

Atmospheric pollution

Coordinated long-term observation of aerosols, cloud-aerosol interactions, and trace gases in Europe...

Climate change and air quality are governed by emission, transport and transformation of key atmospheric components (eg aerosols, clouds, greenhouse and trace gases) and their interaction with solar radiation, and are linked by feedback mechanisms. Contrary to greenhouse gases, radiative forcing by short-lived trace gases and aerosol particles in particular is still very uncertain. Changing aerosols properties in the atmosphere affect the radiative balance both directly by absorbing and scattering radiation and indirectly through the formation of clouds, possibly affecting the frequency of cloud occurrence, cloud thickness and rainfall amounts.

Facing the consequences of global changes will build on implementing sustainable mitigation and adaptation strategies derived with the help of scientific understanding of atmospheric composition changes, its causes and consequences. To achieve benefits for both climate and air quality from emission control of non-greenhouse gases requires not only to improve our understanding of atmospheric chemical processes, but also to develop an observing capacity suited to follow and understand atmospheric composition changes and to account for regional specificities. The need for long-term observation of these atmospheric variables has been unambiguously asserted in the latest IPCC Fourth Assessment Report (IPCC 2007) and in the recent revision of the Thematic Strategy on Air Pollution of the EU.

Sustained long-term observations of a comprehensive suite of atmospheric parameters can be accomplished from multiple coordinated in situ and ground-based remote sensing stations. Satellite observations are insufficient to fulfil this task as it is difficult to

collocate the required complex sets of instruments on space platforms. Moreover, satellite observations do not have a sufficient temporal and even spatial coverage and continuity to study many processes and do need ground-based measurements for calibration and validation (GCOS, 2006).

At present, however, a coordinated European research infrastructure to sustain simultaneous observation of aerosols and their interaction with the other atmospheric constituents (trace gases and clouds) is still lacking.

The Aerosols, Clouds and Trace gases Research InfraStructure Network (ACTRIS) is an outstanding research infrastructure launched in 2011 and will, for the first time, provide coordinated observations of the major atmospheric variables.

ACTRIS aims at integrating European ground-based stations equipped with advanced atmospheric probing instrumentation for aerosols, clouds and short-lived gas-phase species. ACTRIS will have the essential role to support building of new knowledge as well as policy issues on climate change, air quality and long-range transport of pollutants.

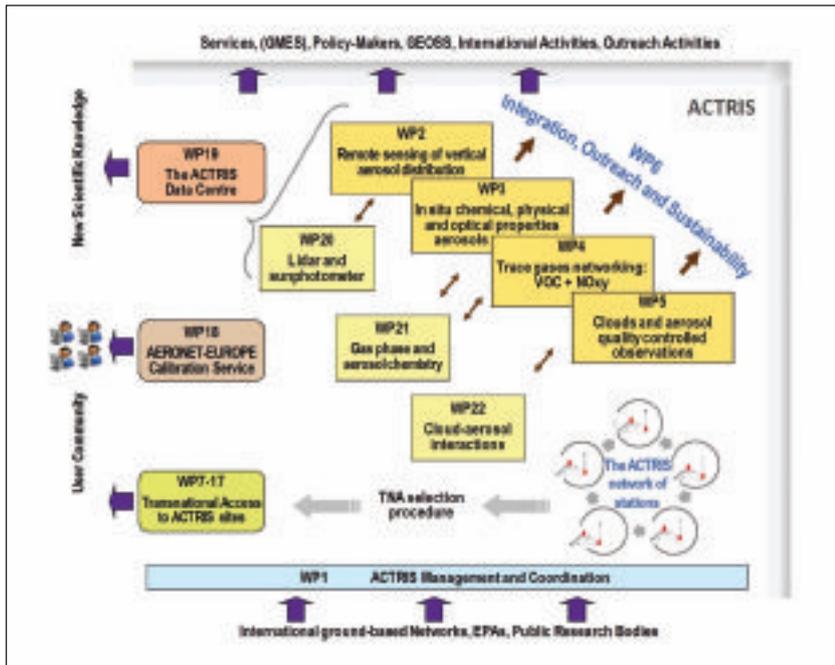
The main objectives of ACTRIS are:

- To provide long-term observational data relevant to climate and air quality research on the regional scale produced with standardised or comparable procedures throughout the network;
- To provide a coordinated framework to support transnational access to large infrastructures strengthening high-quality collaboration in and outside the EU and access to high-quality information and services for the user communities (research, environmental protection agencies, etc);

- To develop new integration tools to fully exploit the use of multiple atmospheric techniques at ground-based stations, in particular for the calibration/validation/integration of satellite sensors and for the improvement of the parameterisations used in global and regional-scale climate and air quality models;
- To enhance training of new scientists and new users, in particular students, young scientists, and scientists from Eastern European and non-EU developing countries in the field of atmospheric observation;
- To promote development of new technologies for atmospheric observation of aerosols, clouds and trace gases through close partnership with EU SMEs.

A key for ACTRIS's success is to build a new research infrastructure on the basis of a consortium joining existing networks/observatories that are already providing consistent datasets of observations and that are performed using state-of-the-art measurement technology and data processing.

In particular the ACTRIS consortium merge two existing research infrastructures funded by the European Commission under FP6: European Supersites for Atmospheric Aerosol Research (EUSAAR) and European Aerosol Research Lidar Network (EARLINET). ACTRIS also includes the distributed infrastructure on aerosol-cloud interaction existing from a previous EU Research project CLOUDNET and by grouping the existing EU ground-based monitoring capacity for short-lived trace gases. Therefore, ACTRIS represents an unprecedented effort towards integration of a distributed network of ground-based stations, covering



Interdependence of activities and tasks within ACTRIS

most climatic regions of Europe, and responding to a strong demand from the atmospheric research community. ACTRIS will be a step towards better integration of aerosol, cloud and trace gases communities in Europe necessary to match the integration of high-quality, long-term observations of aerosol, clouds and short-lived gas-phase species and for assessing their impact on climate and environment. ACTRIS outcomes will be used for supporting decisions in a wide range of policy areas, including air quality but also health, international protocols and research requirements.

ACTRIS is organised in Networking Activities (NA), Transnational Access (TNA), Service Activity (SA), and Joint Research Activities (JRA).

The data provision structure in ACTRIS involves four Networking Activities that will feed the data centre (WP2-WP5), completed by a fifth NA (WP6) aimed at integrating information from WP2-5 into a higher level of products required by users in the modelling and satellite-validation communities.

WP6 can be considered as the core of the research infrastructure, aiming at:

- Technological and conceptual integration of the quality assured

products delivered in the frame of the other networking activities;

- Dialogue with end-users and dissemination of results;
- Sustainability and development of a pan-European long-term monitoring network.

The activities of the research infrastructure will be oriented to a rigorous quality assurance programme addressing both instruments and evaluation algorithms, and a standardised data exchange format.

TNAs will enable users to conduct high-quality research by:

- Offering access to infrastructures with an excellent combination of instruments and expertise (WP7-17);
- Training scientists enhancing the accessibility to the observatories and the exploitation of technical resources and knowledge (WP6 and WP7-17);
- Offering the use of a unique sun photometer calibration facility currently operational in the frame of PHOTONS/AERONET (WP18).

SA will provide scientists and other user groups with access to the

infrastructure data centre through the ACTRIS data portal (WP19).

The data centre:

- Links the existing data bases EARLINET, EUSAAR/EBAS, CloudNet;
- Provides tools and applications for end-users to facilitate the use of all measurements for broad user communities;
- Will make available more than 100,000 datasets of atmospheric parameters;
- Is by far the most comprehensive atmospheric data centre available worldwide including in situ aerosol and gas phase measurements, column aerosol observations, vertical aerosol profiles and cloud observations.

JRAs (WP20-22) develop novel techniques and algorithms to improve observation performance, define new data products, and transfer the technological and scientific outcome to operational instrumentation.

ACTRIS is an important piece of the EU contribution to a Global Earth Observing System of Systems (GEOSS) and its EU component GMES atmospheric services (GAS).



Gelsomina Pappalardo
Senior Researcher, Coordinator of the EC Project ACTRIS

Consiglio Nazionale delle Ricerche – Istituto di Metodologie per l'Analisi Ambientale (CNR-IMAA)
Contrada S. Loja
Tito Scalo (Potenza)
I-85050
Italy

Tel: +39 0971 427 265
Fax: +39 0971 427 271

pappalardo@imaa.cnr.it
www.actris.net