

# Networks of knowledge

The broad-based European Aerosols, Clouds and Trace gases Research InfraStructure network for atmospheric observation provides unprecedented state-of-the-art resources and access to standardised air quality and climate change variables for scientists and researchers in and beyond Europe

**OBSERVING AND MODELLING** climate change and monitoring the effects of polluting events are essential activities in comprehending the effects of changes in the atmosphere on the health of the planet and its people. Understanding variations in the Earth's atmosphere is fundamental to formulating strategies to deal with pollution and climate change but rely on accurate information being consistently collected, analysed and compared over time. At the moment, there is no viable means for doing this on a large scale in Europe and resources are fragmented across the continent.

The Aerosols, Clouds and Trace gases Research InfraStructure (ACTRIS) project integrates advanced data from state-of-the-art, highly instrumentalised research facilities in 19 European countries for monitoring air quality and pollution in Europe. The main objective is to make pan-European services available for its user communities, such as researchers and environmental protection agencies to deliver high-quality long-term observational data on the atmospheric key variables. ACTRIS will be a key contributor to the EU's Global Monitoring for Environment and Security (GMES) programme and the associated Monitoring Atmospheric Composition and Climate project, as well as aiding the Global Earth Observing System of Systems (GEOSS).

The ACTRIS network is comprised of 28 partner and additional associated partner institutions from across Europe and commenced in April 2011, with completion due in March 2015. The project draws upon the significant experience of its coordinators – Dr Gelsomina Pappalardo from the Institute of Methodologies for Environmental Analysis in Potenza, Italy and Dr Paolo Laj from the Geophysical Observatory of the Environment at the J Fourier University in Grenoble, France – both of whom are experts in atmospheric research.

## THE PRINCIPLES OF ACTRIS

The goal of ACTRIS is to support EU requirements for air quality, climate strategies and standardisation of measurements. The central principle for its success is therefore that the data it offers is reliable and unambiguous; anomalies such as variations due to location and time of observation need to be adjusted so that the data is compatible and comparable: "High quality data can only be provided if the atmospheric science community agrees and uses standardised measurement protocols," explains Pappalardo.

The observation systems include both in situ and ground-based remote observation instruments. Many ground-based in situ measurement sites are not collocated with the sites for remote

sensing of aerosols. ACTRIS seeks to improve observation capability through innovative synergistic solutions: improving their tools and algorithms and offering standardised observation methods and procedure, therefore addressing inadequacies in existing arrangements for data and seeking to ensure that data quality assurance is practiced in all research stations.

The project is integrating four existing research infrastructures – the European Supersites for Atmospheric Aerosol Research (EUSAAR) for in situ measurements of the chemical, physical and optical properties of aerosols, the European Aerosol Research Lidar Network (EARLINET) for remote sensing of vertical aerosol distribution, an infrastructure for quality controlled observations of clouds (CLOUDNET), and a new network component for monitoring short-lived trace gases.

## ACTRIS SERVICES

Through joint research initiatives, ACTRIS will provide new monitoring tools and technologies for climate and air quality modelling, satellite retrievals and forecasting systems. These will include testing of the complex assumptions made in

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satellite retrieval algorithms and verification of atmospheric models and space-based data assimilation analyses.

The project partners plan to develop new integration tools to fully exploit the use of multiple techniques at the ground-based stations, in particular for the calibration, validation and integration of satellite sensors and improvement of the parameters used in global- and regional-scale climate and air quality models. It will provide guidance on best practice for data collection and management. ACTRIS also plans to promote the development of innovative observation technologies for aerosols, clouds and trace gases, through new partnerships.

The project's dedicated data centre offers free access to climate and air quality research data on its network and provides support for observation data reporting, offering standardised tools for measurement and reporting and creating sustainable and consolidated hierarchical databases. The data centre also provides tools to improve and facilitate the use of atmospheric observations, with an emphasis on combining key atmospheric variables and their parameters for climate change assessments and weather forecasting. The ACTRIS transnational access and service facilities are designed to enable more researchers to access observatories and to carry out research and calibrations using their advanced infrastructures.

#### CURRENT TRAINING AND RESEARCH OFFERINGS

Training facilities will be provided by ACTRIS, along with courses for researchers, for whom training and support is in strong demand within the European scientific community. The objective is to ensure that Europe remains at the forefront of atmospheric research by training the future leaders in the field. On offer are a range of courses and specialised workshops, including comprehensive and intensive courses for researchers and senior scientists, courses for station managers, technicians and field staff on remote and in situ measurement techniques.

As Pappalardo explains, ACTRIS is a firm supporter of aiding the development of

### A sustainable European atmospheric measurement network is essential

researchers and providing practical experience: "Strong priority will be given to young researchers and users who have not previously used the infrastructure or who would not normally have access to it from, for example, Eastern European or developing countries". If an applicant is successful, ACTRIS will provide support at the research station – administrative and logistical support, free use of the infrastructure, technical and scientific support, and specific training for the use and maintenance of instrumentation and techniques – and will contribute to their travel and subsistence expenses.

Furthermore, the work also provides a network for exchanging knowledge and promoting research and collaboration opportunities for projects both inside and outside Europe.

#### A MONITORING NETWORK FOR THE LONG TERM

Pappalardo and Laj are sure that ACTRIS will add a great deal of value to the planning of European mitigation strategies for air quality and climate change, facilitating estimation of the cost efficiencies for future emission controls and supporting risk analysis of long-term investments. It will, above all, support informed decisions on a wide range of policy areas, including health, international emission reduction protocols and research strategies: "This system responds to future political, societal and economic challenges and to the development of scientific knowledge," enthuses Pappalardo.

The project marks a major step towards a joint European Atmospheric Research Infrastructure, and will reinforce collaboration between national and regional bodies in developing a reliable European monitoring network for the long term.

## INTELLIGENCE

### ACTRIS

#### AEROSOLS, CLOUDS, AND TRACE GASES RESEARCH INFRASTRUCTURE NETWORK

##### OBJECTIVES

To integrate European ground-based stations equipped with advanced atmospheric probing instrumentation for aerosols, clouds, and short-lived gas-phase species in order to support the development of new knowledge, as well as for policy issues on climate change, air quality, and long-range transport of pollutants.

##### PARTNERS

For full details of project partners, please see the ACTRIS website (below)

##### FUNDING

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**GELSOMINA PAPPALARDO** is a senior researcher at CNR (Consiglio Nazionale delle Ricerche). She has over 20 years research experience in the field of atmospheric studies with Lidar techniques. She is co-chair of the WMO GAW Aerosol Lidar Observation Network.

**PAOLO LAJ** is a senior researcher at University of Grenoble I (UJF) and Director of joint UJF-CNRS (Centre nationales de la Recherche Scientifique) Institute for Glaciology and Environmental Geophysics (LGGE). He has been involved in the fields of aerosol and aerosol/cloud interactions for many years. He is a member of the WMO-GAW Science Advisory Group for Aerosols.

LIDAR BEAM AT MPI-M HAMBURG, GERMANY



AEROSOL INLET SAMPLING PROBES AT PUY DE DÔME STATION, FRANCE – 1465M

