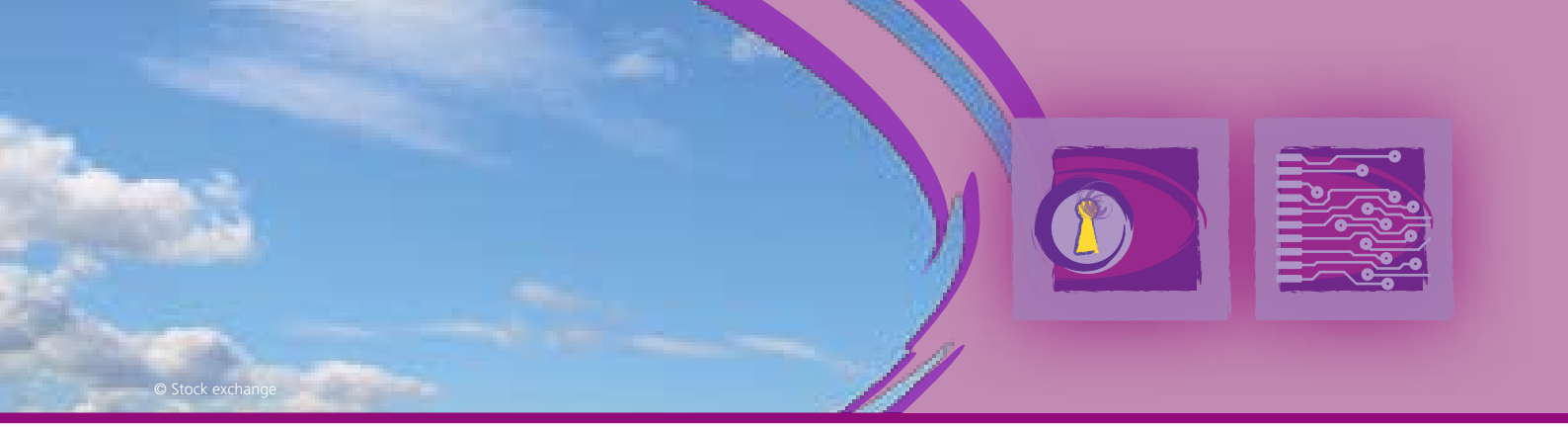

EARLINET-ASOS: European Aerosol Research Lidar Network - Advanced Sustainable Observation System

When the Intergovernmental Panel on Climate Change finally reached the conclusion that human influences were indeed responsible for altering our global climate, atmospheric aerosols were brought into the equation alongside the usual suspects, that is, greenhouse gases. But present knowledge of atmospheric aerosol distribution - and especially of vertical distribution - is not solid enough to accurately gauge their role in changing global and regional environmental conditions and climate. EARLINET-ASOS is one of the aerosol research infrastructure projects the EU is funding to help gain a better understanding of the role of aerosols in the Earth's radiative balance; this one using advanced laser remote sensing techniques to close the observational gap. The expected outcome is the most comprehensive data source for the four-dimensional spatio-temporal distribution of aerosols on a continental scale

LEADING ROLE FOR LIDARS

This Coordination Action builds on the European Aerosol Research Lidar Network's (EARLINET) infrastructure, consisting of 20 lidar (light detection and ranging) stations distributed over Europe. EU funding helps it to improve observations and methodologies urgently needed to feed into a multi-year, continental-scale dataset to assess the impact of aerosols on the environment and to support future satellite missions. Improving four-dimensional spatial and temporal coverage of aerosol observation will contribute to almost all areas of societal benefits listed in the Group on Earth Observation System of Systems' (GEOSS) 10-year implementation plan adopted in 2005. The EARLINET-ASOS project will play a leading role in developing a global observation network for vertical distribution of aerosols as a major innovative element of GEOSS by setting the standards for instruments, methodology and organisation in this area.

More specifically, it will enhance the capacity of existing lidar infrastructure to foster aerosol-related process studies, validation of satellite sensors, model development and validation, assimilation of aerosol data into operational models, and to build a comprehensive climatology of aerosol distribution. Continuous quality control at all 20 lidar stations and fast availability of standardised data are also key objectives for the 21 partner institutions. They are cooperating closely through Networking Activities covering exchange of expertise and best practice; a quality assurance programme for algorithms and instruments; optimisation of instruments and data processing and retrieval of optical, microphysical and other derived parameters; a database with a user interface providing fast and easy access to well structured data for both internal and external users such as atmospheric researchers, global and regional climate modellers, the satellite community and environmental agencies. All this will feed into a platform for cooperation and coordination with the relevant observation and user communities, and serve as a nucleus for a world-wide aerosol lidar network.

CLIMATE FORCING

Atmospheric aerosols influence climate in two main ways, directly and indirectly. In the direct forcing mechanism, aerosols reflect sunlight back to space, thus cooling the planet. In the most heavily polluted regions of the Northern Hemisphere, scientists believe that the cooling effects of man-made sulphate aerosols exceed the warming effects of the past century's increases in greenhouse gases. The indirect effect involves aerosol particles acting as (additional) cloud condensation nuclei, spreading the cloud's liquid water over more, smaller droplets and making clouds more reflective, and longer lasting. Computing the details of cloud microphysics requires a detailed understanding of the dynamic processes moving water vapour through the atmosphere and of the physical mechanisms involved in the formation and growth of cloud particles, including heating and cooling by solar and infrared radiation. This is where the EARLINET-ASOS project can contribute to a better understanding of the role of aerosols in the Earth's radiative balance, with regard to both direct and indirect effects.

In the field of air quality, this Coordination Action also has an important contribution to make in pinpointing both natural and anthropogenic aerosol sources and sinks over Europe and in measuring the extent of pollution from East European countries, Siberia, China and the United States etc.

FROM THE SAHARA TO SPACE

One source of aerosol particles is simply the wind blowing over a dust bowl, because dust interacts with clouds and affects rainfall. However, little is known about these effects owing to the lack of advanced coordinated observations. So one of the earliest EARLINET-ASOS projects was a week-long trip to the Sahara desert in May 2006 when stations from Spain, Germany, Italy and Greece observed the Saharan dust layer in the free troposphere at an altitude of up to 6-7 kilometres. The scientists are hoping to provide valuable input into the little-known effects of long-range transport of dust cloud generation processes and thus on rainfall over Europe.

EARLINET-ASOS has also teamed up with the CALIPSO space mission developed by US space agency NASA and France's Centre National de la Recherche Scientifique (CNES) with a two-wavelength lidar on board to study in detail the performance and information content of a space-borne aerosol lidar during a long-term mission. This mission is a world first that will make a major step towards four-dimensional aerosol observations on a global scale. EARLINET-ASOS is cooperating with NASA/CNES in detailed comparisons of ground-based with spaceborne lidar data sets over Europe. Ground-based lidar measurements are scheduled according to the satellite overpasses for the stations close to the track. Aerosol extinction measurements provided by the lidar network are particularly important for the aerosol retrievals from the CALIPSO backscatter lidar. The integration of EARLINET-ASOS and CALIPSO data will provide a very detailed study of the aerosol distribution over Europe.

EUROPEAN AEROSOL RESEARCH LIDAR NETWORK: ADVANCED SUSTAINABLE OBSERVATION SYSTEM IN SUMMARY

Project acronym: EARLINET-ASOS
Funding scheme (FP6): Coordination Action (CA)
EU financial contribution: €2.76 million
EU project officer: Agnès Robin
Duration: 60 months
Start date: 1 March 2006
Completion date: 28 February 2011
Project webpage: www.earlinetasos.org
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