure (ACTRIS) is a distributed infrastructure dedicated to high-quality observation of aerosol, clouds, trace gases and exploration of their interactions. It will deliver precision data, services and procedures regarding the 4D variability of clouds, short-lived atmospheric constituents and the physical, optical and chemical properties of aerosol to improve the current capacity to analyse, understand and predict past, current and future evolution of the atmospheric environment. ACTRIS serves a vast community of users working on observations, experiments, models, satellite data, analysis and predicting systems and offers access to advanced technological platforms for exploration of the relevant atmospheric processes in the fields of climate change and air quality.

About this book

This is the 2nd ACTRIS Stakeholder Handbook. The Handbook is produced under EU-H2020 ACTRIS Preparatory Phase Project (grant agreement No 739530). The Handbook contains general information on ACTRIS; what ACTRIS is, why it is crucial for the European community in facing global challenges such as climate change, how ACTRIS is structured, and gives annual update of the implementation of ACTRIS. Stakeholder handbook also provides the current national profiles of 22 countries involved in ACTRIS.

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ACTRIS

Aerosol, Clouds and Trace Gases Research Infrastructure

Stakeholder Handbook 2018



ACTRIS

Aerosol, Clouds and Trace Gases
Research Infrastructure

Stakeholder Handbook
2018

ACTRIS Stakeholder Handbook 2018 (first edition)

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The Research Infrastructure (RI) ACTRIS – Aerosol, Clouds and Trace Gases - is the pan-European RI that consolidates activities amongst European partners for observations of aerosol, clouds and trace gases and for understanding of the related atmospheric processes, to provide RI services to wide user groups. ACTRIS is composed of 9 connected elements: distributed National Facilities (Observational platforms and Exploratory platforms) both in Europe and globally, and 8 Central Facilities (Head Office, Data Centre and 6 Topical Centres). ACTRIS provides access to its facilities, open-access data, measurement support, instrument calibration and development, and training to various user groups. By providing data and access, ACTRIS enhances science, but it also generates and disseminates knowledge, boosts technological development, and creates human capital and jobs for the benefit of the society. ACTRIS will positively impact on e.g. human health, climate resilience, and protection from environmental hazards and reduction of air pollution. ACTRIS has been selected to the ESFRI roadmap in 2016 as mature enough to be fully implemented within the next ten years. The ACTRIS Preparatory Phase Project (PPP) has a significant role in enabling the transition from a project-based network of research facilities to a centrally coordinated integrated pan-European RI. ACTRIS PPP brings together a wide community of research performing organizations, research funding organizations and ministries needed to take the decisions and actions to move forward in the implementation of ACTRIS.

This is the second edition of ACTRIS Stakeholder Handbook. The Handbook is produced under ACTRIS PPP. The Handbook contains general information on ACTRIS; what ACTRIS is, why it is crucial for the European community in facing global challenges such as climate change, how ACTRIS is structured, and gives an update of the implementation of ACTRIS. The Stakeholder handbook also provides the latest information of the national profiles of 22 countries involved in ACTRIS. I wish you a good reading experience and that the Stakeholder Handbook will meet your information needs.

With best regards,

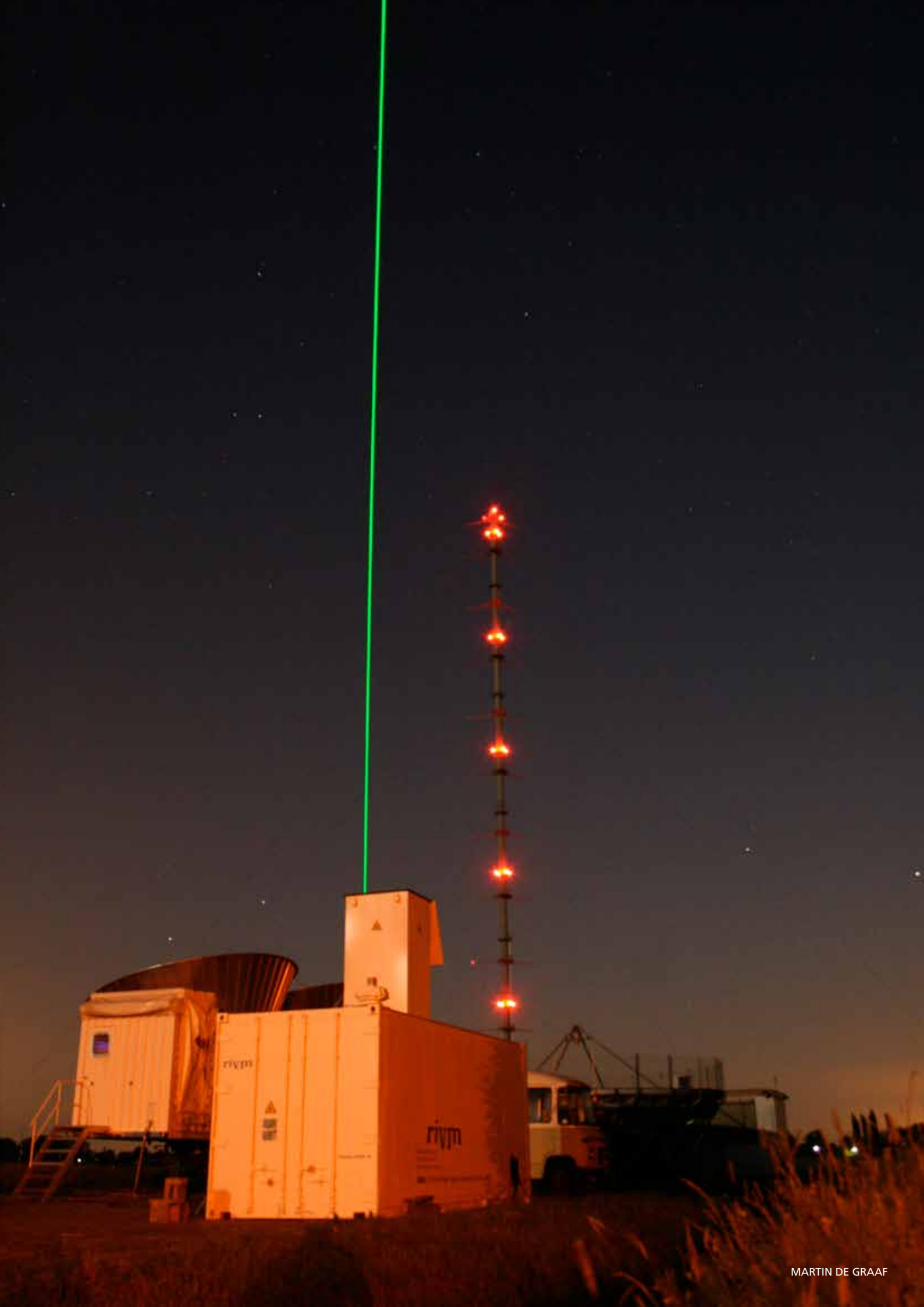


Sanna Sorvari Sundet

ACTRIS PPP coordinator

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SCIENCE CASE

The ability to predict the future behaviour of the atmosphere over all time scales (hours to decades) brings great benefits to society and the economy. Examples include short-term hazardous weather and health warnings as well as long-term evaluation of air quality, climate change and related legislative measures. Atmospheric predictions of all kinds use complex models that are underpinned by observations. Without high quality observation data to constrain predictive models, any forecasts of the atmosphere are highly unreliable.

The Aerosol, Clouds and Trace Gases Research Infrastructure (ACTRIS) focuses on producing high-quality data for the understanding of short-lived atmospheric constituents and their interactions. These constituents have a residence time in the atmosphere from hours to few weeks. The short lifetimes make their concentrations highly variable in time and space and involve processes occurring on very short timescales. These considerations separate the short-lived atmospheric constituents from long-lived greenhouse gases, and calls for a four dimensional distributed observatory (WMO, 2012). Such an observatory system is provided by ACTRIS consisting of different observational and exploratory platforms in Europe and outside Europe (called National Facilities), and a number of Central Facilities fundamental for the provision of harmonized high-precision data and a variety of services required by the scientific community.

The services provided by ACTRIS are important for a number of scientific questions:

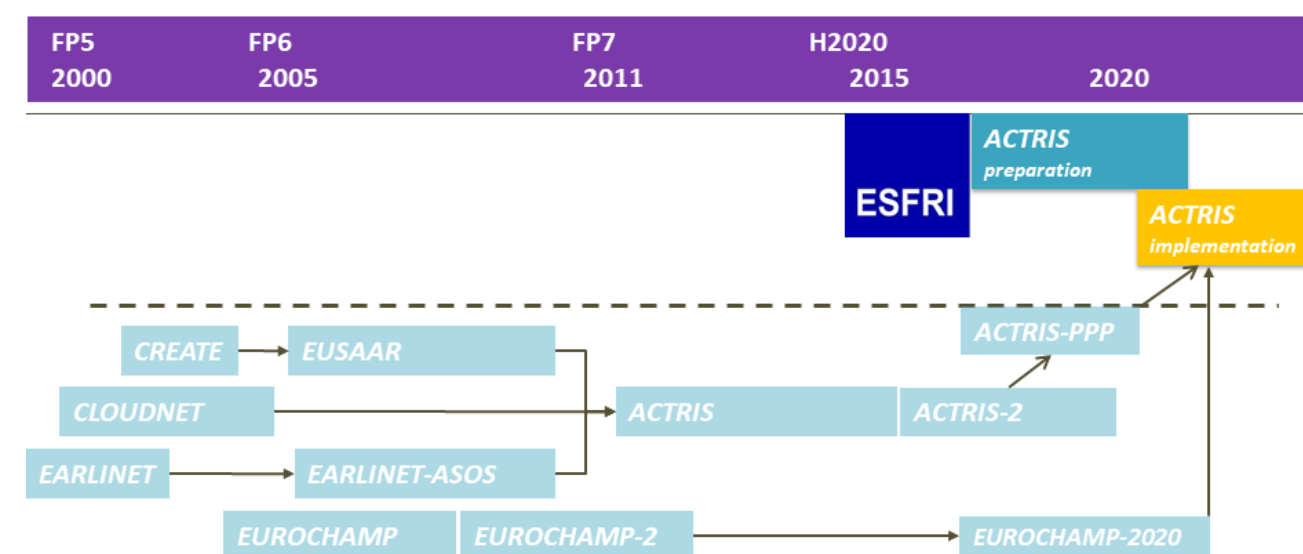
- How do clouds, aerosol and trace gases affect the Earth's radiation balance and the atmospheric chemistry? First, atmospheric aerosol and trace gases modify the Earth's radiation balance. Through the direct effect, aerosol can both cool (for instance sulphates, nitrates and secondary organics) and warm (black carbon) the planet. The indirect (cloud-related) effect of aerosol is believed to be cooling, but there are large uncertainties due to the complexities of cloud systems and how they respond to aerosol, in particular the concentrations of cloud condensation nuclei.
- How do clouds respond to global warming? There are large uncertainties due to the complexity of cloud systems and how they respond to aerosol, in particular the concentrations of cloud condensation nuclei. Clouds are one of the major sources of uncertainty in future-climate predictions. These uncertainties severely undermine our ability to make credible predictions of future climate change.
- How do the concentrations and distributions of aerosol and trace gases vary in space and in time? In order to reduce air pollution and related adverse effects on health and ecosystems, information on concentrations and distributions of aerosol and trace gases is required. It is well established that aerosol particles, at concentrations typically found across Europe, give rise to severe and unacceptable health effects in the European population (WHO, 2013). The situation is even worse in other regions of the globe.

- What is the impact of climate feedback mechanisms on atmospheric composition and chemistry? There are major gaps in knowledge to quantify the impact of climate feedback mechanisms on atmospheric composition and chemistry. There is a large number of factors driving climate change and the various systems are strongly coupled. An additional level of complexity is linked to the issue of anthropogenic-induced climate-chemistry interactions. Emissions of pollutants change the atmospheric composition contributing to climate change through the aforementioned atmospheric constituents, and, vice-versa, climate change influences atmospheric composition through a series of feedback process.
- Deeper understanding of the driving forces of climate change and air pollution requires quantification of the short-lived atmospheric constituents and their emissions, sinks, atmospheric spatial and temporal variability. In order to improve the climate model accuracy and sensitivity, secured access to long-term observational data provided with high precision and with sufficient density is crucial. This is the grand challenge for ACTRIS.

ACTRIS Heritage

ACTRIS results from more than 15 years of consistent development funded from national sources and the European Commission Research Infrastructure programmes (see **Figure 1**). ACTRIS was initiated as an Integrated Initiative in 2011 building on three historical European research collaborations: **EARLINET** (European Aerosol Research Lidar Network, EU-FP5 and FP6 projects), **EUSAAR/CREATE** (European Supersites for Atmospheric Aerosol Research, **EU-FP6** project, Construction, use and delivery of an European aerosol database, **EU-FP5** project) and **Cloudnet** (started as an EU-FP5 project for observing cloud profiles). New integration of long-term trace-gas observatories was then added in 2011 (**ACTRIS-13**

Figure 1. ACTRIS heritage over the past 18 years.



EU-FP7 project). The current operations are pursued as part of **ACTRIS-2**, funded as an Integrated Activity programme by the European Commission in H2020. The ACTRIS National Facilities include also atmospheric simulation chambers which have been operated for many years within the **EUROCHAMP** (European Simulation Chambers for Investigating Atmospheric Processes) projects, currently EUROCHAMP-2020.

In 2016, ESFRI selected ACTRIS as a new Research Infrastructure (RI) on its roadmap encouraging ACTRIS implementation within a 10-year time frame. The ACTRIS Preparatory Phase Project (PPP) (EU-H2020 project) supports the RI development at the organizational level and, hence, enables the transition from a project-based network of research facilities to a centrally coordinated integrated pan-European RI. ACTRIS PPP will set a solid basis for ACTRIS as a research infrastructure in terms of legal, financial and technical maturity to continue towards the implementation of the RI and later on towards operation expected in 2025.

Landscape

ACTRIS is an important RI in the European atmospheric research infrastructure landscape as also acknowledged by the ESFRI Landscape analysis as part of ESFRI Roadmap 2018 (<http://roadmap2018.esfri.eu/>). ACTRIS provides high-quality data and information that are very relevant for atmospheric science and are not covered by any other European RI (see **Figure 2**). In addition, ACTRIS is the only ESFRI RI in the atmospheric domain offering physical access to advanced research facilities. ACTRIS integrates several atmospheric science communities in Europe into one coherent research infrastructure, making ACTRIS the biggest atmospheric RI in size, covering most of the atmospheric observations and experiments, and providing broadest set of atmospheric variables in the atmospheric research infrastructure domain.

ACTRIS is fully integrated in the European Landscape of Atmospheric Research Infrastructures together with IAGOS-AISBL (for all acronyms please, see Appendix 2: List of Acronyms), EISCAT-3D and the atmospheric component of ICOS ERIC, and cooperation with other RIs (which may be formalized) is part of the ACTRIS overall strategy. More specifically:

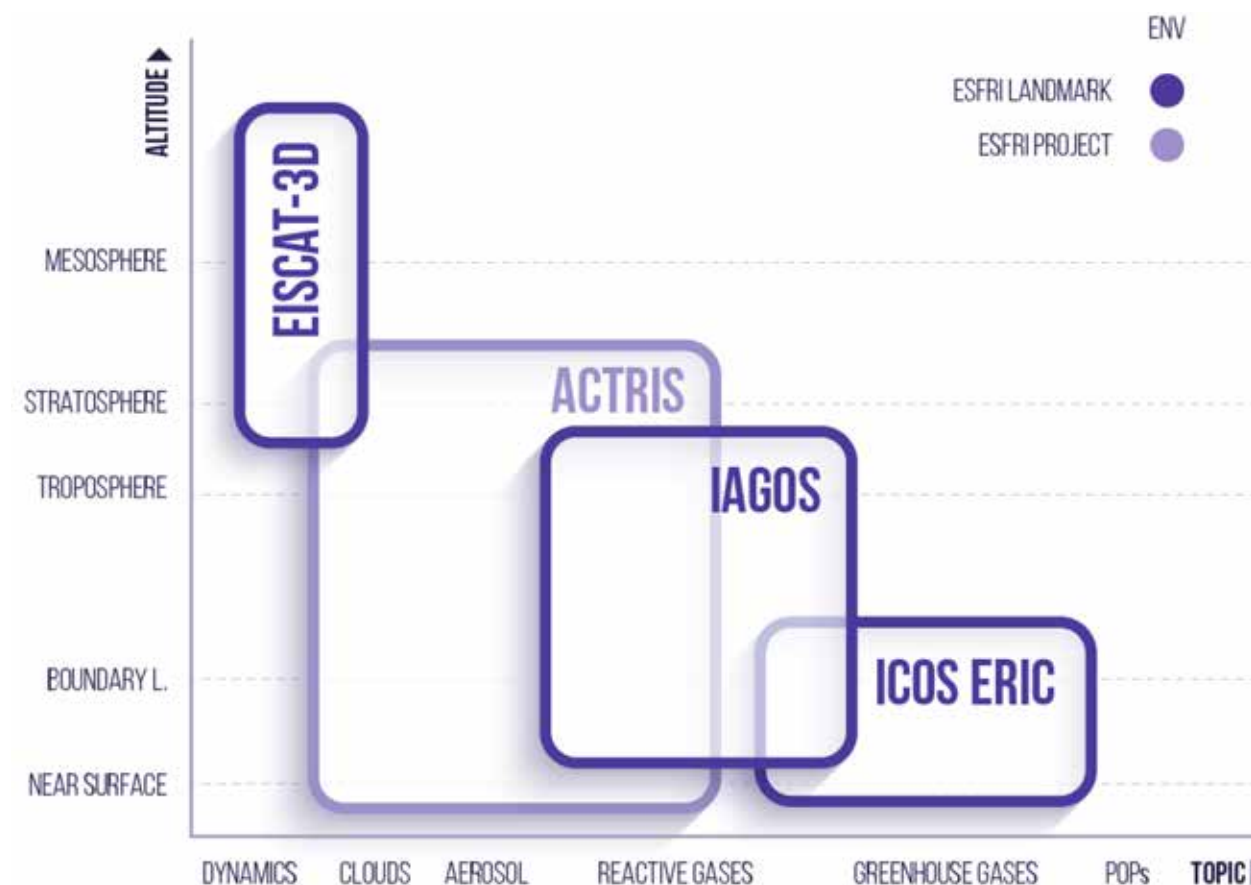
- ACTRIS complements the area of the atmospheric component of ICOS ERIC (long-lived climate forcers) with the provision of information on short-lived climate forcers.
- ACTRIS completes information provided by IAGOS-AISBL (passenger aircraft measurements) both temporally by adding the required continuity of the time series and spatially by offering 4-D information across Europe on parameters measured by both RIs.
- ACTRIS investigates the atmosphere from surface to stratosphere and therefore complements the EISCAT-3D, mostly focusing on upper atmosphere dynamics, a region and a domain not covered in ACTRIS.

In addition, there are other projects currently funded under the European Commission Horizon 2020 Research Infrastructure Programme by the European Commission which are connected to the atmospheric domain of ENVRI (cluster of environmental RIs in Europe):

- ARISE2: a design study aimed at monitoring atmospheric dynamics up to the stratosphere and coupling of modelling and observations, and establishing an atmospheric research and data platform to elucidate the dynamics of the middle and upper atmosphere, including the lidar network of NDACC. ACTRIS will build upon ARISE as part of its National Facilities.
- HEMERA: a newly funded project dealing with atmospheric sounding technologies. HEMERA is a starting community and connections have not been established yet.

ACTRIS is seeking for synergies and collaboration opportunities with other (environmental) RIs, wherever it is feasible and reasonable. The motivation for collaboration derives from the fact that by increasing data interoperability, co-locating RI facilities and widening the access beyond RI specific user communities, unprecedented scientific breakthroughs can be achieved. Therefore, the focus of the collaboration and seeking synergies is at the RI operation level, especially related to enhancing the data interoperability and co-location activities. This work is on-going in the framework of the ENVRI community, in which ACTRIS is actively involved in cross-RI collaboration and shaping of the RI landscape. The cooperation with other RIs in the ENVRI domain, and particularly in the atmospheric domain, is a key to the users and stakeholders.

Figure 2. ACTRIS in the atmospheric subdomain of the ESFRI RI landscape (Reference to: Strategy Report on Research Infrastructures ROADMAP 2018, Part 2 Landscape Analysis)



Outside the atmospheric domain, ACTRIS has potential cooperation with other RIs in the ENVRI domain such as EPOS, for example for studying the evolution of a volcanic ash cloud after an eruption, or with the marine RIs such as Euro-Argo ERIC and EMSO ERIC, for the atmosphere-marine coupling for climate and environmental research. ACTRIS is cooperating with all the ENVRI RIs within the H2020 ENVRIplus project (2015-2019) to create a more coherent, interdisciplinary and interoperable cluster of Environmental Research Infrastructures across Europe. In addition to collaboration within the ENV domain, RIs in the bio-ecosphere domain should be also noted as future collaborators (e.g., ICOS).

Potential future co-operations are also possible with RIs from other domains for example: CTA (Cherenkov Telescope Array), in the Physics domain, where ACTRIS can provide relevant data for atmospheric transmissivity, or in the energy domain where the ACTRIS data and technologies are relevant for both energy supply and consumption (wind energy, solar energy etc.), in the health and food domain where ACTRIS data are relevant for impact on health and on the agriculture (i.e. ANAEE), and also within the social science where the ACTRIS data and technologies are relevant for the impact on cultural heritage (E-RIHS) and on life (ESS ERIC, SHARE- ERIC).

ACTRIS

VISION & MISSION

ACTRIS Vision

ACTRIS is the fundamental European Research Infrastructure for short-lived atmospheric constituents increasing the excellence in Earth system observation and research, and providing information and knowledge for developing sustainable solutions to societal needs.

ACTRIS Mission

ACTRIS shall establish, operate, and develop a pan-European distributed research infrastructure for short-lived atmospheric constituents. ACTRIS shall provide effective access for a wide user community to its resources and services, in order to facilitate high-quality Earth system research.

Objectives of ACTRIS

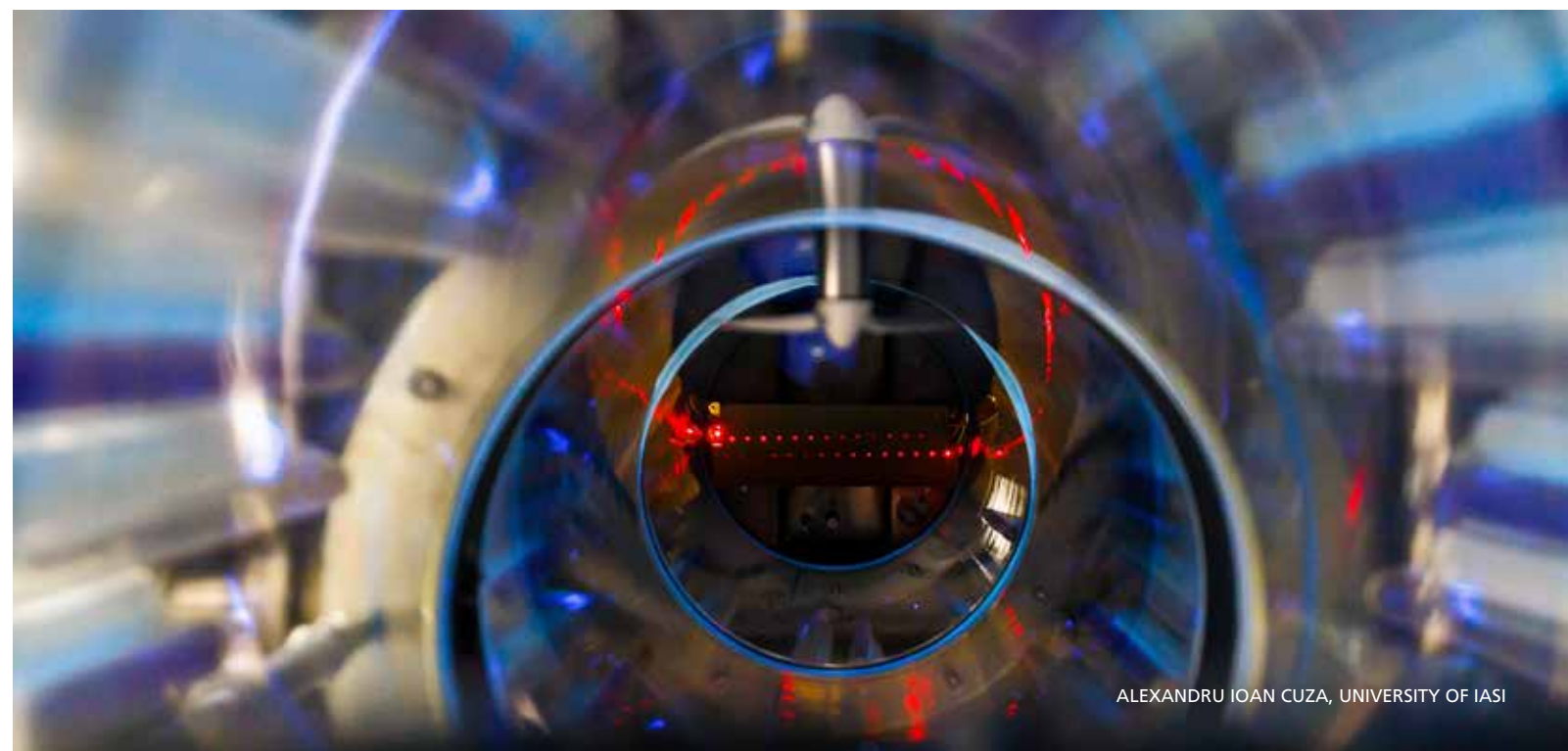
Primary goal of ACTRIS is to produce high quality integrated datasets in the area of atmospheric sciences and provide services, including access to instrumented platforms, tailored for scientific and technological usage. The main objectives of ACTRIS are:

- to provide information on the 4D-composition and variability and of the physical, optical and chemical properties of short-lived atmospheric constituents, from the surface throughout the troposphere to the stratosphere, with the required level of precision, coherence and integration;
- to provide information and understanding on the atmospheric processes driving the formation, transformation and removal of short-lived atmospheric constituents;
- to provide efficient open access to ACTRIS data and services and the means to effectively use the of ACTRIS products;
- to ensure and raise the quality of data and use of up-to-date technology used in the RI and the quality of services offered to the community of users, involving partners from the private sector; and
- to promote training of operators and users and enhance linkage between research, education and innovation in the field of atmospheric science.

Users

ACTRIS users originate from academia, public and private-non-profit research organisations, business, industry and public services, other non-profit organisations and citizen, from ACTRIS member countries as well as from countries which are not ACTRIS members, inside and outside Europe.

ACTRIS is clearly user-oriented. While the extensive use of ACTRIS data and data products can already be documented, ACTRIS products, tools and services are essential to a wide range of communities, and are further expanded following the long-term ACTRIS user strategy. ACTRIS targets various user communities world-wide, comprising researchers from atmospheric sciences, environmental sciences and other neighbouring fields (hydro-marine, bio-ecosystem, geosciences, space physics, energy, health, and food domain); operational and climate services, National weather services, space agencies, national and regional air quality monitoring networks, environmental protection agencies, instrument manufacturers and sensor industries, policy makers and local, regional, and national authorities.



Benefits to main users of ACTRIS

ACTRIS benefits scientists by providing quality-assured and open-access ACTRIS data; standardized operating procedures; instrument and procedure intercomparisons; access to research platforms for conducting excellent research and creating new scientific knowledge; enhancement of research performance due to centralized access to ACTRIS data and specific services; increased possibilities for international collaboration, large-scale research projects and training opportunities; and technical support from CFs and on-site support from NFs.

ACTRIS benefits policy makers by providing support for policy-driven networks established under EU-directives (local and European air-quality networks); development of new policies by provision of novel tools for validating the impact of regulation strategies and emission abatement policies through direct evaluation of atmospheric trends at regional / European scale; decision-making regarding environmental issues by provision of high-quality and long-term data for predicting climate scenarios from local and regional up to national and international level; atmospheric hazard (e.g. volcanic eruptions) management and risk mitigation via the knowledge base of ACTRIS expert teams and monitoring of extreme atmospheric events; and enhancing job creation indirectly (expert jobs, new business opportunities).

ACTRIS benefits the private sector via open-access data; expert services and physical access to the infrastructure for innovative research for the development of novel technologies and products and as a test bed for new technologies and instruments; development of quality assurance standards to support the technological development; and novel public-private collaborations leading to the establishment of spin-off and start-up companies.

ACTRIS benefits ministries and funding organizations by optimization of national investments in research infrastructures; providing better value for money via pan-European dimension and coordinated access to data and services; and by the establishment of a unique research infrastructure for atmospheric sciences within Europe to improve efficiency of operation and coordination among the European research institutions avoiding the duplication and fragmentation of research efforts.

ACTRIS benefits educators by offering training, exchange programmes and knowledge transfer, e.g. basic and advanced international courses on atmospheric composition and processes for Master's and PhD students; providing educational material; and offering expertise (e.g. expert visitors to schools of all levels).

ACTRIS benefit to Civil Society (e.g. general public, national and international media) arises from improved weather, climate and air quality predictions due to novel scientific findings resulting from ACTRIS; enhanced awareness on the environmental challenges that society is facing, e.g., climate change and air quality issues; and promotion of dialogue between researchers and society to translate scientific knowledge into practical applications.

Products & services

ACTRIS provides different categories of services, which are briefly described below. A detailed list of envisioned services applicable to each ACTRIS Central Facility (CF) is presented in the individual Concept Documents (available at [https://www.actris.eu/Documentation/ACTRISPPP\(2017-2019\)/Deliverables.aspx](https://www.actris.eu/Documentation/ACTRISPPP(2017-2019)/Deliverables.aspx)). During the coming years, during the ACTRIS Implementation Phase, a comprehensive ACTRIS service catalogue will be developed.

Services related to ACTRIS data, data products, and data tools are provided by ACTRIS Data Centre (DC) and include:

- Compilation and quality control of ACTRIS measurements data from both observational and exploratory platforms
- Long-term archiving and preservation of ACTRIS data, comprising raw data, calibrated and quality-assured data up to fully quality controlled data and elaborated data products,
- Access to ACTRIS data, data products, and digital tools through a single entry point
- Documentation of data and data flow
- Citation service, and data attribution, including version control, and data traceability
- Data curation for campaigns and dedicated research projects and initiatives, external or internal to ACTRIS.

Services related to ACTRIS technology are provided by ACTRIS Topical Centres (TCs) and include:

- Provision of measurement quality assurance and quality control procedures and tools,
- Instrument-specific calibration,
- Knowledge transfer and operator training,
- Improvement of measurement and retrieval methodologies for aerosol, clouds, and reactive trace gases.

Services provided by the ACTRIS facilities are provided by the ACTRIS National Facilities and include:

- Physical access to observational and exploratory platforms through a single entry point,
- Use of state-of-the-art instrument and equipment,
- Instrument testing and development,
- Scientific experiments, measurement campaigns and intercomparison exercises,
- Training of young scientists and field operators.

Services related to ACTRIS in general are provided by ACTRIS Head Office (HO) and include:

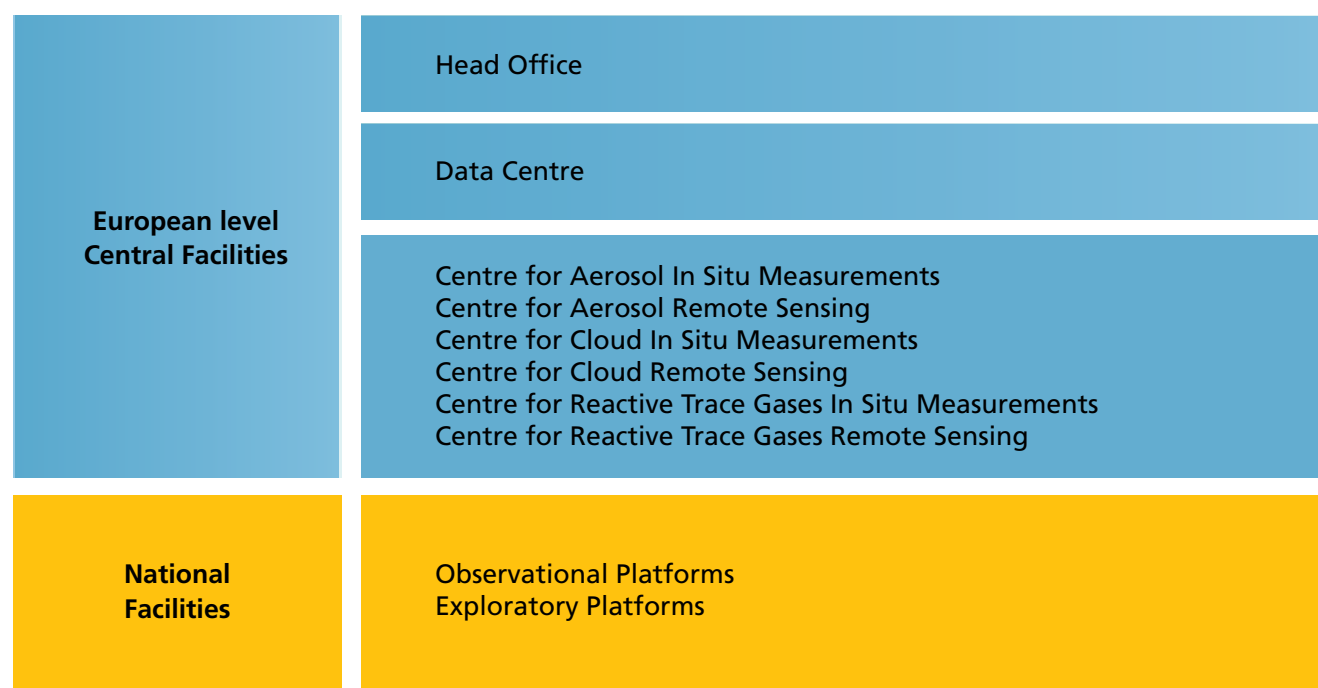
- Provision of information on ACTRIS and ACTRIS services (service catalogue),
- Provision of a user interface and helpdesk,
- Outreach, communication, and representation of ACTRIS for various user communities, stakeholders, and interest groups.

Access to ACTRIS services is regulated by both the ACTRIS access and service policy and the ACTRIS data policy, both approved by the ACTRIS Interim Council in 10/2018

ACTRIS Central Facilities

On the European level, ACTRIS operations are performed by ACTRIS Central Facilities (CFs) that include six Topical Centres, the Data Centre and the Head Office (**Figure 3**). ACTRIS CFs represent the key operative entities of this RI and have a fundamental role as they provide services to the users according to the ACTRIS access policy as well as operation support to the National Facilities (NFs) to increase their performance. CFs are embedded in the governance and decision-making structure of the RI. Each CF may have several operational Units that can be situated in the same or different locations, and are operated by research performing organizations (RPOs) or by ACTRIS ERIC. The CFs link the NFs, i.e. the observational and exploratory platforms, which are operated at the national level and produce the majority of the ACTRIS data.

Figure 3. ACTRIS research infrastructure core components; National and Central Facilities, including the indication of national and European level operations.



ACTRIS Head Office

ACTRIS Head Office (HO) is in charge of the strategic development and planning of ACTRIS services for users to solve important scientific questions and in promoting technology development and innovations. HO also manages and oversees the future cooperation with RIs from other domains. HO manages the ACTRIS scientific and technological development project portfolio and ensures that these collaborations lead to benefits for ACTRIS users, such as developments in services and operations, in line with the ACTRIS strategy. HO shall coordinate and promote ACTRIS services, handle internal and external communication, operate the legal entity, and ensure the strategic development and sustainability of ACTRIS. The HO coordinates the RI at the European level, in close cooperation with the national ACTRIS consortia, the NFs, and the other CFs.

The HO comprises of four operational units: Service and Access Management Unit (SAMU), ERIC Management Unit (EMU), RI Operations Unit (OPU) and Development and Relations Unit (DEVU). ACTRIS HO will be hosted by

I. Finland (Statutory seat of ACTRIS ERIC and three HO units: ERIC Management Unit, RI Operations Unit and Strategies and Relations Unit)

II. Italy (one HO unit: SAMU)

The ERIC Management Unit manages the day-to-day operations of the legal entity. SAMU manages the user requests, organises the needed access processes and manages the Science and User Forum. The RI Operation Unit ensures the smooth operation of ACTRIS RI and develops technical aspects for new services. The Strategies and Relations Unit handles the liaisons and partnerships, e.g., with new user communities, countries, stakeholders incl. innovation and service development. It is also responsible for the strategic planning for collecting data to support the strategy-based decision-making. The HO is responsible for engaging new countries and developing pan-European networks.

ACTRIS Data Centre

ACTRIS Data Centre (DC) is responsible for handling the ACTRIS data. The primary role of ACTRIS DC is to compile, archive and provide access to well documented and traceable ACTRIS measurement data and data products, including digital tools for visualisations, data analysis and research. As a tool for science, the highest priorities for ACTRIS DC is to maintain and increase the availability of ACTRIS data and data products relevant to climate and air quality research for all interested users.

All primary measurement data and produced data products are made available to the users via the ACTRIS data portal. ACTRIS DC will provide scientists and other user groups with free and open access to all ACTRIS data in accordance with the Access policy, and ACTRIS follows the open research data initiative of the Commission, making data discoverable (DOI identification), accessible (via open license) and assessable (via necessary documentation and description).

ACTRIS DC provides access to all measurements, both quality-assured data and near-real-time data, archived in interoperable topical data repositories handling very diverse type of data. The ACTRIS DC is foreseen to consist of 6 complementary units served through a single web interface entry point. The units are

- 1) ACTRIS data and services access unit responsible for access to measurement data, services, tools and documentation, with scientific data management.

Then the DC is comprising 5 specialised data base units all with support to observational and exploratory NFs, and close links to the relevant topical centres:

- 2) ACTRIS In situ data centre unit for all aerosol, cloud and trace gas in situ data
- 3) ACTRIS Aerosol remote sensing data centre unit
- 4) ACTRIS Cloud remote sensing data centre unit
- 5) ACTRIS Trace gases remote sensing data centre unit
- 6) ACTRIS Atmospheric simulation chamber data centre unit.

The Units of the Data Centre are partially operational.

ACTRIS DC will be hosted and composed by a consortium of research performing organizations:

- I. Norway, Norsk Institutt for Luftforskning Stiftelse (NILU)
- II. Italy, Consiglio Nazionale delle Ricerche (CNR)
- III. France, Centre National de la Recherche Scientifique (CNRS)
- IV. Finland, Finnish Meteorological Institute (FMI)
- V. Norway, Norwegian Meteorological Institute (MetNo)
- VI. Spain, Barcelona Supercomputing Center (BSC)

Climate and air quality assessments for scientific communities and National and International Environmental agencies are ultimate user of ACTRIS data and data products. Furthermore, ACTRIS DC will interact with European and global frameworks and initiatives. ACTRIS data base infrastructure and tools for data production and processing developed within ACTRIS aim to contribute to global initiatives as GAW-WDCA, GAW-WDCRG, NDACC and European long-term monitoring programs as EMEP, improving data quality and ensuring harmonized data on pan-European level.

ACTRIS Topical Centres

ACTRIS TCs are or will be organized around the main scientific themes of ACTRIS: aerosol, clouds, and reactive trace gases, each with a particular focus on either remote sensing or in situ measurement techniques. The six ACTRIS TCs are the

- 1) Centre for Aerosol Remote Sensing,
- 2) Centre for Aerosol In Situ Measurements,
- 3) Centre for Cloud Remote Sensing,

- 4) Centre for Cloud In Situ Measurements,
- 5) Centre for Reactive Trace Gases Remote Sensing,
- 6) Centre for Reactive Trace Gases In Situ Measurements.

The key services and operation support provided by the TCs are a) procedures and tools for quality assurance and quality control of ACTRIS measurements and data, b) transfer of knowledge and training to ACTRIS operators and users, and c) improvements of measurement methodologies for aerosol, clouds, and reactive trace gases. The TCs should operate at the state-of-the-art, fostering the implementation of validated new techniques in ACTRIS. To sustain a high level of performance and to stimulate the advancement of new techniques and methodologies, the TCs contribute to expert collaboration networks.

ACTRIS TCs under implementation include the existing European WDC and WCC components of GAW, the European component of the AERONET calibration facility, and complement centres already operating within other RIs (e.g. ICOS) or activities already ongoing in networks (NDACC; www.ndacc.org) in Europe. Quality objectives are therefore compliant with international standards. Not all the TCs are currently at the same level of maturity, some are nearly operational while others are still in planning. Each of the TCs is foreseen to be organized as a consortium with several Units.



1) Centre for Aerosol Remote Sensing (CARS)

The Centre for Aerosol Remote Sensing will consist of topical units hosted by

- I. **Romania, National Institute of Research and Development for Optoelectronics (INOE)**
- II. **Germany, Meteorological Institute of the Ludwig-Maximilians-University (LMU-MIM)**
- III. **Italy, Consiglio Nazionale delle Ricerche (CNR)**
- IV. **Germany, Hohenpeissenberg Meteorological Observatory, Deutscher Wetterdienst (DWD)**
- V. **France, CNRS-Laboratoire d'Optique Atmosphérique France, Université de Lille**
- VI. **Spain, AEMET - Izāna Atmospheric Research Center**
- VII. **Spain, University of Valladolid (UVA)**

The mission of this TC is to offer operational support to ACTRIS National Facilities operating aerosol remote sensing instrumentation: profile and column observation. The Centre for Aerosol Remote Sensing will offer operation support and services for the following ACTRIS variables and measurement techniques:

ACTRIS variables	Measurement techniques
<ul style="list-style-type: none"> • Attenuated backscatter profile • Volume depolarization profile • Particle backscatter coefficient profile • Particle extinction coefficient profile • Lidar ratio profile • Ångström exponent profile • Backscatter-related Ångström exponent profile • Particle depolarization ratio profile • Particle layer geometrical properties (height and thickness) • Particle layer optical properties (extinction, backscatter, lidar ratio, Ångström exponent, depolarization ratio, optical depth) • Column integrated extinction • Planetary boundary layer height • Spectral Downward Sky Radiances • Direct Sun/Moon Extinction Aerosol Optical Depth (column) 	<ul style="list-style-type: none"> • Aerosol high-power aerosol lidar • Automatic low-power aerosol lidar and ceilometers • Automatic sun/sky/lunar photometer

Synergies between these variables and techniques are being developed to provide higher-level aerosol variables such as daytime extinction, backscatter, absorption and mass concentration (total, fine, coarse) and aerosol microphysical properties.

Additionally, the Centre for Aerosol Remote Sensing offers specialized services for the above instruments and related ACTRIS variables, to ACTRIS users of various types.

The Centre comprises fixed and mobile sub-units as well as specialized laboratories for characterization of components and blocks, offering a wide range of operational support and services for the measurement techniques in its responsibility. The Centre includes AERONET-Europe calibration facility for photometers which complements the AERONET-NASA calibration facility in the USA. There is also a close link to the Centre for Cloud Remote Sensing because automatic low-power lidars and ceilometers belong to the minimum required instrumentation of NFs for cloud remote sensing.

The Units of the Centre are partially operational, and provide trans-national access in ACTRIS-2.

2) Centre for Aerosol In Situ Measurements (CAIS)

The Centre for Aerosol In Situ Measurements will consist of topical units hosted by

- I. **Germany, Leibniz Institute for Tropospheric Research (TROPOS)**
- II. **France, French National Institute for Industrial Environment and Risks (INERIS)**
- III. **France, National Center for Scientific Research (CNRS)**
- IV. **France, French Alternative Energies and Atomic Energy Commission (CEA)**
- V. **Finland University of Helsinki – Institute for Atmospheric and Earth System Research (UHEL-INAR)**
- VI. **Czech Republic, Institute of Chemical Process Fundamentals at Czech Academy of Sciences (ICPF)**
- VII. **Italy, Istituto Nazionale di Fisica Nucleare (INFN)**

The mission of this TC is fundamental to improve the quality of the ACTRIS in situ aerosol data, by offering operation support to NFs, operating instruments for the physical or chemical in situ characterization of atmospheric aerosol particles as well as for particle sampling and subsequent laboratory analysis of these particles.



The Centre for Aerosol In Situ Measurements will offer operation support and services for the following ACTRIS variables and measurement techniques:

ACTRIS variables	Measurement techniques
<ul style="list-style-type: none"> • Particle number size distribution – mobility diameter (10 - 800 nm) • Multi-wavelengths particle light scattering & backscattering coefficient • Particle light absorption coefficient & equivalent black carbon • Mass concentration of particulate organic and elemental carbon • Particle number size distribution – optical and aerodynamic diameter (0.7 - 10 µm) • Particle number concentration (> 10 nm) • Mass concentration of particulate elements • Mass concentration of particulate organic tracers • Cloud condensation nuclei number concentration • Mass concentration of non-refractory particulate organics and inorganics • Nanoparticle number concentration (< 10 nm) • Nanoparticle number size distribution (1 - 20 nm) 	<ul style="list-style-type: none"> • Mobility Particle Size Spectrometers • Integrating Nephelometer • Absorption Photometers • Thermo-optical method on quartz filters • Aerodynamic & Optical Particle Size Spectrometers • Condensation Particle Counters • Filter-based X-ray Fluorescence or Particle Induced X-ray Emission • Filter-based IC, GC-MS, HPLC-MS, or LC-MS • Cloud Condensation Nucleus Counter • Aerosol Mass Spectrometers • Particle Size Magnifier • Scanning Particle Size Magnifier, Neutral cluster and Air Ion Spectrometer, Nano Mobility Particle Size Spectrometer

Additionally, the Centre for Aerosol In Situ Measurements will offer specialized services for the above instruments and related ACTRIS variables, to ACTRIS users of various types.

The Units of the Centre are partially operational, and provide trans-national access in ACTRIS-2.

3) Centre for Cloud Remote Sensing (CCRES)

The Centre for Cloud Remote Sensing will consist of topical units hosted by

- I. **France, Centre National de la Recherche Scientifique (CNRS)**
- II. **France, Ecole Polytechnique**
- III. **France, Université de Versailles Saint-Quentin-en-Yvelines**
- IV. **The Netherlands, Delft University of Technology (TUD)**
- V. **The Netherlands, Royal Dutch Meteorological Institute (KNMI)**
- VI. **Germany, University of Cologne (UCol)**
- VII. **United Kingdom, National Centre for Atmospheric Science (NCAS)**
- VIII. **Finland, Finnish Meteorological Institute (FMI)**

The mission of this TC is to offer operation support to ACTRIS National Facilities operating cloud remote sensing instrumentation. The Centre is elemental in developing calibration methods for cloud radars, microwave radiometry and Doppler Wind Lidars to be implemented on site (e.g. using calibration equipment or self-consistency techniques) and through mobile services (e.g. reference instruments or drone-based calibration).

The Centre for Cloud Remote Sensing will offer operation support and services for the following ACTRIS variables and measurement techniques:

ACTRIS variables	Measurement techniques
<ul style="list-style-type: none"> • Cloud/aerosol target classification • Drizzle drop size distribution • Drizzle water content • Drizzle water flux • Ice water content • Liquid water content • Liquid water path • Temperature profile • Relative humidity profile • Integrated water vapor path 	<ul style="list-style-type: none"> • Cloud radar • Doppler cloud radar • Microwave radiometer • Automatic low power Lidars and Ceilometers (in collaboration with the Centre for Aerosol Remote Sensing).

Additionally, the Centre for Cloud Remote Sensing will offer specialized services for the above instruments and related ACTRIS variables, to ACTRIS users of various types, focusing on training of users.

The Centre comprises reference facilities and mobile sub-units to provide support and services.

The Units of the Centre are in preparation.

4) Centre for Cloud In Situ Measurements (CIS)

The Centre for Cloud In Situ Measurements will consist of topical units hosted by

- I. **Germany, Karlsruhe Institute of Technology (KIT)**
- II. **United Kingdom, The University of Manchester, School of Earth and**
- III. **Environmental Sciences**
- IV. **Germany, Leibniz Institute for Tropospheric Research (TROPOS)**
- V. **Austria, Sonnblick Observatory, Zentralanstalt für Meteorologie und Geodynamik (ZAMG)**

The mission of this TC is to offer operation support to ACTRIS National Facilities performing cloud in situ measurements. The Centre for Cloud In Situ Measurements will offer services for instrument calibration, provide training and knowledge transfer opportunities, and support instrument improvements and new technological developments for the following ACTRIS variables and measurement techniques:

ACTRIS variables	Measurement techniques
<ul style="list-style-type: none"> • Liquid Water Content • Droplet effective diameter • Droplet number concentration • Droplet size distribution • Ice particle number concentration • Ice particle size distribution • INP (ice nucleating particle) concentration • Cloud residuals number concentration • Cloud residuals composition • Total inlet aerosol number concentration • Total inlet aerosol size distribution • Interstitial inlet aerosol number concentration • Interstitial inlet aerosol size distribution • Bulk cloud water chemical composition 	<ul style="list-style-type: none"> • Integrating cloud probes • Cloud droplet probes • Cloud ice probes • Continuous flow diffusion chambers • Cloud mixing chambers • Cloud expansion chambers • Offline INP analysis methods • Total and interstitial aerosol inlets • Cloud water chemical analytics

The Centre for Cloud In Situ Measurements is a relatively new activity within ACTRIS, but its development builds on existing infrastructures and a long series of cloud simulation research and instrument intercomparison and calibration activities, both in the laboratory and on mountain stations. During the implementation and early operational phases, the Centre units will establish an extended network of expertise and knowledge transfer in order to develop and establish new reference methods and standard procedures for high quality measurements of cloud in situ variables with both stationary and mobile instruments and methods. Once established, respective services will also be offered to ACTRIS users in order to support new technological developments.

The Units of the Centre are partly operational and provide services as part of the EUROCHAMP-2020 project.

5) Centre for Reactive Trace Gases Remote Sensing (CREGARS)

The Centre for Reactive Trace Gases Remote Sensing will consist of topical units hosted by

- I. **Belgium, Royal Belgian Institute for Space Aeronomy (BIRA-IASB)**
- II. **Germany, Karlsruhe Institute of Technology (KIT)**
- III. **France, Centre National de la Recherche Scientifique (CNRS)**
- IV. **Austria, Medical University Innsbruck (MUI)**
- V. **The Netherlands, Royal Dutch Meteorological Institute (KNMI)**
- VI. **Belgium, University of Liège (ULiège)**

The units are dealing with different trace gas remote sensing techniques: Fourier-transform infrared spectrometry (FTIR), differential optical absorption spec-

trometry in the UV-visible range (UVVIS) and ozone LIDAR or O3 DIAL (differential absorption lidar).

The mission of the Centre is to offer operation support to ACTRIS National Facilities operating reactive trace gases remote sensing instrumentation. The Centre for Reactive Trace Gases Remote Sensing will offer operation support and services for the following ACTRIS variables and measurement techniques:

ACTRIS variables	Measurement techniques
<ul style="list-style-type: none"> • Ozone profile • Ozone partial columns • Ozone column • Formaldehyde column • Formaldehyde lower tropospheric profile • NO2 column • NO2 lower tropospheric profile • NH3 column • C2H6 column 	<ul style="list-style-type: none"> • ozone DIAL (Differential Absorption Lidar) • FTIR (Fourier-transform infrared spectrometry) • UVVIS (differential optical absorption spectrometry in the UV-visible range)

The Centre provides essential knowledge about the observation techniques (measurement and retrieval) that may be applied in future applications (e.g., new satellite sensors, progress in air quality modelling etc.) to species that are currently not addressed. There is already a mature basis for providing these data within ACTRIS community in and outside of Europe based on the expertise built in NDACC and in collaboration with NDACC. ACTRIS as a research infrastructure will implement the remote sensing of trace gases in an operational way to ensure long-term sustainability.

The Units of the Centre are in preparation.



6) Centre for Reactive Trace Gases In Situ Measurements (CiGas)

The Centre for Reactive Trace Gases In Situ Measurements will consist of topical units hosted by

- I. **Germany, Institute of Meteorology and Climate Research (IMK), Department of Atmospheric Environmental Research (IFU), Karlsruhe Institute of Technology (KIT)**
- II. **Germany, Institute of Energy and Climate Research, IEK8: Troposphere, Forschungszentrum Jülich GmbH**
- III. **France, Institution Mines Telecom Lille Douai (IMT/LD), Atmospheric Sciences and Environmental Engineering Department (SAGE)**
- IV. **Finland, University of Helsinki – Institute for Atmospheric and Earth System Research (UHEL-INAR)**
- V. **Germany, Hohenpeissenberg Meteorological Observatory, Deutscher Wetterdienst (DWD)**
- VI. **Switzerland, The Laboratory for Air Pollution/Environmental Technology, EMPA**

The Centre is fundamental in providing operation support to National Facilities measuring key trace gases (non-methane hydrocarbons (NMHC), oxidized volatile organic compounds (OVOC), biogenic volatile organic compounds (BVOC), specific direct aerosol precursors, NO, and NO₂) in order to produce traceable, reliable and quality controlled datasets with known compatibility.

The mission of the Centre for Reactive Trace Gases In Situ Measurements is to offer operation support and services for the following ACTRIS variables and measurement techniques:

ACTRIS variables	Measurement techniques
<ul style="list-style-type: none"> • NMHCs • OVOCs • Terpenes • NO • NO₂ • Condensable vapours 	<ul style="list-style-type: none"> • Gas chromatographic methods with flame ionization (FID) or mass spectrometric detection (MS) • Online Chemical ionization coupled to MS (PTR-MS, CI-API-ToF-MS) • High performance liquid chromatography (HPLC) with UV detection • Sampling of atmospheric gases including on- or off-line traps and whole air sampling in canisters • Chemiluminescence detection (CLD) • Photoluminescence detection (PLD) • Photolytic conversion • Chemical conversion • Cavity Attenuated Phase Shift Spectroscopy (CAPS)

Additionally, the Centre develops and tests innovative gas analytical technologies and data evaluation algorithms, and enhances the competence of operative personnel by intensive training courses.

The Centre comprises inter alia the WMO (World Meteorological Organization) Global Atmosphere Watch (GAW) World Calibration Centres (WCC) for Volatile Organic Compounds (WCC-VOC) and for NO_x (WCC-NO_x). Both WCCs have been approved by the international science community and form one corner stone of the Quality Assurance/Quality Control (QA/QC) framework established within WMO-GAW.

The Units of the Centre are in preparation.

ACTRIS National Facilities

ACTRIS NFs consist of **Observational and Exploratory Platforms** producing data and, if appropriate, providing physical or remote access to selected platforms that will be centrally managed by the ACTRIS Head Office (SAMU). They are operated (or co-operated) by ACTRIS RPOs. **Observational platforms** are fixed ground-based stations that deliver long-term data based on a regular measurement schedule and common operation standards. These platforms perform measurements of aerosol, clouds, and reactive trace gases from the Earth surface throughout the troposphere up to the stratosphere by applying state-of-the-art remote-sensing and in situ measurement techniques under consideration of harmonized, standardized, and quality-controlled instrumentation, operation procedures and data retrieval schemes. The sites are strategically located in diverse climatic regimes both within and outside Europe, and many of them contribute to one or several European and international networks, such as EMEP, NDACC, or GAW, and are possibly partly shared with other environmental infrastructures, such as ICOS, SIOS, ANAEE or eLTER. **Exploratory platforms** are atmospheric simulation chambers, laboratory platforms and mobile platforms that perform dedicated experiments and contribute data on atmospheric constituents, processes, events or regions following common ACTRIS standards. Atmospheric simulation chambers and laboratories are highly instrumented facilities for the determination of parameters needed for understanding chemical, physical, or biological processes and for controlled simulation experiments under near-realistic environmental conditions. Mobile platforms comprise land-based, shipborne and airborne facilities, and thus, allow investigations of various processes under specific meteorological, climatic, or topographic conditions in different environments and ecosystems.

ACTRIS NF technical concepts and requirements have been finalized (*D5.1 Documentation on technical concepts and requirements for ACTRIS Observational Platforms*; *D5.2 Documentation on technical concepts and requirements for ACTRIS Exploratory Platforms*). In addition, ACTRIS NF labelling principles have been established (*D5.3 Documentation on ACTRIS National Facility labelling principles*). These documents are publicly available as ACTRIS PPP deliverables and

can be found on the ACTRIS website ([https://www.actris.eu/Documentation/ACTRISPPP\(2017-2019\)/Deliverables.aspx](https://www.actris.eu/Documentation/ACTRISPPP(2017-2019)/Deliverables.aspx)). The selection of National Facilities is a national task and ACTRIS labels will facilitate this selection. The ACTRIS labelling process aims at ensuring the operational capacity of ACTRIS by granting the label “ACTRIS National Facility” to Observational and Exploratory Platforms that comply with the ACTRIS standards. The labelling process comprises necessary interactions between the ACTRIS ERIC, the CFs and the national RPOs that implement and operate the NFs, in order to assess and permanently monitor the compliance of the NFs with the ACTRIS standards. The ACTRIS NF labelling process shall start in the Implementation Phase.

Country profiles from 22 countries participating in ACTRIS are provided in the end of this Handbook. The country profiles supply information on national ACTRIS consortia and representation, lists of potential ACTRIS NFs (see also **Figure 4**), contributions to host ACTRIS CFs and information on the national financial situation. It should be noted that the list of NFs provided in this document is preliminary and rather gives an overview of the most advanced European atmospheric research facilities. The vast amount of these facilities, both observational and exploratory, highlight the great potential of ACTRIS being able to provide atmospheric data across Europe and from around the globe.

a)

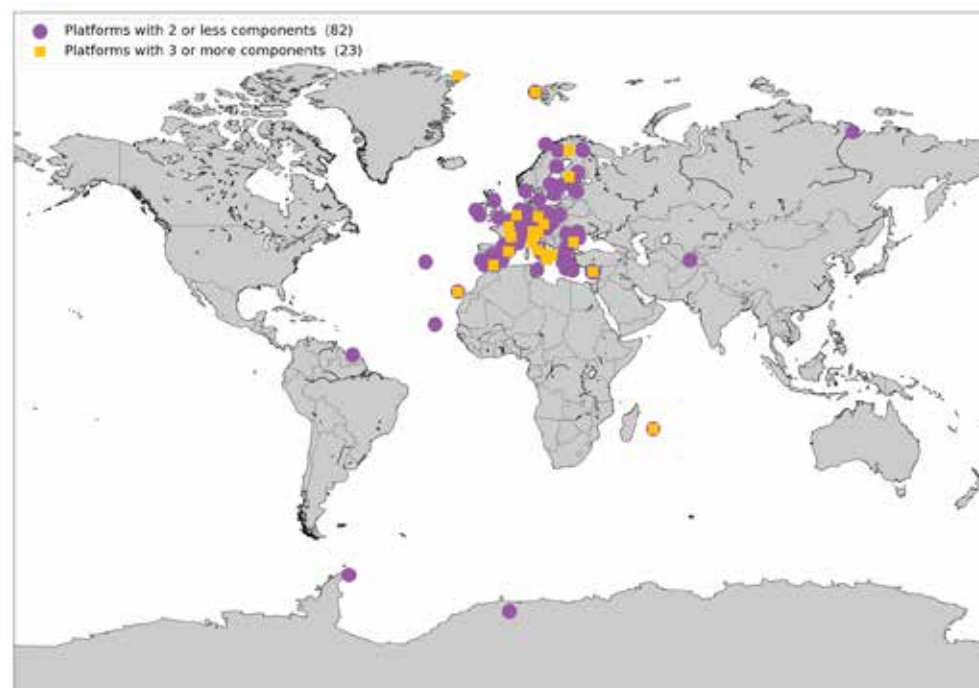
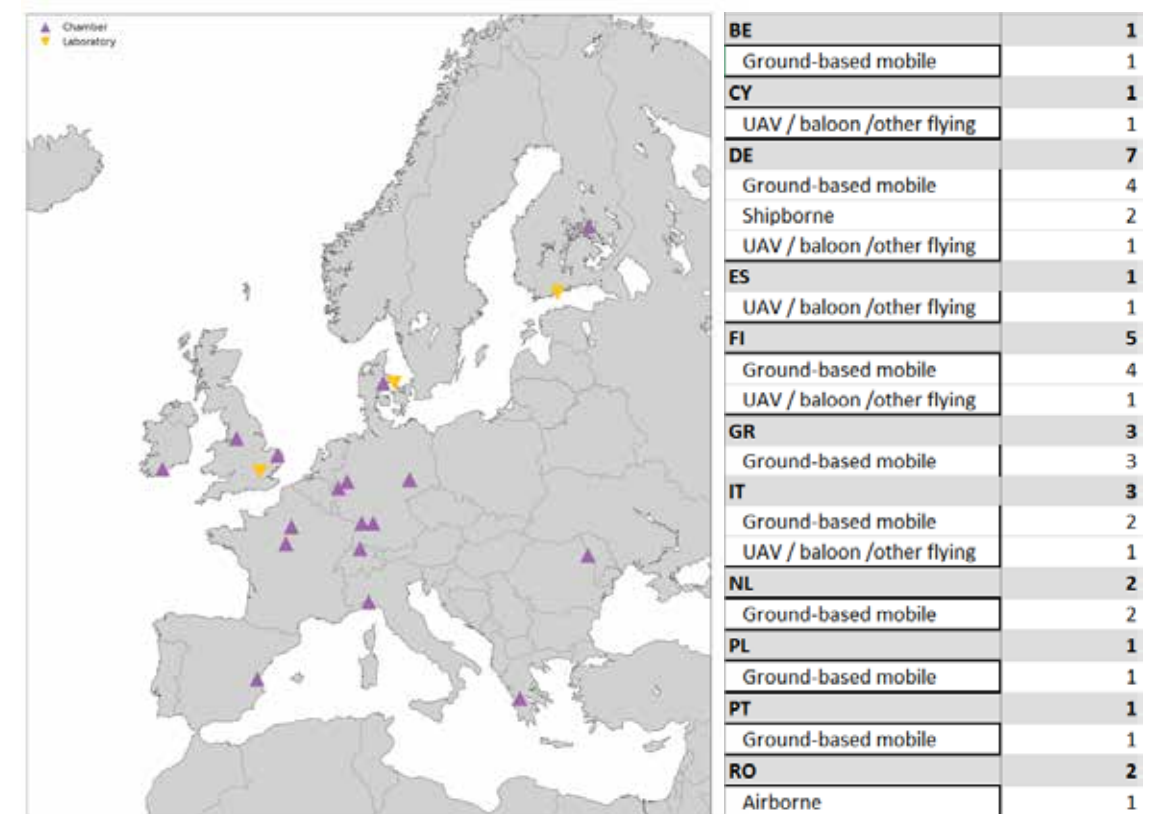


Figure 4. Map of potential ACTRIS Observational Platforms **a)** worldwide and **b)** in Europe as foreseen by 2025, and **c)** map and table of potential ACTRIS Exploratory platforms as foreseen by 2025. Most of the sites already exist but will need upgrading in order to follow ACTRIS NF general principles and fulfil NF technical requirements. Components in the figure legend refer to ACTRIS observational components: aerosol in situ measurements, aerosol remote sensing, cloud in situ measurements, cloud remote sensing, reactive trace gases in situ measurements, and reactive trace gases remote sensing.

b)



c)



IMPLEMENTATION

ACTRIS Lifecycle

ACTRIS was included on the ESFRI roadmap in 2016. After many years of community building, design phase, and three years of ACTRIS Preparatory Phase Project, ACTRIS will enter in a five-year implementation phase (2020-2024) dedicated to constructing and upgrading the National Facilities and Central Facilities, setting-up the user access and service provision, work on the governance and management tasks, increase the connection with new users and member countries, further develop strategies within ACTRIS and for international collaboration and partnerships, and integrate ACTRIS at different strategic levels (national, European and internationally). Following the Implementation Phase, ACTRIS will be fully operational and will become the global reference for short-lived atmospheric constituents, offering a unique portfolio of services including open access to data and physical and remote access to TC and NF services, and thus promoting excellent atmospheric research.

ACTRIS is now in the Preparation Phase and will move into the Implementation Phase in 2020 and plans to be fully operational in 2025. The ACTRIS Preparation Phase is supported by the EC-funded ACTRIS Preparatory Phase Project (PPP). In order to avoid a long transition from ACTRIS PPP to the legal entity status, the Interim ACTRIS Council has decided to apply for the ERIC with the aim to submit ERIC Step 1 application in early 2019. The estimated start of the ACTRIS ERIC is in the end of 2020 or beginning of 2021.

The next ESFRI monitoring of the ESFRI projects, including ACTRIS, will be held in 2020-21; the launch of the monitoring results will be in conjunction with the ESFRI roadmap update in 2021. ACTRIS is aiming to apply for the ESFRI landmark status during this monitoring process. **Figure 5** presents a summary of the ACTRIS lifecycle phases with the main targets.

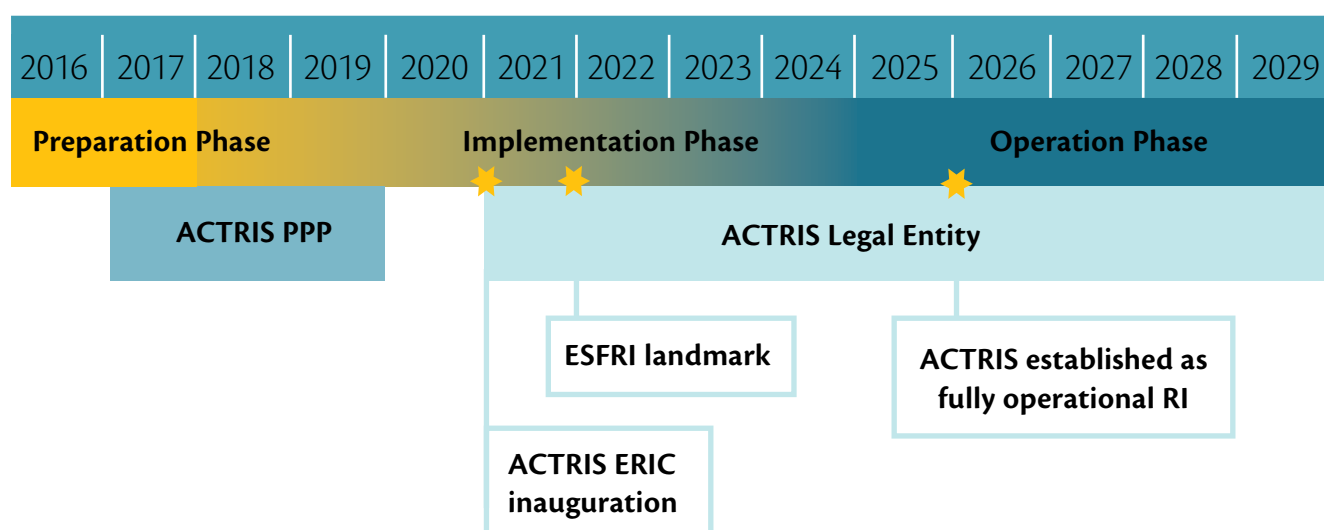


Figure 5. ACTRIS lifecycle phases from design to preparation, implementation and operation. The stars represent ACTRIS targets.

There are two main branches of parallel activities that are needed to achieve the operation phase - organisational and operational (see **Figure 6**). The main tasks in setting up ACTRIS as a research infrastructure that are linked to the operational side define the requirements and construction of the operational facilities, such as NFs, CFs, and Service Access Management Unit (SAMU) and to generating the needed services and the service platforms. The actions and tasks related to the organisational development of the ACTRIS research infrastructure comprise setting up the governing structure (including the interim stages of the same) and establishment of the legal, policy and financial frameworks for the research infrastructure. These actions are generated in the work distribution using different sources of primary funding, the current ACTRIS-2 H2020 and EURO-CHAMP-2020 projects (mainly contributing to the scientific and technical developments), ACTRIS PPP H2020 project (contributing to the setting up the organisational structures and frameworks, and operational concepts) funded by H2020, and national funding supporting the overall implementation and the construction of the NFs and CFs.

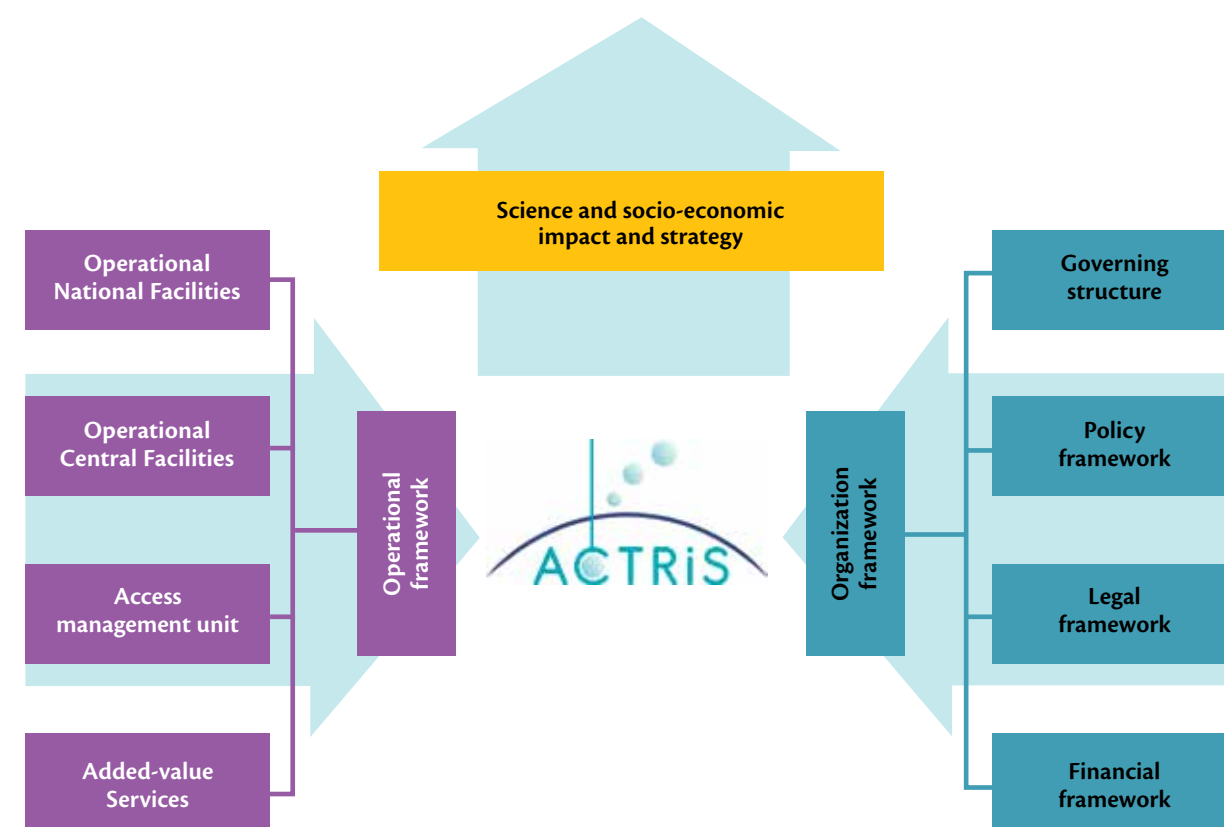


Figure 6. ACTRIS Work Breakdown Structure. Each box describes a key action/product.

Objectives of ACTRIS Implementation Phase

The target of ACTRIS Implementation Phase is to ensure the long-term operations and sustainability of ACTRIS. The objectives of the Implementation Phase are:

- Construct and upgrade the ACTRIS Central Facilities and National Facilities;
- Carry out the NF labelling process to grant ACTRIS status for NFs to be included in ACTRIS;
- Validate the ACTRIS internal support actions for the Operational Phase
- Validate the ACTRIS services for the Operational Phase;
- Design a Catalogue of Services targeted for the broad market of ACTRIS users;
- Enable the smooth and easy access to ACTRIS data by setting up work flows for data processing and data provision
- Provide pilot services to the users, as physical, remote and virtual access to the CFs and selected NFs, and create new services depending on the users' needs by implementing the Services Access Management Unit (SAMU);
- Ensure well-managed ACTRIS ERIC governance and legal entity operations to guarantee the long-term sustainability of the RI;
- Ensure the connections between national ACTRIS consortia and ACTRIS ERIC;
- Guarantee long-term financial commitment from ACTRIS ERIC members;
- Engage potential new members and observers;
- Generate new interactions with ESFRI research infrastructures and international programmes and initiatives where ACTRIS can contribute (e.g., health, agriculture, European contribution to global activities);
- Ensure that ACTRIS is a well-known and recognised RI among users and collaborators;
- Increase the collaboration with, and the number of services offered to the private sector;
- Analyse the socio-economic impacts of ACTRIS to strengthen the value of ACTRIS and communicate the impact to stakeholders to ensure long-term sustainability; and
- Ensure the high-quality performance of the ACTRIS operations and service provision by monitoring the KPIs and risks.

ACTRIS 5-years Activity Plan for the Implementation Phase

Nine main activities for the next five years have been identified in the 5-year implementation plan (see below). More details will be given in the ACTRIS Implementation plan that is currently under development.

1) RI Operations

- As part of the implementation activities, many of the CFs and NFs will become gradually operational during the Implementation Phase. The time at which each CF or NF is developed will depend on the maturity of the CF or NF and the ability of ACTRIS ERIC members to access national and European Structural funding.

2) Service Development

- ACTRIS users will have access to an extensive Catalogue of Services. The core of the ACTRIS implementation plan on service development will be the service validation and the setting-up of user access and feedback mechanisms as part of a quality assurance system for continuous improvement of access and services.

3) Piloting Access and Service Provision

- ACTRIS services are open to all types of users, including European and non-European countries. During the Implementation Phase, a first set of services will be piloted and tested, and user feedback gathered. This requires identifying a set of access services and gathering the test group for piloting the access service.

4) Governance and Coordinated Management

- The Head Office continues to set up and facilitate the ACTRIS governing bodies and ensure the long-term sustainability of the RI. After ACTRIS ERIC is established, ERIC starts working with contractual agreements with NFs, CFs and third parties (partnerships). Among many management tasks, ACTRIS ERIC will set up quality management systems to monitor the RI performance.

5) Community Engagement and Attracting New Members,

- Development of ACTRIS relies on close connection to ACTRIS science community. Thus, ACTRIS will continue to engage with ACTRIS science community and support community building in regions that are not yet connected to ACTRIS. These community building and engagement actions will in the end enable enrolling of new members and observers for ACTRIS ERIC.

5) International cooperation,

- ACTRIS is a key player in the field of environmental RIs, but is also an important part of the regional and global atmospheric networks. ACTRIS will continue to actively participate in international initiatives and collaborate with strategic liaison partners. The ACTRIS HO will be the central point of contact for these liaison and partnership activities.

6) Outreach and Communication,

- The community building and engagement of various stakeholder groups are important ongoing tasks. ACTRIS will strive to outreach to its users and stakeholders but also to the general public to explain the effects that short-lived atmospheric constituents have in our life.

7) Innovation and Technology Development Activities,

- Services offered by ACTRIS to support innovation are meant to foster knowledge transfer, which aims in the medium to long term to create new technological and societal breakthroughs and impact. Such services can include training on demand or targeting specific users groups; the design and co-design of instrumentation, equipment or procedures; joint research activities

and joint instruments testing. ACTRIS participates in the knowledge production on societal challenges and to mitigation of the impacts of climate change and air quality.

- Within the Implementation Phase, ACTRIS will start working towards technology development and innovation activities, including promoting of cooperation with the private sector, policy makers and general public;

8) Socio-economic Impact,

- A socio-economic impact study carried out in ACTRIS Preparatory Phase demonstrates clear societal benefit and contribution to several dimensions of regional, national and European development. During the Implementation Phase, a second round of socio-economic analyses (direct, indirect) will be carried out to follow up the benefits of the new services.

Timetable for Ramping-up the Internal-Support Actions and Service Provision during the Implementation Phase

Table 1. Illustration of ACTRIS Central Facilities ramp-up of the internal support and service provision during the Implementation Phase, and first year of operations (2025).

Most of the main activities proposed above will be implemented within the different CFs in the next five years (2020-2024). The CFs have estimated their ramping-up of the internal support and service provision for the Implementation Phase. A general first overview of the timeframe for ramping-up is presented in **Table 1**. As seen from the table, some parts of ACTRIS CFs already exist and provide services.

Central Facility	2020	2021	2022	2023	2024	2025
Head Office						
Data Centre						
Centre for Aerosol In Situ Measurements						
Centre for Cloud In Situ Measurements						
Centre for Reactive Trace Gases In Situ Measurements						
Centre for Aerosol Remote Sensing						
Centre for Cloud Remote Sensing						
Centre for Reactive Trace Gases Remote Sensing						

ACTRIS Preparatory Phase Project

The ACTRIS Preparatory Phase Project (PPP) is EU Horizon 2020 Coordination and Support Action (grant agreement No 739530, 1/2017-12/2019). ACTRIS PPP was highlighted to have very successful project delivery with significant impact in the European Commission mid-term review performed in the fall 2018.

ACTRIS PPP in numbers:

- 28 beneficiary partners, from 20 countries and the European Commission's Joint Research Centre (see **Table 2**)
- 12 linked third parties
- 70 officially approved associate partner organizations.
- Interim ACTRIS Council with 16 members and 1 observer

The main objectives of ACTRIS PPP are to develop the organizational, operational and strategic frameworks of the RI. The work includes legal, governance, financial, technical, strategic, and administrative aspects carried out in 10 work packages. The main outcomes of the PPP are signature-ready documents for establishment of the ACTRIS ERIC with well-defined operations and a sound business plan.

The ACTRIS Preparatory Phase Project is built upon three themes; organizational framework (WPs 1-3), operational framework (WPs 4-6) and strategic work (WPs 7 and 8) as illustrated in **Figure 7**. Work package 9 (ACTRIS PPP management) manages the other work packages and ensures high quality contributions in a timely manner. The three themes are highly interconnected. Information from all themes

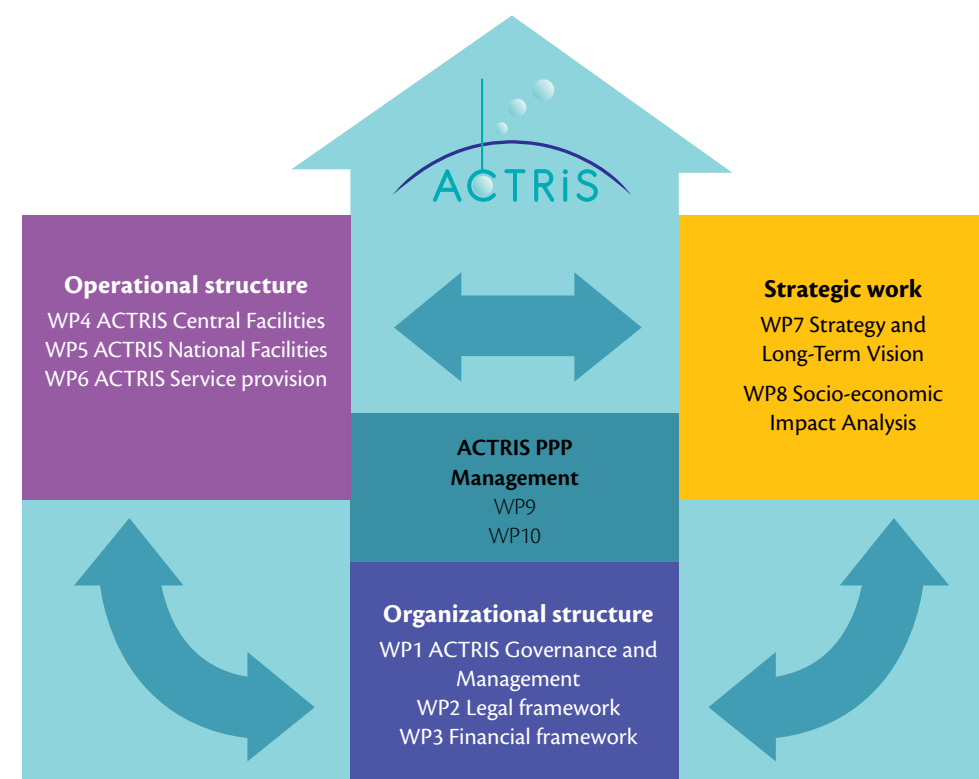


Figure 7. 7 illustrates the three themes of the ACTRIS Preparatory Phase Project: organizational, operational, and strategic work together with their associated work packages.

Participant No	Participant organization name	Country
1	Ilmatieteen laitos (FMI) (Coordinator)	Finland
2	Helsingin yliopisto (UHEL)	Finland
3	Consiglio Nazionale Delle Ricerche (CNR)	Italy
4	Centre National de la Recherche Scientifique (CNRS)	France
5	National Institute of R&D for Optoelectronics (INOE)	Romania
6	Český Hydrometeorologický Ústav (CHMI)	Czech Republic
7	Leibniz-Institut für Troposphärenforschung e.V. (TROPOS)	Germany
8	Karlsruher Institut für Technologie (KIT)	Germany
9	National Observatory of Athens (NOA)	Greece
10	Norsk Institutt for Luftforskning (NILU)	Norway
11	Universitat Politècnica de Catalunya (UPC)	Spain
12	Agencia Estatal Consejo Superior de Investigaciones Científicas (CSIC)	Spain
13	Universidad de Valladolid (UVA)	Spain
14	University of Manchester (UMAN)	United Kingdom
15	National Environmental Research Council (NERC)	United Kingdom
16	Science and Technology Facilities Council (STFC)	United Kingdom
17	Koninklijk Nederlands Meteorologisch Instituut (KNMI)	Netherlands
18	Paul Scherrer Institut (PSI)	Switzerland
19	Eidgenössische Materialprüfungs und Forschungsanstalt (EMPA)	Switzerland
20	The Cyprus Institute (Cyl)	Cyprus
21	Instytut Geofizyki Polskiej Akademii Nauk (IGF PAS)	Poland
22	Lunds Universitet (ULund)	Sweden
23	Koninklijk Belgisch Instituut voor Ruimte-Aeronomie (BIRA-IASB)	Belgium
24	National University of Ireland Galway (NUIG)	Ireland
25	Estonian University of Life Sciences (EULS)	Estonia
26	Aarhus Universitet (AU)	Denmark
27	Institute for Nuclear Research and Nuclear Energy (INRNE)	Bulgaria
28	Joint Research Centre (JRC) of the European Commission	Belgium

Table 2. List of ACTRIS PPP beneficiaries.

is directed to WP1 (governance), where it is then collated and provided to the Interim ACTRIS Council for the final decisions on ACTRIS as a research infrastructure.

WP10 (Ethics requirements) is a virtual work package which aims to provide deliverables in the six issues in which the Ethical Board of European Commission has asked for more information from the project.

ACTRIS PPP governance

ACTRIS PPP has a standard European Commission project management structure with PPP General Assembly, project coordinator, co-coordinator, coordination team and management office and Executive Board (see **Figure 8**).

The PPP General Assembly is the decision-making body of the project consortium to deal with project related issues, and it consists of one authorized representative of each PPP beneficiary. The ACTRIS PPP coordinator represents the project consortium towards the European Commission and ACTRIS Member countries, and is in charge of the administrative, legal, and financial management of the PPP project.

Each of the ACTRIS member countries has nominated a National ACTRIS Contact Person who acts as a main contact point in the ACTRIS research infrastructure (see the list in section ACTRIS Community). The ACTRIS Contact Person is responsible for organising the coordination of the ACTRIS community at national level and is responsible for ensuring the proper dissemination and information flow from the European ACTRIS activities to the national science communities and the relevant national stakeholders.

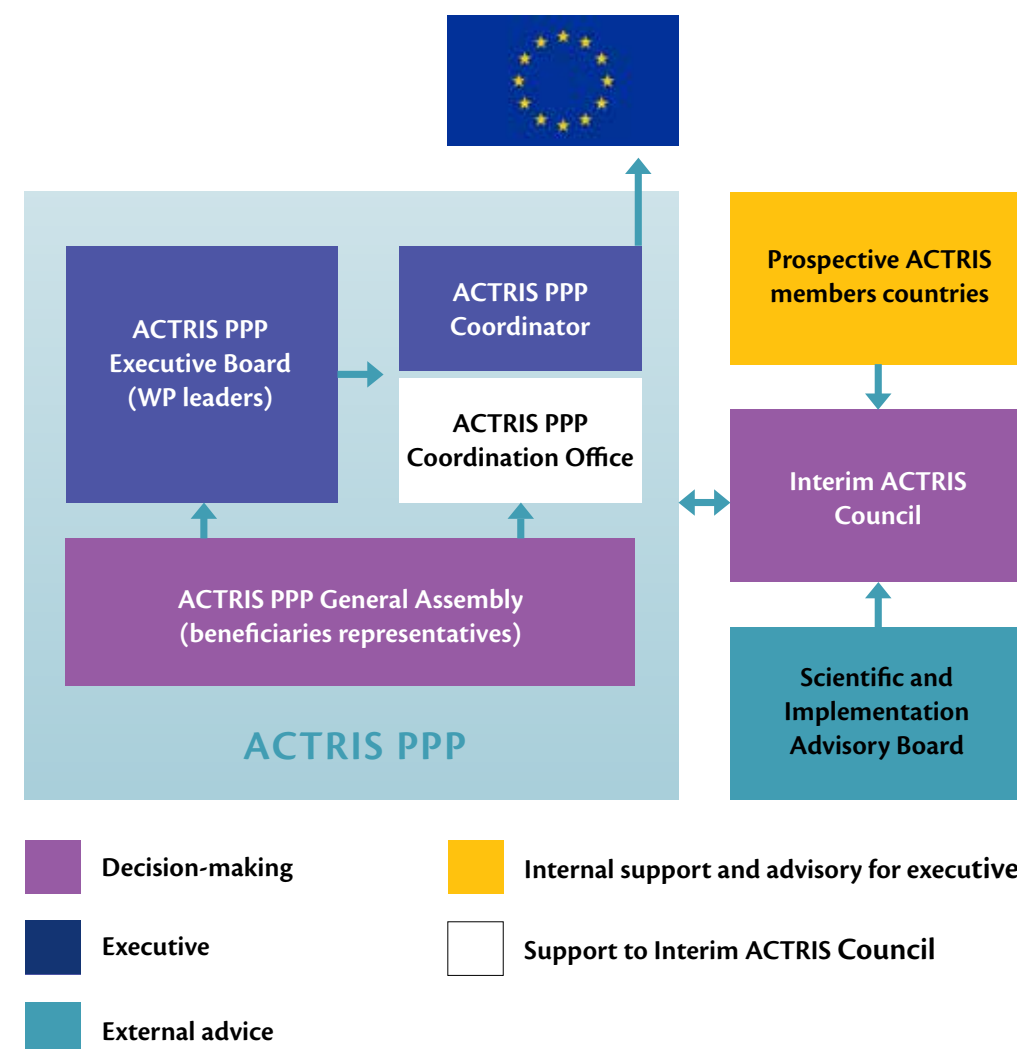


Figure 8. illustrates the governance structure of the ACTRIS Preparatory Phase Project.

Interim ACTRIS Council

The IAC is the superior decision-making body for ACTRIS as a research infrastructure prior to ERIC has been established. The IAC consists of ACTRIS members (country representatives nominated by the ministries or organisation mandated to act on the behalf of the country). The IAC is responsible for negotiating and approving the legal model, governance structure, statutes and all other necessary constitutional documents, Financial Plan and financial internal rules, policy documents such as data policy, access policy, and staff policy for the ACTRIS research infrastructure. The overall governance structure, the roles and responsibilities of the bodies for ACTRIS RI are described in more detail elsewhere (ACTRIS PPP D1.1 ACTRIS Governance and management structure, [https://www.actris.eu/Documentation/ACTRISPPP\(2017-2019\)/Deliverables.aspx](https://www.actris.eu/Documentation/ACTRISPPP(2017-2019)/Deliverables.aspx)).

The IAC has currently (as of December 2018) 16 Members and 1 Observer. The list of the Council Members / Observers is given in **Figure 9**. It should be highlighted that within one year four new members have joined the IAC. So far, the IAC has had six meetings since February 2017.

Figure 9. List of the Members and Observers of the Interim ACTRIS Council as of December 2018.

 Austria Member	 Belgia Member
 Bulgaria Member	 Cyprus Member
 Poland Member	 Czech Republic Member
 Romania Member	 Finland Member
 Spain Member	 France Member
 Switzerland Member	 Greece Member
 United Kingdom Member	 Italy Member
 Norway Member	 Netherlands Member
	 Germany Observer

- 1st IAC meeting, 15-16 February 2017, Helsinki, Finland
 - IAC elected S. La Rosa as the Chair
 - IAC elected V. Vulturescu as the Vice-Chair
 - IAC adopted Rules of Procedure

- 2nd IAC meeting, 23-24 October 2017, Rome, Italy

IAC approved the ERIC legal model for ACTRIS via written procedure in December 2017.

IAC approved the procedure for selecting Interim SIAB (Scientific and Implementation Advisory Board) candidates via written procedure in December 2017.

- 3rd IAC meeting, 26-27 February 2018, Bucharest, Romania
 - IAC approved the operational structure for ACTRIS with National Facilities and Central Facilities incl. Head Office, Data Centre and six Topical Centres
 - IAC approved to try the ERIC STEP 1 submission in January 2019
 - IAC approved the principles of ACTRIS Central Facility selection process (three basic evaluation criteria, the eligibility criteria to apply, the list of reference documents). IAC mandated ACTRIS PPP to set up a selection task group to manage the selection process.
 - IAC approved the SIAB members
- 4th IAC meeting, 7-8 June 2018, Zürich, Switzerland
 - IAC approved ACTRIS Central Facilities specific descriptions
 - IAC approved the irrevocable proposal of Finland to host the statutory seat of ACTRIS ERIC
 - IAC approved the technical concepts and requirements of the ACTRIS National Facilities.
- 5th IAC meeting, 25-26 October 2018, Lyon, France
 - IAC approved ACTRIS data policy
 - IAC approved ACTRIS access policy
 - IAC approved host candidates for
 - Centre for Aerosol In Situ Measurements
 - Centre for Aerosol Remote Sensing
 - Centre for Cloud Remote Sensing
 - Centre for Reactive Trace Gases In Situ Measurements
 - Centre for Reactive Trace Gases Remote Sensing
 - Head Office
 - IAC approved National Facilities labelling principles
 - IAC approved ACTRIS financial principles
 - IAC approved ACTRIS ERIC (initial) perimeter
 - IAC approved ACTRIS ERIC governance structure

- 6th IAC meeting, 12-13 December 2018, Brussels, Belgium
 - IAC approved host candidates for
 - Centre for Cloud In Situ Measurements
 - Data Centre
 - IAC approved the approach to calculate ACTRIS 5-year financial plan for ERIC Step 1
 - IAC approved ACTRIS ERIC voting rights and decisions

7th IAC meeting will take place on 23-24 January 2019 in Barcelona, Spain. The main aim of this meeting is to approve the final documents needed for the ERIC Step 1, and mandate Finland to submit the ERIC Step 1 application on behalf of the participating countries.

Scientific and Implementation Advisory Board

The SIAB was established in early 2018 and since then the SIAB has had two meetings (Webex in June 2018 and face-to-face meeting in September 2018) and they have reported to the IAC once. The SIAB consists of the following experts: Valérie Thouret, Petteri Taalas, Øystein Hov, Len Barrie, Beatrix Vierkorn-Rudolph and Carlo Rizzuto.

The SIAB advises and supports the Interim ACTRIS IAC and the ACTRIS PPP in their implementation work to obtain the objectives of ACTRIS. It comments on the overall technical plans and directions and follows the implementation and setting-up of the ACTRIS ERIC. It supplies feedback and makes recommendations for further developing ACTRIS research infrastructure services and management.

ACTRIS-2

The project ACTRIS-2 Integrating Activity (IA) is funded by the European Union's Horizon 2020 research and innovation programme (grant agreement No 654109, 5/2015-4/2019). ACTRIS-2 addresses the scope of integrating state-of-the-art European ground-based stations for long-term observations of aerosol, clouds and short-lived gases. ACTRIS-2 runs in parallel to the ACTRIS Preparatory Phase Project. ACTRIS-2 is a complementary action and it supports the setting up of the pan-European ACTRIS research infrastructure as it enables the engagement of the user communities and promotes the scientific and technical development of ACTRIS, while the ACTRIS PPP focuses on setting up the structures and processes for managing the research infrastructure.

The main activities in ACTRIS-2 are related to providing transnational access for users, strengthening the measurement and calibration capabilities, and developing data comparability and data life-cycles. ACTRIS-2 facilitates the improvement of the technical level of planned RI services, enhances RI collaboration on a national, regional, and global scale, and encourages public-private partnerships and collaboration.

The ACTRIS-2 consortium has 31 partners and 21 linked third parties. In addition, the project has more than 80 associated partners including several SMEs.

Innovation in instrumentation is one of the fundamental building blocks of ACTRIS-2. Associated partnership with SMEs stimulates development of joint-ventures addressing new technologies for use in atmospheric observations.

EUROCHAMP-2020

EUROCHAMP-2020 (Integration of European Simulation Chambers for Investigating Atmospheric Processes—towards 2020 and beyond) is funded from the European Union's Horizon 2020 research and innovation programme (grant agreement No 730997, 12/2016-11/2020). The EUROCHAMP network has developed a grid of environmental simulation chambers designed for the scientific investigation of atmospheric chemical and physical processes. These chambers are seen as potential ACTRIS National Facilities (exploratory platforms). ACTRIS PPP is strongly connected to EUROCHAMP, with many partners (or associated partners) in ACTRIS operating EUROCHAMP simulation chambers and being partners in the EUROCHAMP-2020 project. The integration of the atmospheric simulation chambers as National Facilities and the connected activities for the definition of access policies will be elaborated jointly with the extended EUROCHAMP communities.

EUROCHAMP-2020 aims at further integrating the most advanced European atmospheric simulation chambers into a world-class infrastructure for research and innovation. The project includes networking activities, which deliver improved chamber operability across the infrastructure as well as standard protocols for data generation and analysis. Trans-national access is provided to sixteen different chambers and four calibration centres, becoming the core of the project. Joint research activities enhance the capability of the infrastructure to provide improved services for users. Cooperation with the private sector is a fundamental element of the project, and it is necessary to exploit the innovation potential of the infrastructure by supporting development of scientific instruments, sensor technologies, and de-polluting materials.

Financial overview

The main objectives of ACTRIS PPP (WP3) regarding ACTRIS financial framework are to define the overall infrastructure implementation and operational costs, assess funding models best suited for delivering the construction and operational needs of ACTRIS, develop policy recommendations on financial principles, and establish the ACTRIS 5-year financial plan for ACTRIS.

The ACTRIS cost book for the whole RI including CFs and NFs over entire RI lifetime (implementation, operation, decommissioning) is iteratively being developed. The complete Cost book will report all the costs as resulting from the final Technical documentation of the selected ACTRIS Central and the different National Facilities types. For the Central Facilities, the total cost for the implemen-

tation phase (up to 2024) is about 110 M€ and the estimated average annual operation cost (2025 onwards) is about 16 M€ per year. **Figure 10** provides the cost estimates for each ACTRIS Central Facility.

During the CF selection process hosting institutions have given information about the possible committed funds. Interim ACTRIS Council made decisions on ACTRIS funding model principles (see below) and ACTRIS 5-year financial plan for ERIC Step 1.

Principles of contribution

- The resources of the ACTRIS ERIC shall include the contributions of members, permanent observers and observers.
- Members' annual contributions shall consist of Host contributions, where applicable, and a Membership contributions.

Host contribution

- The Host contribution is the support provided by ACTRIS ERIC members and permanent observers for the functioning of Central Facilities units hosted in their own country.
- The level of Host contributions for each Central Facility is a relevant quota, and shall account for not less than 50% of its annual operation costs.
- The Host contributions can be provided in cash or in-kind.

Membership contribution

- The quota of each Central Facility's annual operation costs that is not covered by the Host contribution shall be funded by ACTRIS ERIC through the Membership contribution from ACTRIS ERIC members, permanent observers and observers. The detailed calculation method is to be defined in the ACTRIS ERIC financial rules.
- Membership contributions shall be provided in cash only.
- The contributions to ACTRIS ERIC shall be made in Euros.

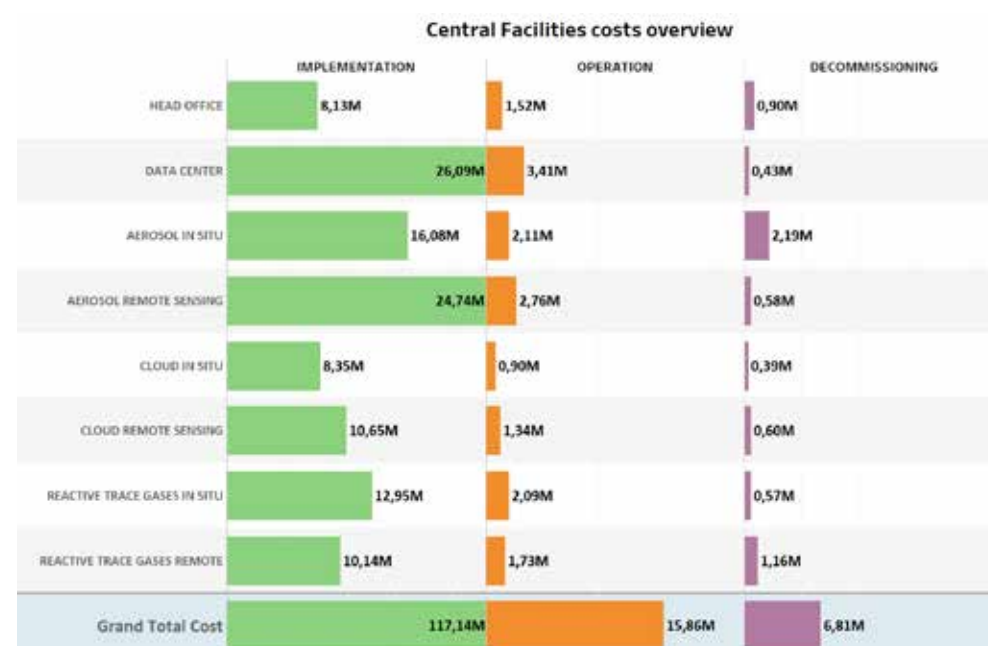


Figure 10. Overview of ACTRIS Central Facility costs (according to 3rd Cost book release in December 2018).

- The annual Membership contribution is based on the main principles of the support provided to members and inclusiveness.

Observer contribution

The annual contributions for permanent observers and observers are based on the same principles as for members and are established by the General Assembly at the moment of deciding on their application.

Members, permanent observers or observers joining the ACTRIS ERIC will pay the pro rata annual contribution for the year of entry, based on the month of joining the ACTRIS ERIC.

ACTRIS COMMUNITY

ACTRIS has a large European wide community - at the moment 22 countries have shown their commitment at organizational or state level (**Figure 11**) and the overall ACTRIS community involves more than 100 RPOs. The list of ACTRIS National representatives is given in **Table 3**. Currently 16 countries are Members in the Interim ACTRIS Council and thus committed to politically and financially support the implementation of ACTRIS as a research infrastructure in the coming years.

In the following section of the handbook, country profiles from the 22 countries participating in ACTRIS are provided. Country profiles give information on the national level ACTRIS community, provides a list of potential ACTRIS National Facilities and contribution to host ACTRIS Central Facilities. Current level of national ACTRIS funding situation is also briefly stated. **As already noted, the provided information regarding ACTRIS National Facilities is still preliminary. ACTRIS National Facility labelling process shall start in the Implementation Phase.**

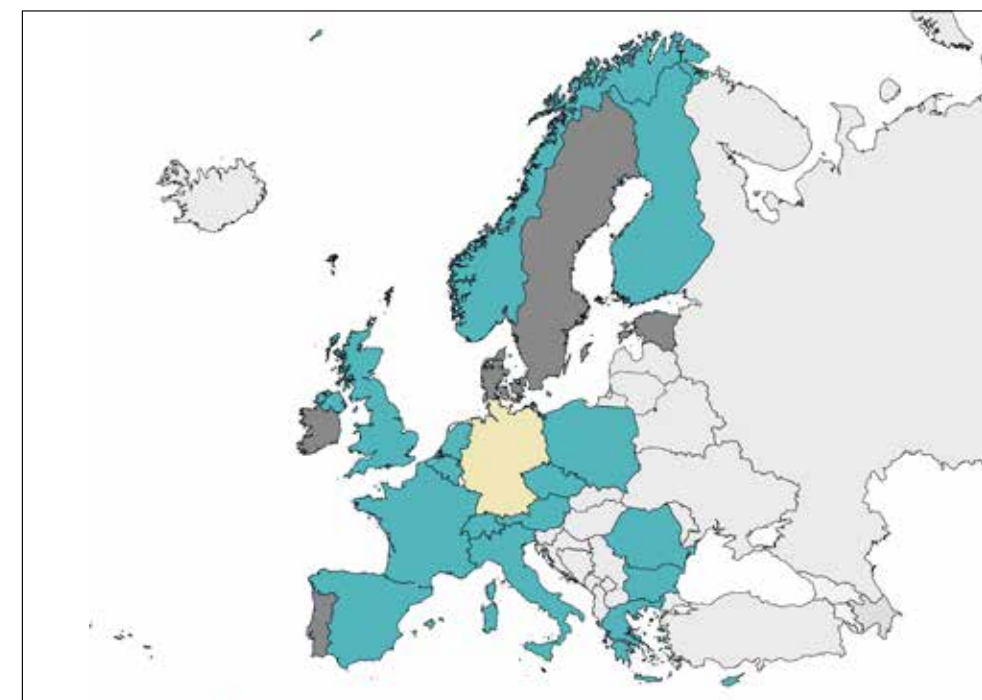


Figure 11. Countries involved in ACTRIS. Members of the ACTRIS Interim Council are marked with petrol blue and Observers with beige. Countries marked with dark grey have been committed to ACTRIS at the organization-level or are in middle of negotiations at the moment (December 2018).

Table 3. List of ACTRIS National Coordinators.

Country	National ACTRIS Coordinator	Contact information		
Austria	Jochen Wagner Division for Biomedical Physics Medical University Innsbruck	jochen.wagner@i-med.ac.at	Italy	Gelsomina Pappalardo National Research Council of Italy - Institute of Methodologies for Environmental Analysis (CNR-IMAA) gelsomina.pappalardo@imaa.cnr.it
Belgium	Martine De Mazière Royal Belgian Institute for Space Aeronomy (BIRA-IASB)	Martine.DeMaziere@bira-iasb.oma.be	The Netherlands	Arnoud Apituley Royal Netherlands Meteorological Institute (KNMI) arnoud.apituley@knmi.nl
Bulgaria	Dimitar Tonev Institute for Nuclear Research and Nuclear Energy (INRNE)	dimitar.tonev@inrne.bas.bg	Norway	Cathrine Lund Myhre NILU – Norwegian Institute for Air Research cathrine.lund.myhre@nilu.no
Cyprus	Jean Sciare The Cyprus Institute	j.sciare@cyi.ac.cy	Poland	Aleksander Pietruczuk Institute of Geophysics Polish Academy of Sci- ences alek@igf.edu.pl
Czech Republic	Milan Váňa Czech Hydrometeorological Institute	vanam@chmi.cz	Portugal	Daniele Bortoli Institute of Earth Sciences - University of Evora (ICT-UE) db@uevora.pt
Denmark	Henrik Skov Aarhus University	hsk@envs.au.dk	Romania	Doina Nicolae National Institute of R&D for Optoelectronics nnicol@inoe.ro
Estonia	Steffen M. Noe Institute of Agricultural and Environmental Sciences, Estonian University of Life Sciences	steffen.noe@emu.ee	Spain	Adolfo Comerón Universitat Politècnica de Catalunya Amalia Muñoz CEAM comeron@tsc.upc.edu amalia@ceam.es
Finland	Markku Kulmala University of Helsinki Contact person: Silja Häme University of Helsinki	markku.kulmala@helsinki.fi silja.hame@helsinki.fi	Sweden	Erik Swietlicki Lund University erik.swietlicki@nuclear.lu.se
France	Paolo Laj Université Grenoble Alpes (UGA)/ Centre National de Recherche Scientifique (CNRS)	paolo.laj@univ-grenoble-alpes.fr	Switzerland	Urs Baltensperger Paul Scherrer Institute urs.baltensperger@psi.ch
Germany	Ulla Wandinger Leibniz Institute for Tropospheric Research (TROPOS)	ulla@tropos.de	United Kingdom	Geraint Vaughan National Centre for Atmospheric Science (NCAS) and School of Earth and Environmen- tal Science, University of Manchester geraint.v Vaughan@manchester.ac.uk
Greece	Nikolaos Mihalopoulos University of Crete and National Observatory of Athens	nmihalo@noa.gr	European Com- mission -Joint Research Centre	Jean-Philippe Putaud jean.putaud@ec.europa.eu
Ireland	John Wenger University College Cork (UCC)	j.wenger@ucc.ie		

4

COUNTRY PROFILES



Puy de Dôme Station
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ACTRIS-Austria



Sonnblick Observatory, 3106 m

National ACTRIS coordinator and contact person:

Jochen Wagner

Division for Biomedical Physics
Medical University Innsbruck

Membership status in the Interim ACTRIS Council

- Member

Nominated representatives:

- Elke Ludewig, Sonnblick Observatory, ZAMG, Salzburg
- Karolina Begusch-Pfefferkorn, Austrian Federal Ministry of Education, Science and Research, Vienna
- Jochen Wagner, Division for Biomedical Physics, Medical University Innsbruck



Ministries and other possible funding organisations supporting ACTRIS

- Austrian Federal Ministry of Education, Science
- FWF (<https://www.fwf.ac.at/en/>)

Research performing organisations in the national ACTRIS consortium

- Institute of Atmospheric and Cryospheric Sciences (ACINN), University of Innsbruck

Thomas Karl

- Aerosol Physics & Environmental Physics (AEP), Universität Wien
Bernadett Weinzierl
- Division of Biomedical Physics (BmP), Medical University Innsbruck
Jochen Wagner
- Institut for Meteorology (Boku-Met), University of Natural Resources and Life Sciences, Vienna
Stefan Schreier
- LuftBlick Earth Observatory Technologies, Mutters, Tyrol
Alexander Cede
- Sonnblick Observatory, ZAMG
Elke Ludewig
- Vienna University of Technology (TU)
Anne Kasper-Giebl

Contribution to the ACTRIS Central Facilities

In the table below, ACTRIS Central Facilities (CFs) hosted by the country are listed.

Potential ACTRIS National Facilities - ACTRIS observational platforms and exploratory platforms

In the table below, a list of national facilities, both observational and exploratory platforms, potentially becoming ACTRIS National Facilities is provided.

Central Facility	CF Unit name	CF Unit description	CF Unit hosting institution / country (for Head Office)
Centre for Cloud In Situ Measurements	Centre for Calibrating Integrating Cloud Probes (CCICP)	<ul style="list-style-type: none"> • Instrument tests and intercomparison campaigns at SBO • Training and knowledge transfer activities and workshops • User services • Calibration of integrated cloud probes, cloud droplets instruments (PVM, CDP) 	Sonnblick Observatory
Centre for Reactive Trace Gases Remote Sensing	CREGARS-UUVIS-AT	operation support, laboratory calibration, provision of procedures for PANDORA instrument characterisation, data acquisition, ...	Medical University Innsbruck

The status of national ACTRIS consortium

The national ACTRIS consortium consists of seven partners, five Universities, the Austrian weather service, ZAMG and the private company LuftBlick. The Austrian Federal Ministry of Education, Science and Research supports ACTRIS-AUSTRIA. There are regular physical meetings and limited national funding for our networking activities.

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
Sonnblick	Observational platform, high altitude station	47.0540°N 12.9575°E 3106 a.s.l.	planned with minor upgrade	planned with major upgrade				
Vienna	Observational platform, urban station	48.2378°N 16.3317°E 266 a.s.l.				planned with upgrade		

Funding for ACTRIS

ACTRIS is established at administrative level at the national RPO's. Furthermore the Austrian Federal Ministry of Education, Science and Research signed a letter of Intent (LoI). Limited funding for networking activities has been available in 2018.

Users of ACTRIS

- The seven partners in Austria are also important users of ACTRIS
- Other RPO's in Austria, especially in the framework of nationally funded research project (FFG,FWF)
- ESA (European Space Agency) / NASA (National Aeronautics and Space Administration) for ground based validation of reactive trace gas retrievals
- Collaboration with private sector is very intense, the private company LuftBlick is even member of the national consortium
- Sonnblick is already member of GAW (Global Atmosphere Watch) with users via WMO (world meteorological organisation)
- ZAMG (the national weather service) will use ACTRIS data for model data assimilation, development and validation



ACTRIS-Belgium



The site of Ukkel (50,51°N, 4,3°E) proposed as an ACTRIS National Facility of Belgium - including some instruments operated at the site by the local RPOs.



National ACTRIS coordinator and contact person:
Martine De Mazière

Royal Belgian Institute for Space Aeronomy (BIRA-IASB)

Membership status in the Interim ACTRIS Council

- Member
- Nominated representatives:
- Laurence Lenoir, BELSPO
- Aline van der Werf, BELSPO

Ministries and other possible funding organisations supporting ACTRIS

- At Belgian Federal level: Belgian Science Policy Office (BELSPO)
- At Walloon level: Direction des Programmes de Recherche du Département de la Recherche et du Développement technologique, DG06 (responsible person: R. Detaille; contact person: D. Flagothier) ; ministry in charge « Economie, Industrie, Recherche, Innovation, Numérique, Emploi et Formation » (actual Minister is P-Y Jeholet).
- Fédération Wallonie-Bruxelles (contact person : M. Vanholsbeeck)

Research performing organisations in the national ACTRIS consortium

- Royal Belgian Institute for Space Aeronomy (BIRA-IASB): Martine De Mazière
- Royal Meteorological Institute of Belgium (KMI-IRM): Hugo De Backer
- University of Liège (ULiège): Emmanuel Mahieu
- Institut Scientifique de Service Publique (ISSeP): Benjamin Bergmans

Contribution to the ACTRIS Central Facilities

In the table below, ACTRIS Central Facilities (CFs) hosted by the country are listed.

Central Facility	CF Unit name	CF Unit description	CF Unit hosting institution / country (for Head Office)
Centre for Reactive Trace Gases Remote Sensing	CREGARS-FTIR-BE	Operational support and user services for FTIR-type instruments for reactive trace gas remote sensing	BIRA-IASB & ULiège
Centre for Reactive Trace Gases Remote Sensing	CREGARS-UVVIS-BE	Operational support and user services for UVVIS instruments for reactive trace gas remote sensing, with a focus on MAX-DOAS type UVVIS instruments	BIRA-IASB

Potential ACTRIS National Facilities - ACTRIS observational platforms and exploratory platforms

In the table below, a list of national facilities, both observational and exploratory platforms, potentially becoming ACTRIS National Facilities is provided.

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
Observatoire de Physique de l'Atmosphère à La Réunion (OPAR), Franco-Belgian site	Observational platform, tropical mountain site, also an ICOS atmospheric site.	21.1°S, 55.4°E 2200 masl						ready
Ukkel	Observational platform, urban	50.78°N, 4.35°E, 104,9 masl	Planned with major upgrade					
Vielsalm	Observational platform, rural, also an ICOS ecosystem	50.27°N, 5.9°E, 494 masl	Planned with major upgrade		ready			

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
Scientific Station of the Jungfraujoch, Swiss-Belgian site	Observational platform, also an ICOS atmospheric site	46.55°N, 7.89°E, 3572 masl						ready
PTR-MS	Exploratory platform	mobile			ready			

The status of national ACTRIS consortium

Belgium does not have a national roadmap yet.

Funding for ACTRIS

The involved RPOs have committed to provide in-kind support for ACTRIS. The funding organisations have not yet made any dedicated financial commitment.

Users of ACTRIS in Belgium

- Belgian Universities (10 in total)
- Belgian Interregional Environment Agency (IRCEL-CELINE) including VMM (Flemish Environmental Agency), IBGE (Environment Brussels), and AWAC (Walloon Agency for Air and Climate)
- Belgian research institutes (VITO, SCK-CEN, ...)
- Citizen science projects, e.g., air quality initiatives

Users of ACTRIS beyond Belgium

- Copernicus
- Network for the Detection of Atmospheric Composition Change (NDACC)



ACTRIS-Bulgaria

© ACTRIS



BEO Moussala

National ACTRIS coordinator and contact person:

Dimitar Vassilev Tonev

Institute for Nuclear Research and Nuclear Energy by the Bulgarian Academy of Sciences (INRNE-BAS)

Membership status in the Interim ACTRIS Council

- Member

Nominated representatives:

- Zornitsa Georgieva, Ministry of Education and Science
- Christo Angelov, INRNE-BAS
- Tanja Dreischuh, Institute of Electronics - Bulgarian Academy of Sciences



Ministries and other possible funding organisations supporting ACTRIS

- Ministry of Education and Science
- Bulgarian Academy of Sciences

Research performing organisations in the national ACTRIS consortium

- Institute for Nuclear Research and Nuclear Energy (INRNE-BAS)

<http://www.inrne.bas.bg>

Contact: Prof. Dimitar Tonev, Dr. Christo Angelov

- Institute of Electronics - Bulgarian Academy of Sciences

Laser Radars Laboratory

http://www.ie-bas.org/ie_Eng.htm

Contact: Prof. Latchezar Avramov, Dr. Tanja Dreischuh

Potential ACTRIS National Facilities - ACTRIS observational platforms and exploratory platforms

In the table below, a list of national facilities, both observational and exploratory platforms, potentially becoming ACTRIS National Facilities is provided.

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
BEO "Mous-sala"	Observational platform, background high mountain site	42.1043° N 23.3507° E 2925 m a.s.l	ready					
Sofia Lidar Station, IE-BAS	Observational Platform Sofia city	42.3914° N 23.2313° E 550 m a.s.l.				planned with minor upgrade		

The status of national ACTRIS consortium

The ACTRIS-BG Bulgarian national consortium consists of two research organizations, Institute for Nuclear Research and Nuclear Energy and Institute of Electronics at the Bulgarian Academy of Sciences, which have signed a Memorandum of Understanding. The organizations are involved in ACTRIS activities with their atmospheric measurement sites - mountain station BEO Moussala (for aerosol in situ observations) and Sofia EARLINET lidar station (for aerosol remote-sensing observations). Since June 2017 ACTRIS-BG has been on the Bulgaria National Roadmap for Research Infrastructure 2017-2023 (http://www.mon.bg/upload/4013/Roadmap_2017_ENG.pdf), which is a clear sign for the national recognition of the conducted research.

Funding for ACTRIS

Funding from Ministry of Education and Science - BULGARIA NATIONAL ROADMAP FOR RESEARCH INFRASTRUCTURE 2017-2023 and Bulgarian Academy of Sciences.

Users of ACTRIS

The user community in Bulgaria is composed by researchers at various educational and academic institutions working on atmospheric research, weather forecasting and climate modeling, as well as by state organizations and policy makers interested in air quality monitoring.

Educational and Research Institutions:

- Sofia University "St. Kliment Ohridski";
- National Institute of Meteorology and Hydrology;

- National Institute of Geophysics, Geodesy and Geography;
- Plovdiv University "Paisii Hilendarski";
- Konstantin Preslavsky University of Shumen;
- Central Laboratory of Solar Energy and New Energy Sources

Policy makers:

- Ministry of Environment and Water;
- Sofia Municipality



Institute for Nuclear Research and Nuclear Energy - Bulgarian Academy of Sciences



Bulgarian Academy of Sciences



REPUBLIC OF BULGARIA
Ministry of Education and Science



Institute of Electronics - Bulgarian Academy of Sciences

ACTRIS-Cyprus



Cyprus Atmospheric Observatory (CAO)



National ACTRIS coordinator and contact person:
Prof. Jean Sciare
EEWRC director, The Cyprus Institute

Membership status in the Interim ACTRIS Council

- Member

Nominated representatives:

- Christos ASPRIS, Planning Officer, Directorate General for European Programmes, Coordination and Development (DGEPCD)

Ministries and other possible funding organisations supporting ACTRIS

- Ministry of Finance, Directorate General for European Programmes, Coordination and Development (DGEPCD)
- Ministry of Education and Culture
- Ministry of Labour, Welfare, and Social Insurance
- Ministry of Agriculture, Rural development, and Environment
- The Cyprus Institute
- Cyprus University of Technology

Research performing organisations in the national ACTRIS consortium

- The Cyprus Institute (Cyl), Nicosia, Cyprus (www.cyi.ac.cy) **Contact:** Jean Sciare (j.sciare@cyi.ac.cy)
- Cyprus University of Technology (CUT), Limassol, Cyprus
Department of Civil Engineering & Geomatics **Contact:** Diofantos Hadjimitsis (d.hadjimitsis@cut.ac.cy)
- Department of Labour Inspection (DLI), Air Quality section **Contact:** Chrysanthos Savvides (csavvides@dlm.msi.gov.cy)
- Department of Meteorology (DoM) **Contact:** Filippos Tymvios (ftymvios@dom.moa.gov.cy)

Potential ACTRIS National Facilities - ACTRIS observational platforms and exploratory platforms

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
Cyprus Atmospheric Observatory	Obsevational platform, Plain boundary layer, Rural, Mediterranean climate, Natural background	35.0386°N 33.0575°E 550 m a.s.l.			planned			planned
Cyprus University of Technology - Limassol	Obsevational platform, Coastal site, Mediterranean climate, Limassol area, urban background	34.675°N 33.043°E 50 m a.s.l.				ready	planned with major upgrade	
Troodos Monitoring station	Obsevational platform, Mountain site, Cyprus, Natural background	34.9436°N 32.8661°E 1820 m a.s.l.	planned with minor upgrade					
Unmanned System Research Laboratory	Unmanned Aerial Vehicles (UAVs)	mobile	ready	ready		ready		

The status of national ACTRIS consortium

ACTRIS-Cy has been ranked first of the ESFRI projects in the Expression of Interest coordinated in July 2017 by the Directorate General for European Programmes, Coordination and Development (DGEPCD) in the framework of the 2016 National Roadmap. The governance structure of ACTRIS-Cy is currently being setting up.

Funding for ACTRIS

Cypriot RPOs have invested c.a. 2M€ over the past 5 years for setting up Research Infrastructure related to ACTRIS (national and lab facilities) and the global annual operation costs in 2016 (early construction phase) are estimated at c.a. 0.4 M€ (including costs for investment, operations, and staff), representing c.a. 5 FTE.

Users of ACTRIS

Cyprus is a remote Mediterranean island - EU member state - located in the Middle East and strategically located to receive long-range transported air pollution from 3 different continents (Europe, Africa, Asia) and the two largest world-wide deserts (Sahara, Arabic Peninsula). Cyprus is the EU member that is the most impacted by desert dust, the only one impacted by Middle anthropogenic pollution.

Within the last 3 years, ACTRIS-Cy Research Infrastructures have attracted a large number (>30) of international RPOs working on aerosol-cloud interactions and long-range transported air pollution, combining ground-based (in-situ) and vertical (remote sensing and in-situ UAV) atmospheric observations.

Several Ministry Departments (DoM, DLI) are directly benefiting from ACTRIS-Cy activities for weather/dust/air quality forecasting, operation of the EMEP station (QA/QC, data submission), and compliance with several EU environmental directives on Air Quality (Aerosol chemical composition).



ACTRIS-Czech Republic

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National atmospheric observatory Košetice

National ACTRIS coordinator and contact person:

Milan Váňa

Czech Hydrometeorological Institute

Membership status in the Interim ACTRIS Council

- Member

Nominated representatives:

- Milan Váňa, Czech Hydrometeorological Institute
- Helena Římská, Ministry of Education Youth and Sports
- Petr Ventluka, Ministry of Education Youth and Sports



Ministries and other possible funding organisations supporting ACTRIS

- Ministry of Education Youth and Sports of the Czech Republic

Research performing organisations in the national ACTRIS consortium

- Czech Hydrometeorological Institute: **Milan Vana**, milan.vana@chmi.cz
- The Institute of Chemical Process Fundamentals of the CAS, v.v.i.: **Vladimir Zdimal**, zdimal@icpf.cas.cz
- Global Change Research Institute CAS, v.v.i.: **Ivan Holoubek**, holoubeki@czechglobe.cz
- Masaryk university: **Jana Klanova**, klanova@recetox.muni.cz

Contribution to the ACTRIS Central Facilities

In the table below, ACTRIS Central Facilities (CFs) hosted by the country are listed.

Central Facility	CF Unit name	CF Unit description	CF Unit hosting institution / country (for Head Office)
Centre for Aerosol In Situ Measurements	Prague Aerosol Calibration Centre (PACC)	Provision of instrument-specific calibration services for aerosol physics (MPSS, CPC, APSS), and training.	Institute of Chemical Process Fundamentals, v.v.i., Czech Academy of Sciences, Czech Republic

Potential ACTRIS National Facilities - ACTRIS observational platforms and exploratory platforms

In the table below, a list of national facilities, both observational and exploratory platforms, potentially becoming ACTRIS National Facilities is provided

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
National Atmospheric Observatory Kosetice (NAOK)	Observational platform, background site in Czech	49°34'24"N 15°04'49"E 534 a.s.l.	ready		ready	Planned 2020		
Prague Atmospheric Supersite (PASS)	Observational platform, suburban background (Prague)	50.127°N, 14.385°E 272 a.s.l.	Planned with minor upgrade					

The status of national ACTRIS consortium

Based on the long-term collaboration on implementation of the national and international projects, monitoring programmes and networks, four partners (Czech Hydrometeorological Institute, The Institute of Chemical Process Fundamentals of the CAS, v.v.i., Global Change Research Institute of the CAS, v.v.i., Masaryk university CAS, v.v.i.), signed the Memorandum of Understanding on Future Cooperation in 2013 and formally established the ACTRIS consortia in the Czech Republic.

ACTRIS-CZ is on the national research infrastructure roadmap.

Webpage: www.actris-ri.cz

Funding for ACTRIS

The total scale of funding for ACTRIS activities in the Czech Republic: 3,8 mil EUR for the period 2016-2019 and 4,7 mil EUR for the period 2020-2022. The project ACTRIS-participation of the Czech Republic (ACTRIS-CZ), funded by The Ministry of Education Youth and Sports of the Czech Republic. Ministry of Environment - applied for project within Operational Programme Environment, funding for equipment of calibration laboratory (PACC), ICPF AS CR.

Users of ACTRIS

The research infrastructure was selected based on its uniqueness within Europe, offering a comprehensive measurement programme at the forefront of research in the specific domains covered within ACTRIS (vertical aerosol distribution, in-situ aerosol properties, trace gases) together with state-of-the-art equipment, high level of services, and capacity to provide research-driven training to young scientists and new users. The users request an e-access to RI data on aerosol (mostly ICPF, some 40 accesses of researchers, technicians, and students a year) or meteorological parameters and greenhouse gases (mostly GCRI some accesses of researchers a year) directly and data on persistent pollutants through the databases of RECETOX (www.genasis.cz), EBAS (www.ebas.nilu.no) or UNEP (www.pops-gmp.org). The latter are more frequent - hundreds of such uses. Many researchers interested in persistent organic pollutants, their levels and spatial and temporal trends, size-specific particle distribution and particle-size specific compound distribution, particle-gas partitioning or source assessments request an access not only to OBK but also to the trace laboratories of RECETOX where the analysis of all such samples are carried out. The users of the RI are both scientists from the ACTRIS consortium and external, as well as students in frames of regular training courses organized at the national and international levels. International summer schools of environmental chemistry and ecotoxicology is organized by RECETOX on the annual basis as well as practical courses for the undergraduate students of Masaryk and Charles University. Research fellowships and training courses are also irregularly organized by the Institute for Environmental Studies, Faculty of Science and Charles University in Prague.

ACTRIS-Denmark



Air Observatory at Villum Research Station located 2 km outside the central complex of the Danish Military outpost, Station Nord



National ACTRIS coordinator and contact person:

Henrik Skov
Aarhus University

Membership status in the Interim ACTRIS Council

- No membership

Ministries and other possible funding organisations supporting ACTRIS

- Ministry for Higher Education and Science
- Universities

Research performing organisations in the national ACTRIS consortium

- Aarhus University
Website: www.AU.DK
- University of Copenhagen
Website: www.ku.dk

Potential ACTRIS National Facilities - ACTRIS observational platforms and exploratory platforms

In the table below, a list of national facilities, both observational and exploratory platforms, potentially becoming ACTRIS National Facilities is provided

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
Villum Research Station	Observational platform in north Greenland	81°36' N, 16°40' W 24 a.s.l	ready		ready		Planned with minor upgrade	ready
Aarhus University Research on Aerosols smog chamber facility (AURA)	Exploratory platform*	56.168N 10.199E	ready					
Copenhagen University; Photochemical reactor	Exploratory platform**	55.701N, 12.561E						

*Cold room chamber facility for studies of aerosol formation, growth and processes. Operational in the temperature range -15 to 25° C. EUROCHAMP 2020 associated partner. Sea spray simulation chambers for simulation of bubble mediated aerosol formation. Laminar flow tube system for studies of aerosol thermodynamic properties. State of the art atmospheric analytical chemistry laboratory for molecular speciation of aerosol constituents. See <http://chem.au.dk/en/research/research-areas/physicalchemistry/atmospheric-physical-chemistry/equipment/>

** Department of Chemistry, University of Copenhagen. Photochemical reactor with long path FTIR detection for pollution reactivity and product studies. Aerosol continuous flow chamber with online GCMS for kinetics and particle studies. Pollution sensor development and testing chamber for calibration and characterization of pollution sensors.

Funding for ACTRIS

At present, there is only limited funding for ACTRIS PPP and no national funding allocated explicitly for ACTRIS activities.

Users of ACTRIS

- There are around 10 using institutions per year and around 10 persons all together using the research facility at Villum Research Station. They do research in particle physics and chemistry.
- AURA facilities is used by 1-2 international research groups per year (funded by other sources).



ACTRIS-Estonia



© ALISA KRASNOVA AND STEFFEN M. NOE

The SMEAR Estonia 130m atmospheric tower and the station main cottage



National ACTRIS coordinator and contact person:

Dr.rer.nat. Steffen M. Noe

Institute of Agricultural and Environmental Sciences, Estonian University of Life Sciences.

Membership status in the Interim ACTRIS Council

- No membership

Ministries and other possible funding organisations supporting ACTRIS

- Ministry of the Environment
- Estonian Science Agency
- Ministry of Education and Research
- Environmental Investment Centre
- Estonian Environmental Agency

Research performing organisations in the national ACTRIS consortium

- Research performing organisations in the national ACTRIS consortium
- Estonian University of Life Sciences
- University of Tartu
- Estonian Environmental Research Centre
- Tartu Observatory (as of January 2018 part of University of Tartu)

Potential ACTRIS National Facilities - ACTRIS observational platforms and exploratory platforms

In the table below, a list of national facilities, both observational and exploratory platforms, potentially becoming ACTRIS National Facilities is provided.

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
SMEAR Estonia	Observational platform, rural background site in a hemiboreal mixed forest environment.	58.2714 N, 27.2703 E 36 m a.s.l.	planned*		ready			
Tahkuse air monitoring station	Observational platform, rural background site in south-western part of Estonia, in-situ aerosol size distribution and trace gases measurements. Station, which belongs to the Institute of Physics, University of Tartu, contributes also to the Estonian ambient air quality measurements (http://airviro.klab.ee/seire/airviro/en).	58°31,47'N, 24°55,53'E, 24 m a.s.l.						
EKUK monitoring sites	Exploratory platform, urban and rural air quality monitoring sites whereof some belong to EMEP system as well (http://airviro.klab.ee/seire/airviro/en).	various						
Aerosol Physics laboratory	Exploratory platform, provides experimental facilities for testing and calibration of aerosol instrumentation: test aerosol generation and classification system for the calibration of aerosol size distribution spectrometers	58.27°N 26.46°E						

* Planned (depend on funding decisions)

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
Remote sensing	Observational platform, At Tartu Observatory is one AERONET station and measurements of global and diffuse spectral UV radiation are carried out	58.27° N, 26.46° E, 70 m a. s. l.						
Estonian Environmental Research Centre (EERC) Tartu monitoring sit	Observational platform, urban, air quality monitoring sites whereof some belong to EMEP system as well (http://airviro.klab.ee/seire/airviro/en).	58.3706°N, 26.7349°E 30m asl.			ready			

The status of national ACTRIS consortium

The interested parties have met and discussed several times, and agreed about the National Facilities and contributions to Topical Centers in ACTRIS. Formally, Estonian University of Life Sciences, University of Tartu and the Estonian Environmental Research Centre are associated partners of ACTRIS.

There is not yet a statement from official Estonian stakeholders on ACTRIS participation. Lobby work is conducted. It is planned to offer ACTRIS participation in the next national roadmap update in 2021.

Webpage: available soon

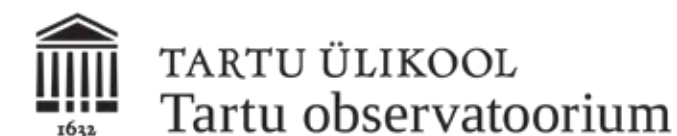
Funding for ACTRIS

There is no dedicated funding for ACTRIS in Estonia yet.

Users of ACTRIS

- The scientific research community dealing with investigation of environmental processes (atmospheric aerosols, radiation, forest ecosystem etc.), environmental questions and air quality.
- The national and regional agencies/policy departments dealing with air quality in Estonia (<http://airviro.klab.ee/seire/airviro/en>).
- Data from Estonian measurement sites are used in modeling of both, scientific and public institutions. (e.g HIRLAM numerical weather forecast).

Data provided by the Estonian facilities is used the ERA-PLANET and the PEEX project. Further in bilateral research projects. The international users community includes mostly climate and air-quality related research communities but also ecology and sustainable development of natural resources and energy communities are collaborators.



ACTRIS-Finland



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SMEAR II (Station for Measuring Earth surface-Atmosphere Relations) aerosol measurement cottage and instrumented mast in boreal forest, Hyytiälä, Finland



National ACTRIS Coordinator / Director:
Markku Kulmala
University of Helsinki

National ACTRIS Contact person:
Silja Häme
University of Helsinki

Membership status in the Interim ACTRIS Council
• Member
Nominated representatives:
• Aino Sipari, Ministry of Transport and Communications
• Petteri Kauppinen, Ministry of Education and Culture

Ministries and other possible funding organisations supporting ACTRIS
• Ministry of Transport and Communications
• Ministry of Education and Culture
• Academy of Finland
• Universities and Institutes involved in ACTRIS (see next page)

Research performing organisations in the national ACTRIS consortium

- University of Helsinki (UHEL) **Contact:** Tuukka Petäjä
- Finnish Meteorological Institute (FMI) **Contact:** Hannele Hakola
- University of Eastern Finland (UEF) **Contact:** Annele Virtanen
- Tampere University of Technology (TUT) **Contact:** Miikka dal Maso

Contribution to the ACTRIS Central Facilities
In the table below, ACTRIS Central Facilities (CFs) hosted by the country are listed.

Central Facility	CF Unit name	CF Unit description	CF Unit hosting institution / country (for Head Office)
Head Office	Statutory seat of ACTRIS ERIC <ul style="list-style-type: none">• ERIC Management Unit (EMU)• RI Operations Unit (OPU)• Development and Relations Unit (DEVU)	<ul style="list-style-type: none">• EMU manages the ACTRIS ERIC organisation tasks and runs all the day-to-day administrative tasks.• OPU manages the internal operations of the RI, ensure the technical development of the RI and down streams the service provision.• DEVU is in charge of strategic planning and strategy development for ACTRIS, building and maintaining national, European and international level liaisons and partnership with other RIs and programmes, countries, and stakeholders.	Finland
Data Centre	ACTRIS Cloud remote sensing data centre unit (CLU)	Data curation and other services for cloud remote sensing data.	Finnish Meteorological Institute
Centre for Cloud Remote Sensing	CCRES-FI	Development of data processing and quality control package for Doppler Wind Lidars, and training for users.	Finnish Meteorological Institute
Centre for Aerosol In Situ Measurements	Cluster Calibration Centre (CCC)	Provision of instrument-specific calibration services for sub 10 nm aerosol, clusters and ions, and training.	University of Helsinki
Centre for Reactive Trace Gases In Situ Measurements	CiGas-UHEL	Instrument development, cluster measurements, and training	University of Helsinki

Potential ACTRIS National Facilities - ACTRIS observational platforms and exploratory platforms

In the table below, a list of national facilities, both observational and exploratory platforms, potentially becoming ACTRIS National Facilities is provided.

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
SMEAR I * (Värriö)	Observational platform, back-ground site in Finnish Arctic	67.7666°N 29.5833°E 400 m a.s.l.	planned with minor upgrade		planned with minor upgrade			
SMEAR II (Hyytiälä)	Observational platform, rural back-ground site in a boreal forest environment	61.85°N 24.2833°E 181 m a.s.l	ready		ready	planned with major upgrade	ready	
SMEAR III (Helsinki)	Observational platform, urban background site, air quality monitoring	60.2°N 24.9666°E 26 m a.s.l.	ready		planned with minor upgrade			
SMEAR IV (Kuopio)	Observational platform, top of Puijo Tower, semi-urban environment	62.9°N 27.65°E 306 m a.s.l. (230 m above surrounding lake level)	planned with minor upgrade	planned with minor upgrade				
Pallas Atmosphere-Ecosystem Supersite	Observational platform, background site in Finnish Arctic	67.973°N 24.116°E 565 a.s.l.	ready	planned with minor upgrade	ready	planned with major upgrade	planned with minor upgrade	
Utö Atmospheric and Marine Research Station	Observational platform, background station on the Baltic sea	59.7833°N 21.3833°E 7 m a.s.l.	ready		ready			

**Station for Measuring Earth surface and Atmospheric Relations (SMEAR), Continuous aerosol and trace gas measurements, and Biosphere - aerosol - cloud - climate interactions. The SMEAR stations I-IV are unique entities in the world with their comprehensive measurements on their respective locations (www.atm.helsinki.fi/SMEAR).*

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
Marambio	Observational platform, Peninsula, permafrost	64.25°S 56.63°W 198 m a.s.l.	ready					
Tiksi	Observational platform, Northern Siberia, tundra (permafrost)	71.6°N 128.8833°E 19 m a.s.l.	planned with minor upgrade					
Kuopio Atmospheric Simulation Chambers (KASCs)	Exploratory platform, chambers for aerosol formation and aging studies including 2 separate chambers. Chambers belongs to EURO-CHAMP-2020 facilities.	62.9°N 27.6333°E	ready	ready	ready			
Aerosol, cluster and trace gas laboratory (Helsinki)	Exploratory platform, size distribution measurements of sub-10nm aerosol particles, cluster measurements.	60.2°N 24.9666°E	ready		ready			
Mobile Aerosol Laboratory	Exploratory platform, on-road studies within real traffic setting and measurements of roadside aerosol when stationary, studies on aging and secondary formation of urban and emission aerosol.	mobile	ready		ready			
Multiwavelength Raman Lidar	Exploratory platform, studies on optical and microphysical aerosol properties	mobile				ready		

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
Doppler Cloud Radar	Exploratory platform, cloud research, cloud parameters for a large altitude range (up to 15-20 km) with high temporal resolution, cloud retrievals within CloudNet	mobile					ready	
Doppler Lidar	Exploratory platform, monitoring of particulate air pollution and boundary layer properties in near real time	mobile					ready	
Unmanned Aerial vehicle (UAV)	Exploratory platform, cloud and trace gas studies, test area at Pallas Atmosphere-Ecosystem Supersite	mobile	ready	planned				

The status of national ACTRIS consortium

In Finland there is strong national support for ACTRIS. ACTRIS is supported by the operating ministries (Ministry of Education and Culture and Ministry of Transport and Communications) and the Finnish Research Infrastructure Committee nominated by Academy of Finland. These instances together make the decisions on ACTRIS-Finland funding commitments. In addition, the research strategies of the participating universities and institutes support the research field of ACTRIS.

ACTRIS belongs to the Finnish RI roadmap 2014-2020 as a major part of INAR (Integrated Atmospheric and Earth System Science Research Infrastructure) and is considered as well advanced RI.

ACTRIS-Finland has a steering committee and it is operated under the Collaboration Agreement of INAR.

Webpage: www.actris.eu/Countries/Finland.aspx (under construction)

Funding for ACTRIS

The current costs of the Finnish component of ACTRIS consist of national ACTRIS activities, mainly upgrading the National Facilities, and European level activities consisting of planning of ACTRIS and the implementation of the ACTRIS Head Office and other Central Facility units to be hosted by Finland.

For 2019, the estimated annual costs of the Finnish component of ACTRIS are around 4.6 M€/year. The funding for these costs is for the most part secured. 1.5 M€/year shall come from the ministries supporting ACTRIS, 2.6 M€/year from the research performing organizations within the ACTRIS national consortium, and 0.5 M€/year from European commission as project funding.

For years 2020-2024, the implementation costs of the Finnish component of ACTRIS are estimated to be around 23 M€ (National Facilities 2.45 M€/year, Central Facilities 10.5 M€/5 years, ACTRIS membership fees in the order of 0.30 - 0.4 M€/year). The ministries supporting ACTRIS as well as the research performing organizations within the ACTRIS national consortium have been committed to contribute significantly to cover the costs. Finland has committed to host ACTRIS Head Office and the statutory seat of ACTRIS ERIC. Finnish Research Infrastructure Committee (under Academy of Finland, Ministry of Education and Culture) has made a principle level decision to contribute to fund ACTRIS Head Office and other ACTRIS CF Units hosted by Finland and to cover half of the Finnish membership contribution (funding 2020-2024 will be applied in spring 2019).” Ministry of Transport and Communications has already secured 500 000€/year for 2020-2021 for financing Finnish CF Units and National Facilities.

Users of ACTRIS

- ACTRIS-Finland National Facilities are currently being used in over 30 international research projects and ACTRIS-Finland National Facilities host over 3200 research visitor days annually. ACTRIS-Finland users mainly include climate and air-quality research communities (e.g. iLEAPS, Future Earth, PEEX), institutes for ecosystem studies of the interaction of atmosphere and biosphere, universities and research institutions for training of researchers and young scientists. ACTRIS-Finland is actively collaborating with ICOS ERIC.
- On a national level ACTRIS-Finland capacity is actively used by the Center of Excellence in Atmospheric Science (<https://www.atm.helsinki.fi/FCoE>). As a total, approximately 615 person months is used each year within ACTRIS-Finland.
- Technological collaboration between ACTRIS-Finland and private sector has created spin offs and it is foreseen that private sector will continue to benefit from ACTRIS services.



ACTRIS-France



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Puy de Dome Atmospheric observation site



National ACTRIS coordinator and contact person:

Paolo Laj

Université Grenoble Alpes (UGA)/ Centre National de Recherche Scientifique (CNRS)

Membership status in the Interim ACTRIS Council

- Member

Nominated representatives:

- Jean Marie FLAUD, Ministère de l'enseignement supérieur de la recherche et de l'innovation (MESRI)
- Bruno BLANKE, Centre National de Recherche Scientifique (CNRS)/Institut National de Sciences de l'Univers
- Juliette LAMBIN, Centre National d'Etudes Spatiales (CNES)

Ministries and other possible funding organisations supporting ACTRIS

- Ministère de l'Enseignement Supérieur de la Recherche et de l'Innovation (MESRI)
- Centre National de Recherche Scientifique (CNRS)
- Centre National d'Etudes Spatiales (CNES)
- Commissariat à l'Energie Atomique et aux Energies Alternatives (CEA)
- Institut de Recherche pour le Développement (IRD)

- Institut Paul-Emile-Victor (IPEV)
- Institut Mines-Télécom Lille Douai (IMT)
- Institut National de l'Environnement Industriel et des Risques (INERIS)
- Météo France (MF)
- Aix-Marseille Université (AMU)
- École des Ponts ParisTech (ENPC)
- Ecole Polytechnique (EP)
- Université Clermont Auvergne (UCA)
- Université Grenoble-Alpes (UGA)
- Université Lille 1 - Sciences et Technologies (Lille 1)
- Université Paris-Est Créteil (UPEC)
- Université Paris Diderot (UPD)
- Université de Toulouse III Paul Sabatier (UPS)
- Université de la Réunion (UR)
- Université Versailles St. Quentin (UVSQ)
- Sorbonne Université (SU)
- Agence Nationale de la Recherche

Research performing organisations in the national ACTRIS consortium

- Centre National de Recherche Scientifique (CNRS)
- Centre National d'Etudes Spatiales (CNES)
- Commissariat à l'Energie Atomique et aux Energies Alternatives (CEA)
- Institut de Recherche pour le Développement (IRD)
- Institut Paul-Emile-Victor (IPEV)
- Institut Mines-Télécom Lille Douai (IMT)
- Institut National de l'Environnement Industriel et des Risques (INERIS)
- Météo France (MF)
- Aix-Marseille Université (AMU)
- École des Ponts ParisTech (ENPC)
- Ecole Polytechnique (EP)
- Université Clermont Auvergne (UCA)
- Université Grenoble-Alpes (UGA)
- Université Lille 1 - Sciences et Technologies (Lille 1)
- Université Paris-Est Créteil (UPEC)
- Université Paris Diderot (UPD)
- Université de Toulouse III Paul Sabatier (UPS)
- Université de la Réunion (UR)
- Université Versailles St. Quentin (UVSQ)
- Sorbonne Université (SU)

Contribution to the ACTRIS Central Facilities

In the table below, ACTRIS Central Facilities (CFs) hosted by the country are listed.

Central Facility	CF Unit name	CF Unit description	CF Unit hosting institution / country (for Head Office)
Centre for Aerosol In Situ Measurements - CAIS	ACMCC	Provision of services related to intercomparison, calibration, and QA/QC of ACSM instruments, and training of users	French National Institute for Industrial Environment and Risks (INERIS), National Center for Scientific Research (CNRS), French Alternative Energies and Atomic Energy Commission (CEA)
Centre for Aerosol Remote Sensing - CARS	CARS-ASP-LOA	Provision of services related to characterization, calibration, maintenance of automatic sun/sky/lunar photometers and training of users	National Center for Scientific Research (CNRS), Université de Lille, Centre National d'Etudes Spatiales (CNES), Aix-Marseille Université (AMU)
Centre for Cloud Remote Sensing - CCRES	CCRES-FR	Provision of target-based calibration procedures for cloud radars and of reference equipment for on-site calibration, instrument testing training of users	National Center for Scientific Research (CNRS), Ecole Polytechnique, Université de Versailles Saint-Quentin-en-Yvelines (UVSQ), Centre National d'Etudes Spatiales (CNES)
Centre for Reactive Trace Gases In Situ Measurements - CiGas	CiGas-IMT	Provision of services related to calibration, intercomparison, and QA/QC of VOC and NOx instruments, and training of users	Institution Mines Telecom Lille Douai (IMT/LD)
Centre for Reactive Trace Gases Remote Sensing - CREGARS	1) CREGARS-UVVIS-FR 2) CREGARS-O3-DIAL-FR	1) Provision of QA/QC tools for SAOZ instruments and processing, and training of users 2) Provision of QA/QC tools for LIDAR instruments and processing, and training of users	National Center for Scientific Research (CNRS), Université de Versailles Saint-Quentin-en-Yvelines (UVSQ), Aix-Marseille Université (AMU)

Central Facility	CF Unit name	CF Unit description	CF Unit hosting institution / country (for Head Office)
ACTRIS Data Centre	1) ACTRIS data and services access unit-France (ACCESS-FR) 2) ACTRIS Aerosol remote sensing data centre unit (ARES) 3) ACTRIS Atmospheric simulation chamber data centre unit (ASC) 4) ACTRIS trace gases remote sensing data centre unit (GRES)	1) Access to ACTRIS data and data products: remote sensing aerosol and reactive trace gases data, simulation chamber data 2) Aerosol remote sensing data processing and curation, including RRT and NRT delivery. 3) Atmospheric simulation chamber data services curation, provision, standardized process for data submission 4) Data curation service for reactive trace gases remote sensing data, added values products, standardized process for data submission and QC	AERIS (National Center for Scientific Research (CNRS), Centre National d'Etudes Spatiales (CNES), Institut de Recherche pour le Développement (IRD), Commissariat à l'Energie Atomique et aux Energies Alternatives (CEA), Météo France (MF), Université de Lille, Université de Toulouse

Potential ACTRIS National Facilities - ACTRIS observational platforms and exploratory platforms

In the table below, a list of national facilities, both observational and exploratory platforms, potentially becoming ACTRIS National Facilities is provided. Currently, there are 7 observational and 2 exploratory platforms that are potential ACTRIS National facilities. All are multi-instrumented platforms, suited for hosted large experiments and with an established record of physical access.

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
Site Instrumental de Recherche par Télédétection Atmosphérique (SIRTA)	Observational platform, peri-urban site in Paris, suburban background	48.7097°N 2.1486°E 160 m a.s.l.	ready		planned	ready	ready	
Site d'observation atmosphériques Puy de Dôme/Opme/Cézeaux (COPDD)	Observational platform, peri-urban + mountain site in natural background, central France	45.772°N 2.966°E 1465 m / 394 m a.s.l.	ready	planned	ready	ready		

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
OPAR Observatoire de Physique de l'Atmosphère à La Réunion	Observational platform, urban/coastal + mountain site in natural background, tropical climate	21.0796°S 55.3841°E 10m a.s.l. - 2160 m a.s.l.	planned		planned	ready	planned	ready*
Plateforme Pyrénéenne d'Observations Atmosphériques (P2OA)	Observational platform, rural + mountain site in natural background, French Pyrenees	42.9372°N 0.1411°E 588 m a.s.l.- 2877 m a.s.l.	planned		planned			
Observatoire de Haute Provence (OHP)	Observational platform, rural site in natural background, French Southern Alps	43.9237°N 5.7183°E 650 m a.s.l.				planned		planned
Plateforme d'Observation Lilloise (LOA)	Observational platform, peri-urban site in North-Eastern France, suburban background	50.6117°N 3.1417°E 32 m a.s.l.				ready		
Site METEOPOLE	Observational platform, peri-urban site in South-Western France, suburban background	43.573°N 1.374°E 115 m a.s.l.					planned	
Atmospheric Simulation Chamber (CESAM)	Exploratory platform	48.7891°N 2.4436°E	ready		ready			
Chambre de simulation atmosphérique à irradiation naturelle d'Orléans (HELIOS)	Exploratory platform	47.8384°N 1.9444°E	ready		ready			

*activities performed in coordination with BIRA (Belgium)

The status of national ACTRIS consortium

ACTRIS-FR (www.actris.fr) is on the French National Roadmap since 2016 and is in its interim phase until the consortium agreement, currently under preparation, will be signed. The governance structure comprises 4 different bodies: a general assembly, executive board, scientific board, and coordination.

Funding for ACTRIS

Global annual operation costs in 2016 (early construction phase) are estimated at 9.2 M€ (including costs for investment, operations, and staff), representing 58.3 FTE.

Users of ACTRIS

- More than 30 research institutes working in Atmospheric and Climate Research (representing a community of several thousand researchers and engineers).
- Key RPOs involved connected to climate, space, environmental, air quality research
- Several Ministries connected to ACTRIS (represented by Ministry for Research)



ACTRIS-Germany (ACTRIS-D)



Leipzig Aerosol and Cloud Remote Observations System (LACROS) in front of the Leipzig Aerosol-Cloud Interaction Simulator (LACIS)



National ACTRIS coordinator and contact person:

Dr. Ulla Wandinger
Leibniz Institute for Tropospheric Research (TROPOS), Leipzig

Membership status in the Interim ACTRIS Council

- Observer
- Nominated representatives:
 - Dr. Christian Plaß-Dülmer (DWD) on behalf of Federal Ministry of Transport and Digital Infrastructure
 - Dr. Marion Wichmann-Fiebig (UBA) on behalf of Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

Ministries and other possible funding organisations supporting ACTRIS

- Federal Ministry of Education and Research (BMBF)
- Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)
- Federal Ministry of Transport and Digital Infrastructure (BMVI)
- German Environment Agency (UBA)

Research performing organisations in the national ACTRIS consortium

- Leibniz Institute for Tropospheric Research (TROPOS)
Contact: Prof. Andreas Macke
- Alfred Wegener Institute, Helmholtz Center for Polar and Marine Research (AWI) **Contact:** Prof. Antje Boetius.
- Bergische Universität Wuppertal (BUW)
Contact: Prof. Peter Wiesen
- Deutscher Wetterdienst (DWD)
Contact: Dr. Christian Plass-Duelmer
- Observatory Hohenpeissenberg Forschungszentrum Jülich GmbH (JUELICH)
Contact: Prof. Andreas Wahner, Prof. Astrid Kiendler-Scharr
- Goethe University Frankfurt am Main (GUF)
Contact: Prof. Joachim Curtius
- Karlsruhe Institute of Technology (KIT)
Contact: Dr. Ottmar Möhler, Dr. Rainer Steinbrecher
- Ludwig-Maximilians-Universität (LMU)
Contact: Prof. Bernhard Mayer
- Max Planck Institute for Chemistry (MPI-C)
Contact: Prof. Jos Lelieveld
- Max Planck Institute for Meteorology (MPI-M)
Contact: Prof. Bjorn Stevens
- German Environment Agency (UBA)
Contact: Prof. Ruprecht Schleyer
- University of Bremen (UNIHB)
Contact: Prof. Justus Notholt
- University of Cologne (UCOL)
Contact: Prof. Susanne Crewell

Contribution to the ACTRIS Central Facilities

In the table below, ACTRIS Central Facilities (CFs) hosted by the country are listed.

Central Facility	CF Unit name	CF Unit description	CF Unit hosting institution / country (for Head Office)
Centre for Aerosol Remote Sensing	CARS-AHL-LMU, CARS-ALC-LMU	Provision of QA services and tools for aerosol high-power lidars (AHL) and of SOPs, QA services and training for aerosol low-power lidars and ceilometers (ALC)	Ludwig-Maximilians-Universität
Centre for Aerosol Remote Sensing	CARS-ALC-DWD	Provision of QA services and tools for aerosol low-power lidars and ceilometers (ALC)	Deutscher Wetterdienst

Central Facility	CF Unit name	CF Unit description	CF Unit hosting institution / country (for Head Office)
Centre for Aerosol In Situ Measurements	World Calibration Centre for Aerosol Physics (WCCAP)	Provision of QA/QC operation support and services, training, and methodology development for physical in situ aerosol measurements	Leibniz Institute for Tropospheric Research
Centre for Aerosol In Situ Measurements	Organic Tracer and Aerosol Constituents Calibration Centre (OGTAC CC)	Provision of calibration services for analysis of particulate organic marker compounds	Leibniz Institute for Tropospheric Research
Centre for Cloud Remote Sensing	Centre for Microwave Radiometry	Provision of calibration and operation guidelines as well as quality assurance and training activities for passive microwave radiometers	University of Cologne
Centre for Cloud In Situ Measurements	Center for Cloud Ice Nucleation (CCIce)	Provision of calibration and standardization services as well as training for ice nucleating particle and cloud residual instruments and methods	Karlsruhe Institute of Technology
Centre for Cloud In Situ Measurements	Centre for Cloud Water Chemistry (CCWaC)	Provision of calibration services for cloud water chemical analysis	Leibniz Institute for Tropospheric Research
Centre for Reactive Trace Gases Remote Sensing	CREGARS-FTIR-DE	Provision of FTIR measurements QA/QC, retrieval QA/QC, and retrieval strategy development/maintenance	Karlsruhe Institute of Technology
Centre for Reactive Trace Gases In Situ Measurements	Centre for Reactive Trace Gases In Situ Measurements - Karlsruhe Institute of Technology (CiGas-KIT)	Leading unit, coordination of TC, QA/QC, provision of calibration and standardization services as well as training for VOC measurements	Karlsruhe Institute of Technology
Centre for Reactive Trace Gases In Situ Measurements	Centre for Reactive Trace Gases In Situ Measurements - Forschungszentrum Jülich (CiGas-FZJ)	Provision of calibration and standardization services, QA/QC, as well as training for NOx measurements	Forschungszentrum Jülich GmbH
Centre for Reactive Trace Gases In Situ Measurements	Centre for Reactive Trace Gases In Situ Measurements - Deutscher Wetterdienst (CiGas-DWD)	Contributions to calibration and standardization services as well as intercomparisons and QA/QC for VOC and NOx measurements	Deutscher Wetterdienst

Potential ACTRIS National Facilities - ACTRIS observational platforms and exploratory platforms

In the table below, a list of national facilities, both observational and exploratory platforms, potentially becoming ACTRIS National Facilities is provided.

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
Bremen (UNIHb)	Observational platform, urban site in northern Germany	53.10°N 8.85°E 27 m a.s.l.						ready
Garmisch-Partenkirchen (KIT)	Observational platform, valley site at the northern edge of the Alps	47.48°N 11.06°E 743 m a.s.l.				minor upgrade planned		ready, but major upgrade planned
Meteorological Observa-tory Hohenpeißenberg (DWD)	Observational platform, mountain site in the foothills of the Alps	47.80°N 11.00°E 990 m a.s.l.	ready		ready	ready		
Jülich Obser-vatory for Cloud Evolu-tion – JOYCE (UCOL)	Observational platform, rural lowland site, partly forested	50.91°N 6.41°E 111 m a.s.l.				major upgrade planned	ready	
Leipzig (TROPOS)	Observational platform, urban Central Euro-pean continen-tal site	51.35°N 12.43°E 120 m a.s.l.	minor upgrade planned			ready		
Meteorolog-ical Observa-tory	Observational platform, rural	52.21°N 14.12°E				ready	ready	
Lindenberg (DWD)	Central European site	103-126 m a.s.l.						
Melpitz Research Station (TROPOS)	Observational platform; rural continental background site	51.53°N 12.93°E 86 m a.s.l.	ready		major upgrade planned	major upgrade planned	major upgrade planned	

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
München (LMU)	Observational platform, urban lowland site north of the Alps	48.21°N 11.26°E 539 m a.s.l.				major upgrade planned		
Schmücke (TROPOS)	Observational platform, mountain site for hill cap cloud measurements	50.65°N 10.77°E 937 m a.s.l.	major upgrade planned	major upgrade planned				
Zugspitze and Schneef-ernerhaus Research Station	Observational platform, high-mountain alpine site	47.42°N 10.98°E 2964/2659 m a.s.l.	ready		ready	major upgrade planned	ready	ready, but major upgrade planned
Cape Verde Atmospheric Observatory (TROPOS)	Observational platform, marine site in the tropical Atlantic and Saharan dust outflow region	16.87°N 25.00°W 30 m a.s.l.	minor upgrade planned			major upgrade planned	major upgrade planned	
Izaña, Tenerife, Spain (KIT)	Observational platform, mountain site in the subtropical Atlantic	28.3°N 16.5°W 2367 m a.s.l.						ready, but major upgrade planned
Kiruna, Sweden (KIT)	Observational platform, Swedish Arctic site	67.8°N 20.4°E 420 m a.s.l.						ready, minor upgrade planned
Ny-Ålesund, Spitsbergen (AWI, UNIHB)	Observational platform, Arctic Ocean site	78.92°N 11.92°E 23 m a.s.l.				ready	ready	ready
Paramaribo, Surinam (UNIHb)	Observational platform, tropical South American site	5.81°N 55.21°W 7 m a.s.l						ready, but major upgrade planned
Taunus Observatory (GUF)	Observational platform, Central European mountain site	50.22°N 8.45°E 825 m a.s.l	major upgrade planned		major upgrade planned			

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
Dushanbe, Tajikistan (TROPOS)	Observational platform, Central Asian dust observation site	38.56°N 68.86°E 864 m a.s.l.				ready		
Limassol, Cyprus (TROPOS)	Observational platform, polluted eastern Mediterranean site	34.67°N 33.04°E 10 m a.s.l.				ready		
Leipzig Aero-sol Cloud Interac-tion Simula-tor (LACIS at TROPOS)	Exploratory platform, Atmospheric Simulation Chamber	51.35°N 12.43°E 120 m a.s.l.	ready					
Leipzig Aerosol Kammer (LEAK at TROPOS)	Exploratory platform, Atmospheric Simulation Chamber	51.35°N 12.43°E 120 m a.s.l.	ready					
Quartz Glass Reactor (QUAREC at BUW)	Exploratory platform, Atmospheric Simulation Chamber	51.24 °N 7.15 °E 240 m a.s.l.	ready					
Atmosphere Simulation Chambers ‘SAPHIR’ and ‘SAPHIR-PLUS’ (JUELICH)	Exploratory platform, Atmospheric Simulation Chamber	50.91°N 6.41°E 90 m a.s.l.	ready					
Aerosol Interaction and Dynam-ics in the Atmosphere (AIDA at KIT)	Exploratory platform, Atmospheric Simulation Chamber	49.09°N 8.42°E 110 m a.s.l.	ready					
AIDA-2 dynamic cloud cham-ber (KIT)	Exploratory platform, Atmospheric Simulation Chamber	49.09°N 8.42°E 110 m a.s.l.	Planned with major upgrade					

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
Leipzig Aerosol and Cloud Remote Observations System (LACROS) operated by TROPOS	Exploratory platform, mobile land-based facility	Mobile				ready	ready	
OCEA-NET mobile shipborne remote sensing facility operated by TROPOS	Exploratory platform, mobile shipborne facility	Mobile				ready		
Shipborne ACTRIS laboratory on research vessel Polarstern-2 operated by TROPOS	Exploratory platform, mobile shipborne facility	Mobile				major upgrade planned	major upgrade planned	
Mobile facility for aerosol and cloud in-situ observations in the atmospheric boundary layer (ground station, balloon, UAVs) operated by TROPOS	Exploratory platform, mobile airborne facility	Mobile	major upgrade planned	major upgrade planned				
One mobile FTIR spectrometer facility for measuring columns of reactive trace gases operated by UNIH-B	Exploratory platform, mobile land-based facility	Mobile						major upgrade planned

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
Five mobile FTIR spectrometer facilities for measuring columns of reactive trace gases operated by KIT	Exploratory platform, mobile land-based	Mobile						major upgrade planned
Mobile VOC laboratory operated by UBA	Exploratory platform, mobile land-based	Mobile			major upgrade planned			

The status of national ACTRIS consortium

The consortium ACTRIS-D consists of 11 RPOs which have signed Letters of Commitment regarding the long-term operation of ACTRIS infrastructure provided that ACTRIS-D is selected for the National Roadmap for Research Infrastructures. Eight of the RPOs have signed Letters of Intent to support the ESFRI Roadmap process.

The application for the National Roadmap for Research Infrastructures is under evaluation. The ACTRIS-D application received a very good scientific assessment. Political assessment is pending.

Webpage:

www.leibniz-gemeinschaft.de/en/infrastructures/leibniz-roadmap/actris/
www.tropos.de/en/research/projects-infrastructures-technology/coordinated-observations-and-networks/actris/

Funding for ACTRIS

German RPOs have invested about 30 million Euro for setting up research infrastructure related to ACTRIS in the last 10 years and spend about 3.5 million Euro per year for maintaining and operating German ACTRIS facilities. ACTRIS-D has applied for a substantial upgrade in the course of the National Roadmap process.

Long-term funding for the German CF units is applied for at the ministries. Thus, funding of CF units is not secured yet. Long-term operational funding of NFs is committed by the RPOs for the existing facilities and will also be provided by the RPOs in case that the substantial upgrade of NFs proposed in the ACTRIS-D application for the National Roadmap for Research Infrastructures will be granted.

Users of ACTRIS

- ACTRIS-D data are or will be used for assimilation purposes, model development and evaluation (e.g., by DWD, for EURAD model CAMS, for ICON and ICON-ART)
- ACTRIS-D observation sites contribute to global and regional networks of GAW and EMEP
- ACTRIS-D observation sites serve as calibration and validation stations for satellite data (e.g., by DLR, ESA, Copernicus, NASA)
- ACTRIS-D facilities are used by German and European/international universities for research and education purposes (e.g., by Technische Universität Bergakademie Freiberg, Universität Leipzig, Technische Universität Darmstadt, University of Leeds - UK, ETH - Switzerland, Michigan Tech - USA)
- ACTRIS-D offers services for and collaborates with federal and regional environment agencies (e.g., Umweltbundesamt; Sächsisches Landesamt für Umwelt, Landwirtschaft und Geologie; Landesamt für Umwelt Brandenburg; Landesamt für Umwelt, Naturschutz und Geologie Mecklenburg-Vorpommern) and with governmental institutions (e.g., Sachsenforst; Staatliche Betriebsgesellschaft für Umwelt und Landwirtschaft; Land Berlin, Senatsverwaltung für Stadtentwicklung und Umwelt; Staatliches Gewerbeaufsichtsamt Hildesheim)
- ACTRIS-D offers services for and collaborates with SMEs active in meteorological and air-quality sensor technology (e.g., ECO PHYSICS GmbH, München; Metek GmbH, Elmshorn; Licel GmbH, Berlin; G. Lufft Mess- und Regeltechnik GmbH, Fellbach; Radiometer Physics GmbH, Meckenheim; Vaisala GmbH, Bonn)

DWD and Federal Ministry of Transport and Digital Infrastructure are users of the volcanic ash observations by the DWD high- and low-power lidars which are linked to the ACTRIS activities on aerosol remote sensing



ACTRIS-Greece

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Finokalia Atmospheric Observatory, Greece

National ACTRIS coordinator and contact person:

Nikolaos Mihalopoulos

University of Crete and National Observatory of Athens

Membership status in the Interim ACTRIS Council

- Member

Nominated representatives:

- Dr. Vassilis Amiridis, National Observatory of Athens
- Ms. Maria Koutrokoi, MSc, GR's delegation member to ESFRI & RIs Programme Committee, Ministry of Education, Research and Religious Affairs



Ministries and other possible funding organisations supporting ACTRIS

- Ministry of Education, Research and Religious Affairs
- Hellenic Foundation for Research and Innovation
- Ministry of Environment, Energy and Climate Change
- Universities (University of Crete, Aristotle University of Thessaloniki, National Technical University of Athens, University of Patras)

- Research Centers (National Observatory of Athens (NOA), National Center for Scientific Research Demokritos (NCSR), Foundation for Research and Technology Hellas (FORTH))
- Regional Authorities (Region of Attica, Region of Crete, Region of Western Greece, Region of Central Macedonia, Region of Ipirus)
- European Commission
- European Space Agency
- Other exceptional funding contributors (e.g., SMEs, Public Benefit Foundations)

Research performing organisations in the national ACTRIS consortium

- National Observatory of Athens (NOA). Contacts: Prof. Nikolaos Mihalopoulos (nmihalo@noa.gr), Dr. Vassilis Amiridis (vamoir@noa.gr), Dr. Evangelos Gerasopoulos (egera@noa.gr).
- National Technical University of Athens (NTUA). Contact: Prof. Alexandros Papayannis (apdlidar@central.ntua.gr).
- National Center for Scientific Research Demokritos. Contact: Dr. Konstantinos Eleftheriadis (elefther@ipta.demokritos.gr).
- Aristotle University of Thessaloniki (AUTH). Contact: Prof. Dimitris Balis (balis@auth.gr).
- University of Patras (UoP) and Foundation for Research and Technology Hellas (FORTH). Contact: Prof. Spyros Pandis (spyros@chemeng.upatras.gr).
- University of Crete (UoC). Contact: Prof. Maria Kanakidou (mariak@uoc.gr).
- University of Ioannina (Uoi). Contact: Prof. Nikolaos Hatzianastassiou (nhatzian@cc.uoi.gr)
- Technical University of Crete (TUC). Contact: Prof. Mihalīs Lazaridis (lazaridi@mred.tuc.gr).
- Demokritos University of Thrace (DUTH). Contact: Prof. Konstantinos Kourtidis (kourtidi@env.duth.gr)
- University of Aegean (UoAegean). Contact Prof. Christodoulos Pilinis (xpil@aegean.gr)
- National Kapodistrian University of Athens (NKUA). Contacts: Prof. Panagiotis Nastos (nastos@geol.uoa.gr), Eleni Giannakaki (elina@phys.uoa.gr)

Potential ACTRIS National Facilities - ACTRIS observational platforms and exploratory platforms

In the table below, a list of national facilities, both observational and exploratory platforms, potentially becoming ACTRIS National Facilities is provided. Note that national prioritization regarding the National Facilities potentially becoming part of ACTRIS is ongoing and thus, the list of NFs below may face significant changes.

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
Finokalia Observatory	Observational platform, located on Crete Island, a regional background site (coastal /rural)	35.33°N 25.66°E 250 m a.s.l.	ready		planned			
Helmos Observatory	Observational platform, located at Helmos mountain (Peloponnese), background atmospheric site in the free troposphere	37.9843°N 22.1963°E 2340m a.s.l.	ready	planned				
NEO observatory	Observational platform, located at Navarino (Peloponnese), a regional background site (coastal)	36.82°N 21.7°E 150m a.s.l.	ready					
Demokritos-Athens	Observational platform, sub-urban background site	37.9950°N 23.8160°E 270m a.s.l.	ready					
NOA-Athens	Observational platform, urban background site	37.967°N 23.717°E 107m a.s.l.	ready	planned				
Zografou-Athens	Observational platform, sub-urban site	37.96°N 23.78°E 212 m a.s.l.				ready		ready
AUTH-Thessaloniki	Observational platform, urban site	40.67°N 22.95°E 50m a.s.l.				ready		planned

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
Antikythera-supersite	Observational platform, regional background site	35.86°N 23.30°E 193m a.s.l.				ready	planned	planned
Mobile unit of NOA	Exploratory platform, ground-based	mobile						
Mobile units of FORTH	Exploratory platform, ground-based. Includes a dual atmospheric simulation chamber facility of the in-situ study of atmospheric chemical processes using near atmospheric conditions	mobile						
FORTH atmospheric simulation chamber	Exploratory platform, for the study of atmospheric chemical processes equipped with advanced instrumentation for measurement of trace gases and aerosols.	laboratory						
Mobile unit of NTUA	Exploratory platform, ground-based	mobile						

The status of national ACTRIS consortium

Several Greek institutions, both Universities and Research Performing Organizations, work on ACTRIS related research activities since about 20 years within several research and collaboration projects. ACTRIS-GR is on the Greek National Roadmap since 2016 under the name PANACEA. It will be entered soon in its preparation phase and the consortium agreement, will be signed until mid- 2018. The ACTRIS-GR foreseen, as a governance body, the General Assembly and a coordination team for a day-to-day activities managing.

Funding for ACTRIS

ACTRIS-GR has made already significant investments in the existing infrastructure (more than 5 M€ in the last 10 years). More investments are already expected in the frame of PANACEA or other ACTRIS related proposals (up to 3 mil. € between 2018-2020). ACTRIS-GR has invested also in human resources (more than 3 M€ the last 10 years) and will continue to do it in the following years (more than 1 M€ between 2018-2020).

In terms of operation costs, it is estimated that for all fully developed ACTRIS-GR facilities, the annual operation cost is about 0,7 M€. These costs will be covered partially by the state through salaries to the permanent staff (expected: more than 0.5 M€ annually) and partially as in-kind contribution from the RPOs (expected: 0.2 M€ annually). The funding program for the operation phase is not yet in place.

Users of ACTRIS

The following kind of ACTRIS users have been identified in Greece:

- By application of ACTRIS products
 - Climate modelling
 - Weather forecasting
 - Atmospheric environment modelling and forecast
 - Ecological research and monitoring
 - Health studies and epidemiology
 - Energy (solar energy)
 - Earth observation satellite community (atmospheric correction)
- By activity domain
 - Academic research
 - Meteorological agencies
 - Environmental ministries and agencies at national and regional levels
 - Health agencies
 - SMEs, including companies in a large span of sizes and activities

The number of people potentially using ACTRIS products in Greece is estimated to be around 70 in the academic domain and rest of fields, including industries and meteorological and environmental agencies, health agencies and policymakers at the national, regional and local levels.

ACTRIS-Ireland



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Mace Head Atmospheric Research Station



National ACTRIS coordinator and contact person:
John Wenger
University College Cork (UCC)

Membership status in the Interim ACTRIS Council
• No membership

Ministries and other possible funding organisations supporting ACTRIS

- Department of Communications, Climate Action and Environment (DCCAE)
- Department of Education and Skills
- Environmental Protection Agency (EPA)
- Enterprise Ireland
- Irish Research Council (IRC)
- Science Foundation Ireland (SFI)

Research performing organisations in the national ACTRIS consortium

- National University of Ireland, Galway (NUIG): **Contact:** Colin O’Dowd
- University College Cork (UCC) **Contacts:** Andy Ruth and John Wenger
- Met Éireann : **Contact:** Saji Varghese
- Environmental Protection Agency (EPA)

Potential ACTRIS National Facilities - ACTRIS observational platforms and exploratory platforms

In the table below, a list of national facilities, both observational and exploratory platforms, potentially becoming ACTRIS National Facilities is provided.

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
Mace Head Atmospheric Research Station (NUIG)	Observational platform, Atlantic coastal site in North-west of Ireland	53.3258° N 9.8994° W 5 m a.s.l.	Ready	Minor upgrade planned	Minor upgrade planned	Ready		
UCC Atmospheric Monitoring Station (UCC)	Observational platform, urban background in Cork city	51.9000° N 8.4863° W 12 m a.s.l.	Major upgrade planned		Minor upgrade planned	Ready		Minor upgrade planned
Valentia Observatory (Met Éireann)	Observational platform, coastal site in South-west of Ireland	51.9397° N 10.2444° W 9 m a.s.l.	Minor upgrade planned			Minor upgrade planned	Major upgrade planned	
Irish Atmospheric Simulation Chamber (IASC) Facility (UCC)	Exploratory platform, large indoor Teflon chamber	51.8930° N 8.4942° W 15 m a.s.l.	Ready		Ready			

The status of national ACTRIS consortium

The ACTRIS-Ireland consortium is yet to be formalised. The two main participants (NUIG and UCC) are already part of ACTRIS and EUROCHAMP-2020. Discussions have been initiated with Met Éireann and plans to engage with the principal funding agencies (EPA, SFI, IRC), as well as the relevant government departments are in place. The aim is to secure a letter of intent signed by the ministries/funding agencies and prepare a Memorandum of Understanding between the consortium members.

Funding for ACTRIS

Observational and exploratory platforms facilities in NUIG and UCC have already been supported by research infrastructure funding from EPA, Met Éireann and SFI. The respective institutions have also supported the research facilities in terms of equipment and staff. Continued operation of these facilities into the Implementation and Operational Phases of ACTRIS can only be ensured through the commitment of national funding. This needs to be discussed.

Users of ACTRIS

- Researchers in various academic institutes across Ireland (DIT, TCD, NUIM).
- State organisations carrying out research in air quality and atmospheric modelling (EPA, Met Éireann).
- Local authorities interested in air quality data (City and county councils).
- Private sector companies (airlines, scientific instrument developers, air quality sensor companies).



ucc
Coláiste na hOllscoile Corcaigh, Éire
University College Cork, Ireland



NUI Galway
OÉ Gaillimh



ACTRIS-Italy



CIAO: CNR-IMAA Atmospheric Observatory located in Tito Scalo, Southern Italy

National ACTRIS coordinator and contact person: Gelsomina Pappalardo

National Research Council of Italy - Institute of Methodologies for Environmental Analysis (CNR-IMAA)

Membership status in the Interim ACTRIS Council

- Member
- Nominated representatives:
 - Salvatore La Rosa – Italian Ministry of Research and Education
 - Grazia Pavoncello - Italian Ministry of Research and Education
 - Gelsomina Pappalardo - National Research Council of Italy



Ministries and other possible funding organisations supporting ACTRIS

- Italian Ministry of Research and Education
- Italian Ministry of Economic Development
- Regions in which territory ACTRIS national and/or central facilities are located:
 - Abruzzo Region
 - Basilicata Region
 - Calabria Region
 - Campania Region

- Emilia Romagna Region
- Lazio Region
- Liguria Region
- Puglia Region
- Sicilia Region

Research performing organisations in the national ACTRIS consortium

- CNR - National Research Council of Italy - Gelsomina Pappalardo - <https://www.cnr.it/en>
- ENEA - Italian National Agency for New Technologies, Energy and Sustainable Economic Development – Giandomenico Pace - <http://www.enea.it/en>
- INFN – Italian National Institute for Nuclear Physics – Paolo Prati - <http://home.infn.it/en/>
- University “Federico II” of Naples – Nicola Spinelli - http://www.unina.it/en_GB/home
- University of L’Aquila – Vincenzo Rizi - http://www.univaq.it/en/index.php?&lang_s=en
- University of Salento – Maria Rita Perrone - <https://international.unisalento.it/>
- University of Urbino – Michela Maione - <https://www.uniurb.it/international>

Contribution to the ACTRIS Central Facilities

In the table below, ACTRIS Central Facilities (CFs) hosted by the country are listed.

Central Facility	CF Unit name	CF Unit description	CF Unit hosting institution / country (for Head Office)
Head Office	Service and Access Managment Unit (SAMU)	Provision of information on ACTRIS and ACTRIS services (service catalogue), being a single entry point for users to access to ACTRIS services, managing the user access	National Research Council of Italy
Data Centre	ACTRIS Aerosol remote sensing data centre unit (ARES)	Provision of Aerosol remote sensing data processing and curation. This includes centralized processing, traceability, harmonization and data versioning, quality control, data provision and archiving, and documentation. The activity enables RRT and NRT delivery. Tutorial activities. Production of level 3 data for climatological analysis and new products	National Research Council of Italy

Central Facility	CF Unit name	CF Unit description	CF Unit hosting institution / country (for Head Office)
Centre for Aerosol Remote Sensing	CARS-AHL-CNR	<ul style="list-style-type: none"> • Development of documentation to be made available on the CARS web-site • Establishment and administration of CARS forum • Organization of CARS workshops • Participation to the labelling/evaluation of ACTRIS NFs • Comparison with fixed / mobile reference AHLs • Development of software tools for automatic submission of AHL measurements to the SCC • Codification of the results of the QA program for AHLs for uptake at the ACTRIS DC • Training on specific subjects related to AHLs (face-to-face) • Training on specific subjects related to AHLs (webex) • Laboratory tests for characterization of optical components and blocks for AHLs • Consultancy for specific AHL observation protocols • Testing of new AHLs and blocks 	National Research Council of Italy
Centre for Aerosol In Situ Measurements	Elemental Mass Composition Centre (EMC2)	Provision of access and elementary analysis for the ACTRIS variables: <ul style="list-style-type: none"> • Mass concentration of particulate elements • Measurement of particulate heavy metals and inorganic element composition • Proficiency tests of individual laboratory analysis • Inter-comparison and round robin exercises • Training of operators and scientists 	Italian National Institute for Nuclear Physics

Potential ACTRIS National Facilities - ACTRIS observational platforms and exploratory platforms

In the table below, a list of national facilities, both observational and exploratory platforms, potentially becoming ACTRIS National Facilities is provided.

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
Mt Cimone with Po Valley facilities (CNR)	Observational platform, mountain and polluted site	44.2°N 10.7°E 2165 m a.s.l.	Ready	Major upgrade planned	Ready	Minor upgrade planned		

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
L'Aquila (UNIAQ/ CETEMPS)	Observational platform, mountain rural site	42.3440°N 13.3270°E 656m a.s.l.				Ready	Major upgrade planned	
Roma (CNR) – CIRAS	Observational platform, urban site	41.840°N 12.647°E 107 m a.s.l.	Ready			Ready	Major upgrade planned	
Napoli (UNINA)	Observational platform, urban and coastal site	40.838°N 14.183°E 118 m a.s.l.	Minor upgrade planned			Ready		
Potenza (CNR) – CIAO	Observational platform, mountain Mediterranean site	40.601°N 15.723°E 760 m a.s.l.	Major upgrade planned			Ready	Ready	Major upgrade planned
Lecce (CNR and UNISal)	Observational platform, pre-urban site	40.3363°N 18.1225°E 30 m a.s.l.	Ready		Ready	Ready		
Lamezia (CNR)	Observational platform, coastal site	38.8°N 16.2°E 6 m a.s.l.	Ready		Ready	Ready		
Lampedusa (ENEA)	Observational platform, coastal site	35.518°N 12.63°E 45 m a.s.l.				Minor upgrade planned	Major upgrade planned	
Genova (INFN) – ChAMBRe	Exploratory platform	44.42° N 8.9°E	Ready					
(CNR) - Mobile platform for aerosol and trace gases in situ observations.	Exploratory platform	mobile	Major upgrade planned	Major upgrade planned				
(CNR) Cimone Tethered balloon platforms equipped with aerosol in situ instruments.	Exploratory platform	mobile				Minor upgrade planned	Minor upgrade planned	

The status of national ACTRIS consortium

Seven Italian institutions, both Universities and Research Performing Organizations, work on ACTRIS related research activities since about 15 years within several research and collaboration projects. National consortium has been organized as a Joint Research Unit named ACTRIS Italy (ACTRIS- IT), formally established in October 2017 and acknowledged official in September 2018 by the Italian Ministry of Research and Education. The ACTRIS-IT has a governance bodies the General Assembly, already established, that is the major decision body, and a coordination team for day-to-day managing. All the parties of the JRU contribute in terms of human and instrumental resources.

ACTRIS is present in PNIR, the national research infrastructure roadmap, on-line at www.ponrec.it/media/388972/pnir.pdf.

Webpage: www.actris.it

Funding for ACTRIS

ACTRIS activities in Italy are funded based on the principle of synergies between the different Union funds as encouraged from the European Commission to amplify the research and innovation investments and their impact. The EU collaboration and strategic preparation is funded at EU level (i.e. ACTRIS-PPP, ACTRIS2, EUROCHAMP2020). The realization and upgrade of the facilities is in charge of National funds through the National Research and Education Ministry public call on Research Infrastructures; the proposal has been submitted in June 2018 and the evaluation process is on-going. Being in the national research infrastructure roadmap, specific funds from the Italian Ministry of Research and Education and from the involved RPOs are allocated on annual basis for ACTRIS-IT. Furthermore, local ESIF funds are foreseen to cover the activities with a major local impact and connection with SMEs.

Users of ACTRIS

Italian user communities is primary composed by a large number of researchers working on atmospheric research, weather forecasting modeling, climate modeling, modeling of the atmospheric environment, satellite calibration and validation programme, air quality monitoring, as well as Educational/outreaching activities. The policy makers representing user for ACTRIS are at first national governance in his different expressions: Ministry of Research and Education, Ministry of Environment, Ministry of Economic Development, National Agency of Aerospace, the regional agencies for environmental monitoring and so on. This users community is more related to the information content of ACTRIS data that can be used as a decision or regulatory support.

Industrial sector, especially SMEs, represents a large user community that can benefit from data but also from the access to knowledge and facilities. The linkage with this community is expected to trigger the value chain from research to innovation.



ACTRIS-The Netherlands

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CESAR site

National ACTRIS coordinator and contact person:

Arnoud Apituley

Royal Netherlands Meteorological Institute (KNMI)

Herman Russchenberg

Technical University Delft

Membership status in the Interim ACTRIS Council

- Member

Nominated representative:

- Prof.dr. Gerard van der Steenhoven, Director General, Royal Netherlands Meteorological Institute (KNMI), De Bilt, The Netherlands



Ministries and other possible funding organisations supporting ACTRIS

- Ministry of Infrastructure and Water Management
- Ministry of Education, Culture and Science
- The Netherlands Organisation for Scientific Research (NWO)
- Ministry of Economic Affairs and Climate Policy

Research performing organisations in the national ACTRIS consortium (research organisations foreseen to host ACTRIS national and/or central facilities)

The following institutes work together under a collaboration agreement and jointly operate the Cabauw Experimental Site for Atmospheric Research (CESAR), www.cesar-observatory.nl, which is hosted by KNMI. The national roadmap for large scale research infrastructure project Ruisdael Observatory includes ACTRIS-NL and ICOS-NL activities, www.ruisdael-observatory.nl, which is led by TU-Delft.

- Royal Netherlands Meteorological Institute (KNMI) **Contact:** Ir. Arnoud Apituley www.knmi.nl
- Delft University of Technology (TU-Delft) **Contact:** Prof.dr.ir. Herman Russchenberg www.tu-delft.nl
- National Institute for Public Health and the Environment (RIVM) **Contact:** Drs. Daan Swart www.rivm.nl
- Netherlands Organisation for applied scientific research (TNO) **Contact:** Dr.ir. Hugo Denier van der Gon www.tno.nl
- Wageningen University and Research (WUR) **Contact:** Prof.dr. Jordi Vila www.wur.nl
- Utrecht University – Institute for Marine and Atmospheric Research (IMAU) **Contact:** Prof.dr. Sander Houweling www.uu.nl
- Free University (VU), Amsterdam **Contact:** Prof.dr. Sander Houweling www.vu.nl
- University of Groningen (RoG) **Contact:** Dr. Ulrike Dusek www.rug.nl

Contribution to the ACTRIS Central Facilities

In the table below, ACTRIS Central Facilities (CFs) hosted by the country are listed.

Central Facility	CF Unit name	CF Unit description	CF Unit hosting institution / country (for Head Office)
Centre for Cloud Remote Sensing	CCRES-NL	<ul style="list-style-type: none"> • Development of Doppler Cloud Radar calibration procedures • Development of quality control package for Doppler Cloud Radars • Training of users, organization of workshops • Test of new instruments 	TU-Delft
Centre for Trace Gas Remote Sensing	CREGARS-UVVIS-NL	UVVIS intercomparison support at Cabauw site: <ul style="list-style-type: none"> - Provision of ancillary observations - instrument expertise - meteorological and model validation support <ul style="list-style-type: none"> • Contributions to common TC activities 	KNMI

Potential ACTRIS National Facilities - ACTRIS observational platforms and exploratory platforms

In the table below, a list of national facilities, both observational and exploratory platforms, potentially becoming ACTRIS National Facilities is provided.

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
Cabauw	Observational platform	51.971° N 4.927° E -0.7m a.s.l	ready		ready	ready	ready	planned upgrade
Lutjewad	Observational platform	53° 24' N 6° 21' E 1m a.s.l.					planned upgrade	
Transportable cloud profiler	Exploratory platform	mobile				planned upgrade	planned upgrade	

The status of national ACTRIS consortium

The national roadmap for large scale research infrastructure project Ruisdael Observatory includes ACTRIS-NL and ICOS-NL activities,

Webpage:

www.ruisdael-observatory.nl
www.cesar-observatory.nl

Funding for ACTRIS

The Ruisdael Observatory project (2018-2027), funded by NWO, is part of the national roadmap of large scale research infrastructures and is linked to ACTRIS and ICOS. The project includes investment in and installation of infrastructure. The NWO funding is matched with cash and in-kind contributions from the project partners.

Users of ACTRIS

- The users of the ACTRIS-NL facilities in Cabauw are the CESAR partners, other national and international research institutes and private companies. CESAR participates in the ACTRIS-2 Trans National Access and has an access policy for visitors that cannot apply in the framework of ACTRIS. Several long-term collaborations exist with private companies at the site.

- For non-physical access, all measurements are publicly available and have been used by scientists, policy makers and the general public since the start of the observations at Cabauw in 1972. The Cabauw data is well-known in the research community of use in Numerical Weather Prediction model validation. As of December 2018, the CESAR database has 1731 unique users.
- A particular use of the Cabauw site is for (large scale) field campaigns that have been conducted every one to two years for various subjects, including clouds and radiation research, air quality studies, application of satellite data and satellite validation. In September 2016, the Second Cabauw Inter-comparison of Nitrogen Dioxide Measuring Instruments (CINDI-2), involving more than 100 researchers working on-site from 34 institutes around the world. In September 2017 the first Proton-transfer-reaction mass-spectrometer (PTR-MS) Inter-comparison campaign in CABauw (PICAB) was held as part ACTRIS-2. Eleven PTR-MS instruments operated by European and US groups measured for two weeks the ambient air composition at the CESAR observatory near Cabauw. All instruments were subjected to new calibration procedures, developed at IMAU, using a custom manufactured gas standard.

ACTRIS-Norway

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The Zeppelin Observatory in Ny-Alesund - Svalbard, Arctic - View from the roof top

National ACTRIS coordinator and contact person:

Cathrine Lund Myhre

NILU – Norwegian Institute for Air Research

Membership status in the Interim ACTRIS Council:

- Member
- Nominated representative:
 - Åsa Alexandra Borg Pedersen, Norwegian Environment Agency



Ministries and other possible funding organisations supporting ACTRIS

- The Research Council of Norway
- NILU – Norwegian Institute for Air Research
- Norwegian Environment Agency
- Norwegian Meteorological Institute - Met.No

Potential funding supporting institutions in the future are

- Norwegian Ministry of Climate and Environment
- Norwegian Ministry of Education and Research
- University of Oslo

Research performing organisations in the national ACTRIS consortium

- NILU - Norwegian Institute for Air Research, <http://www.nilu.no>, **Contact:** Cathrine Lund Myhre (National Coordinator)
- Norwegian Meteorological Institute, <http://met.no>, **Contact:** Michael Schulz
- Andøya Space Center, <https://www.andoyaspace.no>, **Contact:** Michael Gausa

Contribution to the ACTRIS Central Facilities

In the table below, ACTRIS Central Facilities (CFs) hosted by the country are listed.

Central Facility	CF Unit name	CF Unit description	CF Unit hosting institution / country (for Head Office)
Data Centre	ACTRIS data and services access unit (ACCESS)	Provision of ACTRIS web interface for data, services and digital tools.	NILU – Norwegian Institute for Air Research
Data Centre	ACTRIS data and services access unit (ACCESS)	Data production of selected Level 3 data, quality control tools, and synergy data products.	Norwegian Meteorological Institute - Met.No
Data Centre	ACTRIS In situ data centre unit (In-situ)	Data curation service for aerosol, cloud and trace gas in-situ data. Inclusion of data in EBAS database	NILU – Norwegian Institute for Air Research

Potential ACTRIS National Facilities - ACTRIS observational platforms and exploratory platforms

In the table below, a list of national facilities, both observational and exploratory platforms, potentially becoming ACTRIS National Facilities is provided.

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
Birkenes Observatory	Observational platform, regional background site	58.389°N 8.252°E 190 m a.s.l.	ready		planned			
Zeppelin Observatory	Observational platform, Arctic mountain site	78.907°N 11.888°E 474 m a.s.l.	ready		planned			
Trollhaugen Observatory	Observational platform, Antarctic mountain site	72.012°S 2.535°E 1553 m a.s.l.	planned					

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
Andøya Observatory	Observational platform, Arctic coastal site	69.278°N 16.009°E 380 m a.s.l.				ready		

The status of national ACTRIS consortium

There is a memorandum of understanding between NILU, Met.No, and Andøya Space Center working actively on setting up ACTRIS in Norway. ACTRIS-Norway proposal is submitted to the research council autumn 2018 with these partners. ACTRIS-Norway is not on the Norwegian Roadmap, but receives support from the Norwegian Research Council for Norwegian participation in preparations of research infrastructures on ESFRI Roadmap. This support is for the period 2017-2019.

Funding for ACTRIS

Costs of the Norwegian engagement in ACTRIS consist of national ACTRIS activities mainly maintaining measurements programs and national facilities, planning and implementation activities at the European level and development and construction of the Central Facility Norway plans to host, the ACTRIS Data Centre.

Observatories and measurement programs are funded by various sources, mainly the following;

- Direct infrastructure funding from Norwegian ministry of Climate and Environment.
- Measurement programs funded through contracts with Norwegian Environment Agency
- NILU institutional funds

NILU is hosting e-infrastructure capacities, including databases and data curation of ACTRIS data with shared solutions and infrastructures with other central programs, in particular, EMEP, GAW-WDCA, GAW-WDCRG, AMAP. This is funded by various sources, mainly the following;

- NILU – Norwegian Institute for Air Research
- EMEP – European Monitoring and Evaluation Programme
- EU – H2020 through ACTRIS-2, ENVRIplus
- Other minor contributions

The total cost per year is ca 1 M€/year now for full e-infrastructure for in situ data in EBAS, including the ACTRIS data portal.

Users of ACTRIS

The Norwegian climate research community is the most frequent user of the national ACTRIS data. This community consists of a many of governmental and private institutes and institutions, such as e.g. NILU, the Norwegian Meteorological Institute (Met.No), University of Oslo, Cicero, and includes modelers, experimental scientists and PhD students. The outcome has been (and will continue to be) central scientific publications in high impact journals, where different Norwegian research groups (such as CICERO, universities in Bergen, Oslo, Tromsø) are using ACTRIS data and products. A recent investigation showed that 49 high impact publications are produced by Norwegian community over the last year. This includes high impact journals, and last IPCC report, working group 1 (Chapter 2: Observations: Atmosphere and Surface).

National and international air quality assessments for National and International Environmental agencies are also based on ACTRIS data and are the ultimate user of ACTRIS activities by NILU and Met.No. The ACTRIS-Norway measurements from Zeppelin, Birkenes and Troll are widely used nationally and internationally. Monitoring the download from EBAS shows that 16 387 measurement year of data are downloaded from 44 countries since 2010, the main users are Finland, Norway, US, Sweden, Great Britain, Germany, and France. Approximately 20% of the users downloading data are located within Norway. In addition are more >5000 measurement years of data to submitted to MET for Copernicus model evaluation.



**Meteorologisk
institutt**



NILU Norsk institutt for luftforskning
Norwegian Institute for Air Research



ANDØYA SPACE CENTER

ACTRIS-Poland

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Measurement platform at University of Warsaw

National ACTRIS coordinator and contact person:

Aleksander Pietruczuk

Institute of Geophysics Polish Academy of Sciences

Membership status in the Interim ACTRIS Council

- Member

Nominated representatives:

- Michal Rybinski, Ministry of Science and Higher Education Republic of Poland
- Aleksander Pietruczuk, Institute of Geophysics Polish Academy of Science
- Iwona S. Stachlewska, Faculty of Physics, University of Warsaw



Ministries and other possible funding organisations supporting ACTRIS

- Ministry of Science and Higher Education, Republic of Poland

Research performing organisations in the national ACTRIS consortium

- Institute of Geophysics, Polish Academy of Sciences, Aleksander Pietruczuk, alek@igf.edu.pl
- University of Warsaw, Faculty of Physics, Iwona Stachlewska, iwona.stachlewska@igf.fuw.edu.pl
- Institute of Environmental Engineering, Polish Academy of Sciences, Krzysztof Klejnowski, kklejnowski@ipis.zabrze.pl

- Institute of Meteorology and Water Management, National Research Institute, Leszek Ośródka, Leszek.Osrodka@imgw.pl
- IPoznan University of Life Sciences, Bogdan Chojnacki, bogdan.chojnacki@gmail.com
- IUniversity of Silesia, Mariola Jabłońska, mariola.jablonska@us.edu.pl
- IUniversity of Wroclaw, Maciej Kryza, maciej.kryza@uwr.edu.pl

Potential ACTRIS National Facilities - ACTRIS observational platforms and exploratory platforms

In the table below, a list of national facilities, both observational and exploratory platforms, potentially becoming ACTRIS National Facilities is provided.

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
Belsk	Observational platform, background site in central Poland	51.83°N 20.78°E 180 m a.s.l.	major planned upgrade			minor planned upgrade		
Warsaw	Observational platform, urban site in central Poland	52.21°N 20.98°E 112 m a.s.l.					major planned upgrade	
Racibórz	Observational platform, sub-urban site in southern Poland	50.08°N 18.19°E 230 m a.s.l.	major planned upgrade			minor planned upgrade		
Rzecin	Observational platform, background site in western Poland	52.75°N 16.3°E 54 m a.s.l.				major planned upgrade	major planned upgrade	
Mobile platform for aerosol measurements		mobile	major planned upgrade			major planned upgrade		

The status of national ACTRIS consortium

ACTRIS Poland consortia applied for national roadmap (June 2018). The proposal is under evaluation

Funding for ACTRIS

ACTRIS Poland is currently funded at the level of each involved RPOs.

Users of ACTRIS

- The scientific research community, including partners of ACTRIS Poland.
- National Research Institute for Environment Protection – modelling of air quality; joint ACTRIS – EMEP campaigns



ACTRIS-Portugal



National ACTRIS coordinator and contact person:
Daniele Bortoli
 Institute of Earth Sciences - University of Evora (ICT-UE)

Membership status in the Interim ACTRIS Council

- No membership

Country (national authority) contact persons:

- Prof. Miguel Castanho and Dr. Cristiana Leandro

Ministries and other possible funding organisations supporting ACTRIS

- Technology and Science Foundation (FCT)
- Commissions for Coordination of Regional Development (CCDRs)
- Ministério da Ciência, Tecnologia e Ensino Superior (MCTES)

For all: financial commitment to be confirmed

Research performing organisations in the national ACTRIS consortium

- Institute of Earth Sciences (University of Evora) (<http://www.ict.uevora.pt/?lang=en>) **Contact:** Daniele Bortoli - db@uevora.pt
- University of Aveiro (<https://www.ua.pt/>)
Contact: Celia Alves - celia.alves@ua.pt
- University of Azores (<http://international.uac.pt/>)
Contact: Paulo Fialho - fialho.paulo@gmail.com
- University of Beira Interior (<http://www.ubi.pt/en/>)
Contact: Sandra Mogo - sipmogo@gmail.com
- LEPABE - Laboratory for Process Engineering, Environment, Biotechnology and Energy - LEPABE University of Porto (<https://paginas.fe.up.pt/~lepabe/>)
Contact: Sofia Sousa - sofia.sousa@fe.up.pt
- IPMA - Instituto Português do Mar e Atmosfera (<https://www.ipma.pt/en/index.html>) **Contact:** Miguel Miranda - miguel.miranda@ipma.pt

Potential ACTRIS National Facilities - ACTRIS observational platforms and exploratory platforms

In the table below, a list of national facilities, both observational and exploratory platforms, potentially becoming ACTRIS National Facilities is provided.

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
Observatory of Atmospheric Sciences- Évora	Observational platform, background site	38.5678N, 7.9115W, 293 m a.s.l.	minor planned upgrade			ready	minor planned upgrade	major planned upgrade
GOA-UVA in situ measurement station	Observational platform, rural background	40.275N, 7.510W, 704 m asl.	minor planned upgrade					
Pico Mountain Observatory	Observational platform, maritime background	38.0478N, 28.4038W 2225m asl.				major planned upgrade		
Mobile Station for Air Quality Assessment:	Laboratory Platform		minor planned upgrade		minor planned upgrade			

The status of national ACTRIS consortium

Since 2009, the University of Evora through ICT (former CGE- Geophysics Centre of Evora) is the only Portuguese associated partner of the ACTRIS projects (ACTRIS, ACTRIS2, ACTRIS-PPP) Only in 2015, the Portuguese research institutions started to organize them self as a consortium and nowadays the Portuguese ACTRIS community is discussing with the decision makers about the setup of the consortium; there is not yet any MoU nor official consortium document established. ACTRIS is not inserted yet in the national Roadmap. The Portuguese Science Foundation is partially supporting national ACTRIS activities of the associated partner. A meeting with the Portuguese funding authorities to solicit support for ACTRIS is soon envisaged.

Funding for ACTRIS

Even after some more meetings with the funding authorities is not yet possible to quantify the available Portuguese financial support to ACTRIS.

Users of ACTRIS

The user communities in Portugal are:

- The scientific research community dealing with environmental questions and air quality
- The regional departments dealing with air quality
- The education sector
- The transport sector (air traffic in particular)
- The health sector



Instituto de Ciências da Terra
Institute of Earth Sciences



UAc
UNIVERSIDADE
DOS AÇORES

ACTRIS-Romania

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Mobile laboratory for atmospheric measurements during Pre-Tect campaign in Crete, Apr. 2017 – daytime observations of marine aerosols and clouds with the scanning UV polarization lidar

National ACTRIS coordinator and contact person:

Doina Nicolae

National Institute of R&D for Optoelectronics

Membership status in the Interim ACTRIS Council

- Member

Nominated representatives:

- Viorel Vulturescu, Ministry of Research and Innovation
- Doina Nicolae, National Institute of R&D for Optoelectronics



Ministries and other possible funding organisations supporting ACTRIS

- Ministry of Research and Innovation

Research performing organisations in the national ACTRIS consortium

- National Institute of R&D for Optoelectronics (INOE), Doina Nicolae, nnicol@inoe.ro, <http://environment.inoe.ro>
- “Babes-Bolyai” University of Cluj-Napoca (UBB), Nicolae Ajtai, nicolae.ajtai@ubbcluj.ro, <http://enviro.ubbcluj.ro/en/>
- “Al.I. Cuza” University of Iasi (UAIC), Sivliu Gurlui, sgurlui@uaic.ro, <http://spectroscopy.phys.uaic.ro/>
- “Dunarea de Jos” University of Galati (UGAL), Mirela Voiculescu, Mirela.Voiculescu@ugal.ro, <http://www.ecee.ugal.ro/index.html>
- National Institute of Aerospace Research “ELIE CARAFOLI” (INCAS), Andreea Calcan, boscornea.andreea@incas.ro, <http://www.incas.ro/>

Contribution to the ACTRIS Central Facilities

In the table below, ACTRIS Central Facilities (CFs) hosted by the country are listed.

Central Facility	CF Unit name	CF Unit description	CF Unit hosting institution / country (for Head Office)
Centre for Aerosol Remote Sensing	Aerosol High-power Lidar unit INOE (CARS-AHL-INOE)	Provision of high-power lidar specific calibration services and operation support, including development of procedures and protocols, QA criteria and standards, QC tools and training.	National Institute of R&D for Optoelectronics (INOE)

Potential ACTRIS National Facilities - ACTRIS observational platforms and exploratory platforms

In the table below, a list of national facilities, both observational and exploratory platforms, potentially becoming ACTRIS National Facilities is provided.

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
RADO-Bucharest	Observational platform, pre-urban site in SE Romania	44.348°N 26.029°E 93 a.s.l.	ready			ready	minor planned upgrade	
RADO-Cluj	Observational platform, urban site in Central Romania	46.766°N 23.583°E 352 a.s.l.				ready	major planned upgrade	
RADO-Iasi	Observational platform, urban site in NE Romania	47.166°N 27.566°E 66 a.s.l.				minor planned upgrade		
RADO-Galati	Observational platform, PRE-urban site in E Romania	45.438°N 28.056°E 35 a.s.l.					major planned upgrade	
CERNESIM	Exploratory platform, chamber	47.166°N 27.566°E 66 a.s.l.	ready		ready			
ATMOSLAB	Exploratory platform, small research aircraft	mobile	ready	ready	major planned upgrade			

The status of national ACTRIS consortium

ACTRIS-RO is organized as a consortium of institutions, with a MoU signed. The consortium includes RPOs that are potentially hosting NFs and CF Units, but also institutions that are ACTRIS users (Universities, public services, SMEs). ACTRIS-RO has been recently included on the national research infrastructure roadmap. ACTRIS-RO has applied for structural funds to build further its capacities. For example, MARS site has been approved and is currently under construction. Other applications are foreseen in the near future.

Webpage: <http://actris.ro/>

Funding for ACTRIS

ACTRIS-RO has made already significant investments in the existing infrastructure (5 mil. € between 2008-2016). More investments are already committed (8 mil. € between 2017-2019). Additionally, ACTRIS-RO intends to apply for the rest of 2 mil. € necessary to finalize the plans described above. ACTRIS-RO has invested also in the preparation of human resources (2 mil. € between 2008-2016) and will continue to do it in the following years (2 mil. € between 2017-2019).

In terms of operation cost, it is estimated that for all fully developed ACTRIS-RO facilities (NFs and CF), the annual operation cost is about 0.8 mil. €. These costs will be covered partially by the state (expected: 0.6 mil. € annually) and partially as in-kind contribution from the RPOs (expected: 0.2 mil. € annually). The funding program for the operation phase is not yet in place.

Users of ACTRIS

- National Institute for Research and Development for Optoelectronics, research
- National Institute of Aerospace Research "ELIE CARAFOLI", research
- "Babes-Bolyai" University of Cluj-Napoca, research & education
- "Al.I. Cuza" University of Iasi, research & education
- "Dunarea de Jos" University of Galati, research & education
- University of Bucharest, research & education
- "Politehnica" University of Bucharest, research & education
- Romanian Air Traffic Services Administration, aviation
- Romanian Space Agency, space agency
- National Administration for Meteorology, weather forecast
- Centre for Risk and Hazard Management, risk management
- ENVIROSCOPY Romania, SME
- INOESY Romania, SME



MINISTERUL CERCETĂRII ȘI INOVĂRII

ACTRIS-Spain



Master photometers at the calibration centre of Izaña Atmospheric Station



National ACTRIS coordinator and contact person:

Adolfo Comerón

Universitat Politècnica de Catalunya

Amalia Muñoz

CEAM

Membership status in the Interim ACTRIS Council

- Member

Nominated representative:

- Inmaculada Figueroa Rojas, Ministry of Economy, Industry and Competitiveness

Ministries and other possible funding organisations supporting ACTRIS

- Ministry of Science, Innovation and Universities
- Ministry of Agriculture, Fisheries and Food
- Ministry for the Ecologic Transition
- Department of Economy and Knowledge, Regional Government of Andalusia
- Department of Economy, Industry, Commerce and Knowledge, Regional Government of the Canary Islands
- Department of Education, Regional Government of Castilla y León
- Department of Business and Knowledge, Regional Government of Catalonia
- Department of Territory and Sustainability, Regional Government of Catalonia
- Department of Agriculture, Cattle Farming, Fisheries, and Food, Regional Government of Catalonia
- Department of Agriculture, Environment, Climate Change and Rural Development, Regional Government of Comunitat Valenciana

- Department of Education, Research, Culture and Sports, Regional Government of Comunitat Valenciana
- Department of Education and Research, Regional Government of Madrid
- Agencia Estatal de Meteorología (AEMET)
- Agencia Estatal Consejo Superior de Investigaciones Científicas (CSIC)
- Barcelona Supercomputing Center – Centro Nacional de Supercomputación (BSC)
- Instituto Interuniversitario de Investigación del Sistema Tierra en Andalucía – Universidad de Granada (IISTA-UGR)
- Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT)
- Fundación de la Comunitat Valenciana Centro de Estudios Ambientales del Mediterráneo (CEAM)
- Instituto Nacional de Técnica Aeroespacial (INTA)
- Universidad Miguel Hernández (UMH)
- Universidad de Valladolid (UVA)
- Universitat de València (UV)
- Universitat Politècnica de Catalunya (UPC)

Research performing organisations in the national ACTRIS consortium

- Agencia Estatal Consejo Superior de Investigaciones Científicas (CSIC). Contact: Prof. Andrés Alastuey (andres.alastuey@idaea.csic.es), <http://www.idaea.csic.es/index.php?lang=en>.
- Agencia Estatal de Meteorología (AEMET). Contact: Dr. Emilio Cuevas (ecuevasa@aemet.es), Dr. Natalia Prats (npratasp@aemet.es), <http://izana.aemet.es/index.php?lang=en>
- Barcelona Supercomputing Center – Centro Nacional de Supercomputación (BSC). Contact: Dr. Carlos Pérez (carlos.perez@bsc.es), <https://www.bsc.es/>
- Instituto Interuniversitario de Investigación del Sistema Tierra en Andalucía – Universidad de Granada (IISTA-UGR). Contact: Prof. Lucas Alados-Arboledas (alados@ugr.es), <http://www.iista.es/en/>
- Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT). Contact: Dr. Begoña Artíñano (b.artinano@ciemat.es), Dr. Manuel Pujadas (manuel.pujadas@ciemat.es), <http://www.ciemat.es/>
- Fundación de la Comunitat Valenciana Centro de Estudios Ambientales del Mediterráneo (CEAM). Contact: Dr. Amalia Muñoz (amalia@ceam.es), http://www.ceam.es/GVAceam/ceam_en/home.htm
- Instituto Nacional de Técnica Aeroespacial (INTA). Contact: Dr. Margarita Yela (yelam@inta.es), <http://www.inta.es/opencms/export/sites/default/ATMOSFERA/en>
- Universidad Miguel Hernández (UMH). Contact: Prof. Javier Crespo (Jcrespo@umh.es), <http://www.umh.es/?lang=EN>
- Universidad de Valladolid (UVA). Contact: Prof. Victoria Cachorro (chiqui@goa.uva.es), Prof. Carlos Toledano (toledano@goa.uva.es), <http://goa.uva.es/>

- Universitat de València (UV). Contact: Prof. José Antonio Martínez-Lozano (Jose.A.Martinez@uv.es), Prof. José Luis Gómez-Amo (Jose.L.Gomez-Amo@uv.es), <https://www.uv.es/solar>
- Universitat Politècnica de Catalunya (UPC). Contact: Prof. Adolfo Comerón (comeron@tsc.upc.edu), <http://www.tsc.upc.edu/en/research/com-msenslab>

Contribution to the ACTRIS Central Facilities

In the table below, ACTRIS Central Facilities (CFs) hosted by the country are listed.

Central Facility	CF Unit name	CF Unit description	CF Unit hosting institution / country (for Head Office)
Data Centre	ACTRIS data and services access unit (ACCESS)	Data production of selected Level 3 data and synergy data products	Barcelona Supercomputing Center – Centro Nacional de Supercomputación
Centre for Aerosol Remote Sensing	CARS-ASP-AEMET	<ul style="list-style-type: none"> • Calibrating reference sun-photometer required by CNRS and UVA • Primary link to WMO-GAW reference AOD network (traceability) • Testing of new technics and methodologies for photometry measurements. • Development of synergy photometer/lidar/ceilometer methodologies 	State Meteorological Agency of Spain (AEMET), Izaña Atmospheric Research Center
Centre for Aerosol Remote Sensing	CARS-ASP-UVA	<ul style="list-style-type: none"> • Maintenance and calibration transfer from reference instrument automatic sun/sky/lunar photometers to field instrument NASA radiance traceability with CARS • Update of photometer monitoring tools, such as CAELIS (www.caelis.uva.es) • Submission of photometer level 1 data to ACTRIS DC • Update ACTRIS-DC processing software and system for ASP level 2/3 data production 	University of Valladolid, Group of Atmospheric Optics

Potential ACTRIS National Facilities - ACTRIS observational platforms and exploratory platforms

In the table below, a list of national facilities, both observational and exploratory platforms, potentially becoming ACTRIS National Facilities is provided.

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
Izaña Atmospheric Observatory (AEMET)	Remote background mountain site	28.3°N 16.5°W 2370 a.s.l.	ready		ready			ready
CIEMAT-Madrid	Urban background site in Iberian peninsula center	40.456°N 3.726°W 700 a.s.l	ready			ready		
Barcelona	Urban site	41.387°N 2.116°E 115 a.s.l	ready		major planned upgrade	ready		
Montseny	Regional background site	41.779°N 2.358°E 720 a.s.l	ready		minor planned upgrade			
Montsec	Remote background site	42.052°N 0.7294°E 1600 a.s.l	ready					
Granada	Urban site	37.167°N 3.600°W 680 a.s.l	ready			ready	ready	
Sierra Nevada	Remote background mountain site	37.1°N 3.4°W 2550 a.s.l	ready	major planned upgrade				
INTA – El Arenosillo – ESAt	Rural coastal background site	37.1°N 6.7°W 40 a.s.l	ready					
Aitana	Regional background mountain site	38.633°N 0.250°W 1558 a.s.l	ready					

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
Burjassot	Urban site	39.500°N 0.417°W 60 a.s.l				ready		
Aras de los Olmos	Remote back-ground mountain site	39.95°N 1.1°W 1300 a.s.l	major planned upgrade					
Universidade da Coruña	Urban back-ground site in Atlantic coast	43.3°N 8.4°W 140 a.s.l	major planned upgrade					
EUro-pean PHO-to-Reactor (EUPHORE, CEAM)	Chamber	39.5N 0.5W	ready		ready			
INTA UAV platform for aerosol in situ observations	RPAs equipped with instruments for aerosol in situ measurements	mobile	ready					

The status of national ACTRIS consortium

ACTRIS-Spain is currently organized under a Memorandum of Understanding signed by 11 RPOs, namely:

- Agencia Estatal Consejo Superior de Investigaciones Científicas (CSIC)
- Agencia Estatal de Meteorología (AEMET)
- Barcelona Supercomputer Center - Centro Nacional de Supercomputación (BSC)
- Instituto Interuniversitario de Investigación del Sistema Tierra en Andalucía.
- Universidad de Granada (IISTA-UGR)
- Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT)
- Fundación de la Comunitat Valenciana Centro de Estudios Ambientales del Mediterráneo (CEAM)
- Instituto Nacional de Técnica Aeroespacial (INTA)
- Universidad Miguel Hernández (UMH)
- Universidad de Valladolid (UVA)
- Universitat de València (UV)
- Universitat Politècnica de Catalunya (UPC)

The Spanish National Research Infrastructure Roadmap does not exist at present, but the Ministry of Economy, Industry and Competitiveness, from which research infrastructures depended in 2015, expressed its political commitment in support to ACTRIS by providing a letter of intent to the coordinator of the ESFRI proposal. In addition, the RPOs have also provided letters committing in-kind support. The Ministry of Science, Innovation and Universities, which is in charge currently of research infrastructures, keeps that support.

Webpage: www.bsc.es/actris/en

Funding for ACTRIS

Up to now ACTRIS has been funded essentially through public grants at the national and regional levels, contributions from the RPOs, mostly in kind, and other contributions from European Framework Programme projects.

The level of investment already devoted to reach the present ACTRIS-Spain capacities is estimated in around 16 M€ (without taking into account all the housing investments) aggregated for all the signatories of MoU. The annual funding that the MoU members are attracting for maintaining and upgrading the infrastructure is estimated in 2 M€. The estimated annual operation cost is also around 2 M€ including in-kind contributions.

Users of ACTRIS

The following kind of ACTRIS users have been identified in Spain:

By application of ACTRIS products

- Climate modelling
- Atmospheric environment modelling and forecast
- Ecological research and monitoring
- Health studies and epidemiology
- Energy (solar energy)
- Earth observation satellite community (atmospheric correction)
- Aerial navigation

By activity domain

- Academic research
- Meteorological agencies
- Environmental ministries and agencies at national and regional levels
- Natural resources ministries and agencies at national and regional levels
- Health agencies
- Industrial users, including companies in a large span of sizes and activities

Present known users include

- climate modelling, and atmospheric environment modelling and forecast research groups at Universidad Complutense de Madrid, Universidad Politécnica de Madrid, and Universidad de Extremadura
- several departments at the Meteorological Agency of Spain (AEMET)
- the environmental agency of the Castilla y León Regional Government

- a health studies and epidemiology group at the research institute of biomedical studies Instituto de Salud Carlos III.

It is reasonably considered that future users can include councils of major Spanish cities, departments with responsibilities in environment, public health, agriculture and food at national and regional levels (besides those already mentioned), as well private companies, especially, but not only, in the energy sector (electricity, gas, oil, etc.).

Some international communities, such as those reached by the WMO's Sand and Dust Storm Warning Advisory and Assessment System (SDS-WAS) Regional Northern Africa-Middle East-Europe (NA-ME-E) Regional Center, under the responsibility of AEMET and BSC, are also potential users of ACTRIS products with high probability.

The number of people potentially using ACTRIS products in Spain is estimated to be 300 in the academic domain and 700 in the rest of fields, including industries and meteorological and environmental agencies, health agencies and policymakers at the national, regional and local levels



ACTRIS Sweden

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Service work on the 30 m high aerosol tower at the ICOS-ACTRIS site at Hyltemossa.

National ACTRIS coordinator and contact person:

Erik Swietlicki
Lund University

Membership status in the Interim ACTRIS Council

- No membership

Ministries and other possible funding organisations supporting ACTRIS

- Swedish Research Council (no funding commitment)
- Swedish Environment Protection Agency
- Lund University
- Stockholm University
- Gothenburg University
- Swedish University of Agricultural Sciences (SLU)
- Swedish Meteorological and Hydrological Institute (SMHI)
- Uppsala University
- Swedish private foundations



Research performing organisations in the national ACTRIS consortium

- Lund University, Erik Swietlicki, erik.swietlicki@nuclear.lu.se, www.lu.se
- Stockholm University, Hans-Christen Hansson, HansChristen.Hansson@aces.su.se, www.su.se
- Gothenburg University, Mattias Hallquist, mattias.hallquist@gu.se, www.gu.se
- Swedish University of Agricultural Sciences, Mats B Nilsson, Mats.B.Nilsson@slu.se, www.slu.se
- Swedish Meteorological and Hydrological Institute SMHI, Anke Thoss, Anke.Thoss@smhi.se, www.smhi.se
- Uppsala University, Anna Rutgersson, Anna.Rutgersson@met.uu.se, www.uu.se

Potential ACTRIS National Facilities - ACTRIS observational platforms and exploratory platforms

In the table below, a list of national facilities, both observational and exploratory platforms, potentially becoming ACTRIS National Facilities is provided. The two previous ACTRIS sites at Vavihill (Lund University) and Aspvreten (Stockholm University) were fully dismantled in spring 2018 and replaced with Hyltemossa and Norunda.

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
Hyltemossa	Operated by Lund University, co-located ICOS-ACTRIS site in southern Sweden. Combined ICOS atmosphere and ecosystem tall-tower station.	56°06'N, 13°25'E, 115 m asl	Ready					
Norunda	Co-located ICOS-ACTRIS site north of Stockholm. Combined ICOS atmosphere and ecosystem tall-tower station. ACTRIS activities operated by Stockholm University, ICOS activities operated by Lund University.	60°05'N, 17°29'E, 46 m asl	Ready					

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
Zeppelin	Background Arctic, mountain top, co-located with ICOS station operated by NILU, Norway	78°54'29" N 11°52'53" E, 474 m asl	Ready	planned with minor upgrades during 2019 and 2020				
Svartberget	Co-located ICOS-ACTRIS site north of Stockholm. Combined ICOS atmosphere and ecosystem tall-tower station. ACTRIS activities operated by Stockholm and Lund Universities, ICOS activities operated by SLU Umeå.	64°15'N, 19°46'E, 270 m asl	major upgrade planned					
Östergarnsholm	Baltic coastal 4 km from the eastern coast of Gotland. ICOS planned combined ecosystem and oceanic station. Currently no ACTRIS activities.	57°26'N, 18°59'E	major upgrade planned					
Exploratory platform	Complementary to Aerosol IS, also as stand-alone.	Mobile	major upgrade planned					
Exploratory platform		Mobile ground-based (primarily at Norunda)	major upgrade planned	major upgrade planned				

The status of national ACTRIS consortium

ACTRIS Sweden is formally established (Memorandum of Understanding), involving Lund University, Stockholm University, Gothenburg University, Swedish University of Agricultural Sciences, Swedish Meteorological and Hydrological Institute, and Uppsala University.

Since we are co-locating with ICOS at several sites in Sweden, we aim to integrate extensively with the ICOS Sweden management structure. The links

between ICOS Sweden and ACTRIS Sweden remain to be formalized. A major change in organization will be the establishment of a separate ACTRIS Sweden Coordination Office, assuming responsibilities and duties for all ACTRIS-related activities at the selected sites. This office may be co-located with the ICOS Sweden Coordination Office at Lund University. The ACTRIS Sweden Coordination Office will be led by a Director assisted by a Science Officer or similar, both experienced in ACTRIS activities. The current ICOS Board may be modified or enlarged to ensure that competences within all the research fields that are addressed by ACTRIS are also well represented. The Board is responsible for the economy and the overall and long-term strategy of ICOS-ACTRIS Sweden.

Webpage: www.actris.se

See also www.icos-sweden.se/index.html and www.fieldsites.se/en-GB.

Funding for ACTRIS

There is currently no funding from Swedish ministries or research funding organizations explicitly earmarked as ACTRIS.

ACTRIS Sweden is on the Swedish Research Infrastructure Roadmap in the highest prioritized Category (A1). The ACTRIS Sweden consortium is thus allowed to submit a proposal for funding from the Swedish Research Council latest 19 February 2019. Decision is expected late October 2019 with funding starting earliest January 2020. The participating RPOs are expected to co-finance the infrastructure activities to at least 50%. The Swedish Environment Protection Agency funds some ACTRIS-related measurements at two ACTRIS sites since more than 10 years, mostly motivated by air quality issues. The participating RPOs fund ACTRIS-related activities at sites across Sweden, to varying degrees.

One requirement from the Swedish Research Council involves close collaboration between ACTRIS and ICOS.

In Sweden, ACTRIS researchers at Lund University and Stockholm University have conducted aerosol measurements since 2000 at the two previous Swedish ACTRIS sites at Vavihill (southern Sweden) and Aspvreten (south of Stockholm). During 2018, researchers at these universities finalized the move of their ACTRIS activities to co-locate with the ICOS Sweden observations at the tall tower sites at Hyltemossa in southern Sweden and Norunda outside Uppsala. In doing so, ACTRIS benefits significantly from the infrastructure already constructed by ICOS in terms of on-site housing and laboratory space, towers, electricity, internet and roads. As an example, the costs for building up the entirely new Hyltemossa station during 2010-2016 amounts to 1.5 MEUR only for direct investments, excluding salaries, running costs and indirect costs. Similar investments have also been made at the two other ICOS tall tower and combined atmospheric/ecosystem sites at Norunda and Svartberget. All these three ICOS sites are now fully operational. In addition to these direct financial co-benefits, the ICOS observations that are now performed on meteorology, boundary layer structure and ecosystem conditions are essential also for ACTRIS. Additional sites are Östergarnsholm (ICOS Sweden) and Zeppelin on Svalbard.

The cost for procuring and installing equipment over the initial 5 year period amounts to between 800 and 2 000 kEUR for each ACTRIS site (Hyltemossa, Norunda, Svartberget, Zeppelin, Östergarnsholm), the exact sum depending on existing and recently installed equipment and the level of ambition for the ACTRIS observations. Each site requires at least 1 FTE research engineer (95 kEUR/year) for setting up and servicing the instruments. Management staff (ACTRIS Sweden Head Office) is an estimated additional 150 kEUR/year (part-time coordinator, Scientific Officer). In addition 150 kEUR/year for other direct costs such as travel, workshops, courses, Advisory Board etc. In total, ACTRIS Sweden is estimated to cost 2.8 MEUR/year for the first 5 years pre-operation phase.

Users of ACTRIS

The co-located ICOS-ACTRIS research infrastructure addresses a wide range of Earth system sciences, including atmospheric research, climate science, ecosystem science, meteorology, hydrology, limnology, biology, forestry etc).

At the Universities in Lund, Stockholm and Gothenburg and at SMHI, several of the researchers in these areas of science are involved in the Strategic Research Areas (SRA) MERGE (<http://www.merge.lu.se/>); Bolin Centre for Climate Research (BBCC; <http://www.bolin.su.se/>) and BECC (<http://www.becc.lu.se/>). These SRA are developing climate and Earth system models (MERGE, BBCC) with a strong coupling to biodiversity and ecosystem services (BECC).

To these strong research communities, ACTRIS provides data that are used for model development and verification across a wide range of temporal and spatial scales, going from detailed atmospheric chemistry and aerosol dynamics models to Earth system models such as EC-Earth.

In Sweden, several stakeholders and practitioners would benefit from the ACTRIS RI and data:

Governmental agencies

- Swedish Environmental Protection Agency (air quality and climate)
- Swedish Meteorological and Hydrological Institute (climate change and meteorology)
- Swedish Energy Agency (sustainable energy production)
- Swedish Forest Agency (climate change and forest management, forest fires, etc.)
- Swedish Board of Agriculture (climate change and agriculture etc.)
- Swedish Civil Contingencies Agency MSB (climate change, forest fires, etc.)
- LFV Group (air navigation services and volcanoes)
- Swedish Transport Agency (air traffic and volcano plumes, climate change and transport etc.)

Private sector, research institutes:

Selection of Swedish research institutes that would benefit from the ACTRIS RI and data:

- IVL Swedish Environmental Research Institute
- Swedish Geotechnical Institute (SGI)
- Geological Survey of Sweden (SGU)

Political:

- Swedish Government and Parliament (basis for decision-making)
- Swedish Ministry of the Environment
- Ministry of Education and Research
- Ministry of Enterprise, Energy and Communications
- Permanent Representation of Sweden to the EU
- Swedish regional and local (municipalities) authorities.

Industry:

- Hydropower, energy production sector, insurance sector, forest sector, wood and paper industry, tourism.



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Stockholms
universitet



Swedish University of
Agricultural Sciences

ACTRIS-Switzerland

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High Altitude Research Station Jungfrauoch, Switzerland

National ACTRIS coordinator and contact person:

Urs Baltensperger

Paul Scherrer Institute

Membership status in the Interim ACTRIS Council

- Member

Nominated representatives:

- Regine Röthlisberger, Federal Office for the Environment, Climate Division
- Urs Baltensperger, Laboratory of Atmospheric Chemistry Paul Scherrer Institute
- Stefan Reimann, Empa - Laboratory for Air Pollution and Environmental Technology



Ministries and other possible funding organisations supporting ACTRIS

- State Secretariat for Education, Research and Innovation, SERI, <https://www.sbf.admin.ch/sbf/en/home.html>
- Swiss Federal Office for the Environment FOEN (BAFU), Dr. Richard Ballaman, richard.ballaman@bafu.admin.ch, <https://www.bafu.admin.ch/bafu/en/home.html>

- MeteoSwiss, Prof. Bertrand Calpini, Bertrand.Calpini@meteoswiss.ch, <http://www.meteoswiss.admin.ch/home.html?tab=overview>
- Swiss National Science Foundation, <http://www.snf.ch>

Research performing organisations in the national ACTRIS consortium

- Paul Scherrer Institute, Prof. Urs Baltensperger, urs.baltensperger@psi.ch, <https://www.psi.ch/>
- Swiss Federal Laboratories for Materials Science and Technology (Empa), Dr. Brigitte Buchmann, Brigitte.Buchmann@empa.ch, <https://empa.ch/web/empa>
- University of Bern, Prof. Markus Leuenberger, Prof. Niklaus Kaempfer, leuenberger@climate.unibe.ch, niklaus.kaempfer@iap.unibe.ch, <http://www.unibe.ch/>
- International Foundation High Altitude Research Stations Jungfraujoch and Gornergrat (HFSJG), Prof. Markus Leuenberger, Prof. em. Silvio Decurtins, leuenberger@climate.unibe.ch, silvio.decurtins@dcb.unibe.ch, <https://www.hfsjg.ch/en/home/>
- MeteoSwiss, Prof. Bertrand Calpini, Bertrand.Calpini@meteoswiss.ch, <http://www.meteoswiss.admin.ch/home.html?tab=overview>
- Physikalisch-Meteorologisches Observatorium Davos (PMOD), Dr. Julian Gröbner, Julian.groebner@pmodwrc.ch, <https://www.pmodwrc.ch/>
- ETH Zurich, Prof. Ulrike Lohmann, ulrike.lohmann@env.ethz.ch, <https://www.ethz.ch/>

Contribution to the ACTRIS Central Facilities

In the table below, ACTRIS Central Facilities (CFs) hosted by the country are listed.

Central Facility	CF Unit name	CF Unit description	CF Unit hosting institution / country (for Head Office)
Centre for Reactive Trace Gases In Situ Measurements	CiGas-EMPA	Measurement guideline development and testing of new procedures. Checking of working standard and calibration. Plausibility checks and issue tracker. Organization of annual data quality workshops. Organization of local training activities. Testing of new techniques and procedures to facilitate more stations and measurements	EMPA

Potential ACTRIS National Facilities - ACTRIS observational platforms and exploratory platforms

In the table below, a list of national facilities, both observational and exploratory platforms, potentially becoming ACTRIS National Facilities is provided.

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
Jungfraujoch	Observational platform, high altitude research station	46.548°N 7.985°E 3580 a.s.l.	ready		ready			
Payerne	Observational platform, rural station	46.813°N 6.944°E 489 a.s.l.	minor upgrade planned		minor upgrade planned	minor upgrade planned		
Beromünster	Observational platform, rural station	47.190°N 8.176°E 797 a.s.l.			minor upgrade planned			
PSI Smog-chamber	Exploratory, platform, aerosol formation and transformation, secondary organic aerosol characterization	47.539°N 8.228°E	ready					

The status of national ACTRIS consortium

There is a letter of intent from the Swiss government, and several preparatory meetings have taken place, however, there is no Memorandum of Understanding yet.

In 2018 the Swiss partners submitted the documentation for the inclusion of ACTRIS into the Swiss national Research Infrastructure Roadmap 2019, which was rated A by the Swiss National Science Foundation.

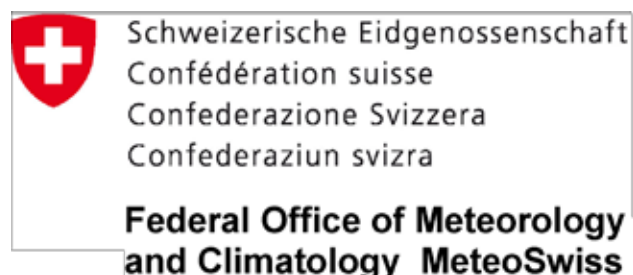
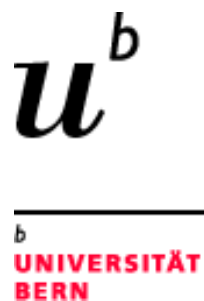
Funding for ACTRIS

Current funding 2.5 M€ per year.

The continued operation of the Jungfraujoch station will require the same level of funding in the future; the implementation of Payerne and Beromünster will require substantial additional funding.

Users of ACTRIS

- Modellers are using the data from this unique site in the lower free troposphere to compare their model results to observations.
- The site is regularly visited by a large number of politicians, e.g. on 22 September 2017 by former UN Secretary-General H.E. Mr. Ban Ki-moon (see <https://www.hfsjg.ch/en/publications/news/2017-09-22/>).
- The site is regularly in the news both in print and TV media (see, e.g., <https://www.hfsjg.ch/en/media/videos/>).
- The site is visited by about 1 million visitors per year, and the research station applies a proactive information policy, e.g. with a brochure (<https://www.hfsjg.ch/en/publications/on-the-top-booklet-about-research-at-jungfrau-joch/>), or with permanent video exhibitions.
- A wide variety of data is available online, see <https://www.hfsjg.ch/en/jungfrau-joch/online-data/>



ACTRIS-United Kingdom

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Chilbolton Facility for Atmospheric Radar Research

National ACTRIS coordinator and contact person:

Prof Geraint Vaughan

National Centre for Atmospheric Science (NCAS) and School of Earth and Environmental Science, University of Manchester.

Membership status in the Interim ACTRIS Council

- Member
- Nominated representative:
 - Prof Stephen Mobbs, Director of NCAS and University of Leeds



Ministries and other possible funding organisations supporting ACTRIS

Natural Environment Research Council (NERC)

Research performing organisations in the national ACTRIS consortium

- National Centre for Atmospheric Science (NCAS), Prof Geraint Vaughan
- Centre for Ecology and Hydrology (CEH), Dr Christine Braban
- Science and Technology Facilities Council, Dr Chris Walden
- University of Manchester, Prof Tom Choularton and Prof Gordon McFiggans
- University of East Anglia, Prof Jan Kaiser
- University of Hertfordshire, Prof Detlef Mueller

Contribution to the ACTRIS Central Facilities

In the table below, ACTRIS Central Facilities (CFs) hosted by the country are listed.

Central Facility	CF Unit name	CF Unit description	CF Unit hosting institution / country (for Head Office)
Centre for Cloud in situ Measurements	Centre for Cloud Droplet and Ice probes (CDIP)	Calibration of cloud droplet and ice probes, and training.	University of Manchester
Centre for Cloud Remote Sensing	CCRES-UK	Development/evaluation of technical solutions for CCRES, relating to standard operating procedures, calibration, quality control, check-up tools. • Training of users	Science and Technology Facilities Council

Potential ACTRIS National Facilities - ACTRIS observational platforms and exploratory platforms

In the table below, a list of national facilities, both observational and exploratory platforms, potentially becoming ACTRIS National Facilities is provided.

Site	Description	Coordinates & altitude	Aerosol IS	Cloud IS	RTG IS	Aerosol RS	Cloud RS	RTG RS
Chilbolton Observatory	Observational platform, southern England	51.1444° N, 1.4386° W 86 m a.s.l.				Planned major upgrade	ready	
Auchencorth Moss	Observational platform, central Scotland	55.7922° N, -3.2429° W 267 m a.s.l.	Planned with minor upgrade		ready			
Manchester Aerosol Chamber	Simulation chamber	53.4658° N, 2.2312° W 38 m a.s.l.	ready					
Roland von Glasow Air-Sea-Ice chamber	Simulation chamber	52.6219° N, 1.2392° E 11 m a.s.l.			ready			
University of Hertfordshire	LITES lidar laboratory	51.7529° N, 0.2422° W 82 m a.s.l.				ready		

The status of national ACTRIS consortium

Currently, the consortium is informal and there is no UK air quality infrastructure roadmap. A UK ACTRIS website is being developed and virtual and face-to-face meetings were organized in 2018.

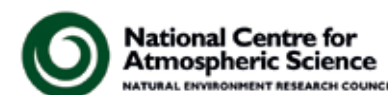
Funding for ACTRIS

Both Chilbolton and Auchencorth are funded through NERC National Capability funding and the future for each site is relatively secure. The exploratory platforms are funded through their own institutions. A national infrastructure roadmap is being prepared by the Research Councils.

Users of ACTRIS

The main ACTRIS user community in the UK is the academic research community, in the Universities and research establishments. There are groups working directly on measurements, groups who use ground-based measurements for 'ground-truthing' satellites, groups who compare measurements and models, and groups who use data in a more applied way to address societal problems such as air quality. Currently, around a dozen research groups have expressed some sort of interest in ACTRIS measurements. Beyond academia, there is interest from Defra (the UK environment ministry) and the Environment Agency in the surface aerosol and trace gas measurements, and from the Met Office in the lidar and spectrophotometer areas. The devolved administrations (in Scotland, Wales and Northern Ireland) are also interested in the air quality aspects.

For air quality measurements Auchencorth is used as an upwind site to Edinburgh, used by both scientists and policy makers. VOC measurements at Auchencorth are used by UK, European and Global scientists. Particle measurements are similarly used by modellers. All measurements at both sites are publically available and have been used by scientists, policy makers and the general public over the past 20 years. Auchencorth has a flat fetch which has been used for long term deposition and emission flux studies both of reactive gases and aerosols and greenhouse gases.



Appendixes

Appendix 1: ACTRIS Glossary

ACTRIS - Aerosol, Clouds and Trace Gases Research Infrastructure, which produces high-quality data documenting short-lived atmospheric constituents and processes leading to their variability in natural and controlled atmospheres and integrates, harmonizes and distributes datasets, activities and services provided by Central Facilities and National Facilities.

ACTRIS data - data from observational National Facilities and exploratory National Facilities complying with the procedures established within ACTRIS.

- **ACTRIS level 0 data:** Raw sensor output. Native resolution, metadata necessary for next level.

- **ACTRIS level 1 data:** Calibrated and quality assured data with minimum level of quality control.

- **ACTRIS level 2 data:** Approved and fully quality controlled ACTRIS data product or geophysical variable.

- **ACTRIS level 3 data:** Elaborated ACTRIS data products derived by post-processing of ACTRIS Level 0 -1 -2 data, and data from other sources. The data can be gridded or not.

ACTRIS Data Centre (DC) - the Central Facility responsible for ACTRIS data curation, preservation, and distribution of data, value-added products and tools, and hosting the ACTRIS data portal.

ACTRIS data originator - entity operating instruments at a National Facility or Topical Centre, resulting in ACTRIS data and delivering ACTRIS data to the Data Centre.

ACTRIS data provider - the Data Centre offering the ACTRIS data and value-added data products and tools to users.

ACTRIS digital tools - tailored codes and software for processing and visualization of ACTRIS data, production of ACTRIS data products, and for data analysis and research.

ACTRIS exploratory platform - ACTRIS National Facility; atmospheric simulation chambers, laboratory platforms and mobile platforms that perform dedicated experiments and contribute data on atmospheric constituents, processes, events or regions by following common ACTRIS standards.

ACTRIS General Assembly (GA) - a council of ministry- and funding organization representatives of ACTRIS members after ACTRIS legal entity has been established, superior decision-making body of ACTRIS.

ACTRIS Head Office (HO) - a Central Facility coordinating and representing ACTRIS, and holding the statutory seat.

ACTRIS label - earmarks a data set or a measurement site as ACTRIS data or ACTRIS National Facility.

ACTRIS observational platform - ACTRIS National Facility; a fixed ground-based station that delivers long-term data based on a regular measurement schedule and common operation standards.

ACTRIS synthesis product - Data products not under direct ACTRIS responsibility from e.g. research activities, citizen science, for which ACTRIS offers repository and access.

ACTRIS Topical Centres (TCs) - a Central Facility offering services and operation support for QA/QC of measurements and data (including training, calibration, QA/QC tools, and development of standard operation and evaluation procedures)

ACTRIS variables - the measured atmospheric variables as described in ACTRIS Data Centre Concept document.

Central Facility (CF) - a European level ACTRIS component that offers ACTRIS data or other ACTRIS services to users as well as operation support to ACTRIS National Facilities.

Central Facility Unit - part of a Central Facility located at, and operated by a research performing organization (RPO) or by ACTRIS ERIC.

CF Director - the person responsible for the coordination and representation of a Central Facility.

CF Unit Head - the person responsible for the coordination and representation of a Central Facility Unit.

CF Management Board - consists of the CF Unit Heads and the CF Director; this board manages the Central Facility.

Data curation - the activity that stores, manages and ensures access to all persistent data sets produced within the infrastructure.

Data traceability - an unbroken chain of uniquely identified process steps leading from raw data to any kind of processed data, where identification of process steps follows the data.

Director General (DG) - is the leader of the ACTRIS (research infrastructure) and the legal representative of the ACTRIS ERIC. The main duty of the DG is to implement the GA decisions and ensure the scientific and strategic development of ACTRIS.

ERIC Management board - If a Central Facility is a part of ACTRIS ERIC (ACTRIS Head Office is a part of ERIC per default), the director of the given CF can be a member of the internal ERIC management board that ensures the coordinated development, management, and implementation of ACTRIS ERIC activities.

Ethical Advisory Board - consists of independent external members appointed by the GA; the board provides feedback and recommendations to develop the ethical aspects of the ACTRIS ERIC and the research infrastructure activities.

Financial Committee - consists of members appointed by the GA; the committee supports the GA on matters related to the management of financial planning as an internal body of GA.

In situ measurements - measured or sampled air and instrument are at the same location and in physical contact. In the context of ACTRIS, in situ measurements of aerosol, cloud, and reactive-trace-gas properties are performed at observational sites near the Earth surface, on mobile surface-based or airborne platforms, and in atmospheric simulation chambers and laboratories.

Interim ACTRIS Council - a council of ministry- and funding organization representatives of ACTRIS members before ACTRIS legal entity has been established (during the ACTRIS Preparation and

Transition Phase), superior decision-making body of ACTRIS.

Measurement traceability - an unbroken chain of comparisons relating an instrument's measurements to a known standard, in the ideal case SI units.

National Facility (NF) - an observational or exploratory platform providing data and/or physical access to the platform within ACTRIS.

National Facilities Assembly - is the platform for the principal investigators and technicians from the ACTRIS NF to exchange experiences and interact with each other and with the ACTRIS CFs; the assembly develops the RI and ensure the connection between the scientific expertise and technological development.

Physical access - physical access of users to the services of an ACTRIS Central Facility or National Facility.

Quality assurance and control: Quality assurance is process oriented and focuses on defect prevention; quality control is product oriented and focuses on defect identification:

Quality Assurance (QA): The process or set of processes used to ensure the quality of a product (e.g. data series, instrument, sample, measured value of a variable, etc.),

Quality Control (QC): The process and activities of ensuring products and services meet the expectations.

Remote access - access to an ACTRIS Central Facility or National Facility without users physically visiting the facility.

Remote sensing - measured air and instrument are not at the same location and not in physical contact. In the context of ACTRIS, active and passive atmospheric remote-sensing techniques for the observation of aerosol, clouds and trace gases are applied at observational sites and on mobile surface-based or airborne platforms.

RI committee - is established by the GA; the committee advises the DG on matters related to the RI to ensure consistency, coherence, and sustainability of the operations of the RI. Each CF director from those CFs that are not part of ACTRIS ERIC has a seat in the Research Infrastructure Committee. Also, representatives of the National Facilities

Assembly shall be members of the Research Infrastructure Committee.

Science and Innovation Advisory Board - consists of independent external members appointed by the GA; the board monitors and advises on the scientific and operative quality of the ACTRIS ERIC and the research infrastructure activities.

Science and User Forum - an open platform for users to interact with ACTRIS. To be established during the implementation phase of ACTRIS.

Scientific and Implementation Advisory Board (SIAB) - The SIAB advises and supports the Interim ACTRIS IAC and the ACTRIS PPP in their implementation work to obtain the objectives of ACTRIS.

Service and Access Management Unit (SAMU) - a part of ACTRIS Head Office facilitating the access to ACTRIS services.

User - a person, a team, or an institution making use of ACTRIS data or other ACTRIS services, including access to ACTRIS facilities.

Virtual access - free access provided through communication networks.

Reference documents

ACTRIS PPP Deliverable 1.1: ACTRIS governance and management structure

ACTRIS PPP Deliverable 2.3: Data policy

ACTRIS PPP Deliverable 2.6: Access and service policy

ACTRIS PPP Deliverable 4.1: Concept document on ACTRIS Central Facilities structure and services

ACTRIS PPP Deliverable 5.1: Documentation on technical concepts and requirements for ACTRIS observational platforms

ACTRIS PPP Deliverable 5.2: Documentation on technical concepts and requirements for ACTRIS exploratory platforms

ISO 10012:2003: Measurement management systems — Requirements for measurement processes and measuring equipment

ISO 9000:2015: Quality management systems—Fundamentals and vocabulary

Appendix 2:

List of Acronyms

ACMCC Aerosol Chemical Monitor Calibration Center

ACTRIS Aerosol, Clouds and Trace Gases Research Infrastructure

ACTRIS HO ACTRIS Head Office

ACTRIS DC ACTRIS Data Centre

ACTRIS CF ACTRIS Central Facility

ACTRIS TC ACTRIS Topical Centre

ACTRIS NF ACTRIS National Facility

ACTRIS SAMU ACTRIS Service and Access Management Unit

ACTRIS GA ACTRIS General Assembly

ACTRIS-I3 EU FP7 Aerosol, Clouds and Trace gases Research InfraStructure Network, grant agreement No 262254 (2011-2015)

ACTRIS-2 Aerosol, Clouds and Trace gases Research InfraStructure Integrated Activity (IA) project is funded by EU Horizon 2020 Research and Innovation programme (grant agreement No 654109). ACTRIS-2 started on 1 May 2015 for a period of 4 years.

ACTRIS PPP, Aerosol, Clouds and Trace gases Research InfraStructure Preparatory Phase Project is a EU Horizon 2020 Coordination and Support Action (grant agreement No 739530). ACTRIS PPP started on 1 January 2017 for a period of 3 years.

AERONET Aerosol Robotic NETwork

AISBL Association without lucrative purpose

AMAP Arctic Monitoring and Assessment Programme

ANAE European research infrastructure on Analysis and Experimentation on Ecosystems

AOD Aerosol optical depth

ARISE2 Atmospheric dynamics Research InfraStructure in Europe Design Study (DS) is a collaborative infrastructure project (2015-2018) funded by the H2020 European Commission.

BVOC Biogenic Volatile Organic Carbon

CAPS Cavity Attenuated Phase Shift Spectroscopy

CI-API-ToF-MS Chemical Ionization Time-Of-Flight mass spectrometer

CLD Chemiluminescence detection

CLOUDNET EU FP5 Development of a European pilot network of stations for observing cloud profiles (2001-2005)

COPERNICUS The European Earth Observation Programme

CREATE Establishment, use and delivery of anAS European aerosol database

CTA Cherenkov Telescope Array

DIAL Differential Absorption Lidar

DOI Digital Object Identifier

EARLINET EU FP5 European Aerosol Research Lidar Network to establish an aerosol climatology

EARLINET-ASOS EU FP6 European Aerosol Research Lidar Network - Advanced Sustainable Observation System

EBAS Database EMEP framework Observation database of atmospheric chemical composition and physical properties

EISCAT-3D The Next Generation Radar for Atmospheric and Geospace Science

eLTER Long-Term Ecosystem Research in Europe

EMEP Co-operative programme for monitoring and evaluation of the long range transmission of air pollutants in Europe

EMSO ERIC European Multidisciplinary Seafloor and water-column Observatory

ENVRIplus Horizon 2020 cluster project on Environmental Research Infrastructures (ENVRI) Providing Shared Solutions for Science and Society

EPOS European Plate Observing system

ERA-PLANET The European network for observing our changing planet

ERIC European Research Infrastructure Consortium

E-RIHS European Research Infrastructure for Heritage Science

ESA European Space Agency

ESFRI European Strategy Forum on Research Infrastructures

ESS ERIC European Social Survey

Euro-Argo ERIC European infrastructure for Argo program that aims at sustaining 1/4 of the global network and enhance coverage in European seas.

EUROCHAMP-2020 Integration of European Simulation Chambers for Investigating Atmospheric Processes - Towards 2020 and beyond project is funded from the European Union's Horizon 2020 research and innovation programme (grant agreement No 730997, 12/2016-11/2020).

EUSAAR EU FP6 European Supersites for Atmospheric Aerosol Research Grant Agreement n°026140 (2006-2011)

FID Gas chromatographic methods with flame ionization

FTIR Fourier-transform infrared spectrometry

Future Earth Global change research program coordinated by the International Council for Science (ICSU)

GAW WMO Global Atmosphere Watch

GAW-WDCA WMO World Data Centre for Aerosols

GAW-WDCRG WMO World Data Centre for Reactive Gases

GC-MS Gas chromatography mass spectrometry

HEMERA EU H2020 project dedicated to balloon-based observations of Earth and space

HPLC-MS High performance liquid chromatography mass spectrometry

IAC Interim ACTRIS Council

IAGOS-AISBL European Research Infrastructure on In-service Aircraft for a Global Observing System

IC Ion chromatography

ICOS ERIC Integrated Carbon Observation System Research Infrastructure

iLEAPS Integrated Land Ecosystem-Atmosphere Processes Study, Global Research Project of Future Earth

INP Ice nucleating particle

I3 European Commission's Integrated Infrastructure Initiative of EU FP7 or design study

LC-MS Liquid chromatography mass spectrometry

LIDAR Light detection and ranging

MoU Memorandum of Understanding

MS Mass Spectrometry

NASA The National Aeronautics and Space Administration

NDACC International Network for the Detection of Atmospheric Composition Change

NMHC Non-methane hydrocarbon

NOAA National Oceanic and Atmospheric Administration, U.S. Department of Commerce

OVOC Oxidized Volatile Organic Carbon

PEEX Pan-Eurasian Experiment

PTR-MS Proton-transfer-reaction mass spectrometry

RECETOX Research Centre for Toxic Compounds in the Environment

RI Research Infrastructure

RPO Research performing organization

SHARE ERIC The Survey of Health, Ageing and Retirement in Europe

SIOS Svalbard Integrated Earth Observing System

SME Small and Medium-sized Enterprise

UAV Unmanned Aerial Vehicle

UNEP United Nations Environment Programme

UVVIS Differential optical absorption spectrometry in the ultraviolet-visible range

VOC Volatile Organic Compound

WCC GAW World Calibration Center

WCC-VOC GAW World Calibration Center for Volatile Organic Compounds

WDC GAW World Data Center

WHO World Health Organization

WMO World Meteorological Organization

WMO-GAW The Global Atmosphere Watch (GAW) programme of WMO

Exploring the atmosphere

www.actris.eu

MEL - LIDAR at the TROPOS research
station at Melpitz, Germany



