TROPOS
Leibniz Institute for Tropospheric Research

# EARLINET

## Overview

EARLINET (European Aerosol Research Lidar Network) is the first aerosol lidar network which attempts to retrieve quantitative data on the vertical distribution of aerosol optical properties in a systematic and statistically significant approach and on a continental scale. Therefore, the main effort as well as the main achievements are in the development of methods. Strong emphasis is on making the results from all stations and all times comparable, because this is essential for the use of joint data sets in all studies involving several stations.

EARLINET was started in 2000 as a infrastructure project funded by the European Comission. Since 2011 it is part of ACTRIS.

TROPOS is an essential member of EARLINET. It was already involved into the foundation of EARLINET in 2000. Amongst others, TROPOS contributes to the support and development of EARLINET via the following activities:

- Development of the automatic Polly lidar systems, which enable a high data availabilty as well as high data quality.
- Development and test of new data analysis algorithms for the determination of optical and microphysical properties of aerosols (combined Sun-photometer-Lidar-Algorythms, inversion techniques).
- Further development and extension of the Single-Calculus-Chain (SCC) that enables a centralized, automatic processing of lidar data within EARLINET.


*Map with the location of the 27 EARLINET stations.*

## Goals

The main objectives of EARLINET are the establishment of a comprehensive and quantitative statistical data base of the horizontal and vertical distribution of aerosols on the European scale using a network of advanced laser remote sensing stations, and the use of these data for studies related to the impact of aerosols on a variety of environmental problems. This also includes the creation of a suitable research infrastructure comprising quality controlled instruments and evaluation procedures as well as the establishment of a common data base. Also important is a system of internal communication for exchange of technical know-how and data as well as for the performance of joint analyses using data from several groups. The intensive observational period lasted from May 2000 to February 2003. Measurements are continued on a volunteering basis by several groups since then.

## Achievements

- Advanced lidar systems for regular use are finally implemented at 27 permanent and 3 temporary stations in 12 European countries including the Newly Associated States. A large part of Europe is thus covered by the observation network. 13 stations are now using detection channels for Raman scattering to retrieve aerosol extinction profiles.
- An extensive quality assurance program at instrument and retrieval algorithm levels was conducted.
- A schedule is established for making the measurements on the one hand in a way to minimize bias in statistical evaluations due to selective measurement conditions, and on the other hand to make special measurements for various dedicated studies. For establishing an aerosol climatology a regular schedule is chosen with 3 measurements per week at preselected times. For the special measurements dedicated to various process studies an alerting system is established which is used by the corresponding work package leaders to inform the relevant groups about important measurement opportunities.
- To provide important information about the history of the observed air mass back-trajectories, provided by the German Weather Service, were compiled for each station, 2 daily arrival times, and 6 pressure levels.
- Observations of the aerosol distribution allow to retrieve boundary layer characteristics, which in turn are most important for the distribution of pollutants.
- Studies of Saharan dust outbreaks allow to address directly the mechanisms of mineral dust formation, long-range transport, and impact on solar radiation and climate. Using the particles as tracers also serves to study long-range transport of many other pollutants.
- Observations of the modification of aerosol properties when air masses pass over Europe provide excellent material to improve air pollution and climate prediction models, and thus help to develop abatement strategies.
- Observations of elevated aerosol layers in combination with trajectory analysis permit the study of long-range transport of pollutants on a hemispherical scale. Again this is important material to improve air pollution and climate prediction models.
- The development of methods to retrieve microphysical properties of aerosol will lead to a much better characterization of the aerosol distribution, providing additional information about the composition and origin of the particles. This will help to identify major sources of aerosol and hence support the development of suitable abatement strategies.

## Additional links

- Website of EARLINET
- Overview on the measurements of all EARLINET stations
- Measurements of the EARLINET lidar MARTHA at TROPOS
- Measurements of the Polly lidars at TROPOS

***Leibniz-Institut für***
***Troposphärenforschung e.V. (TROPOS)***
*Permoserstraße 15*
*04318 Leipzig*

*Phone: ++49 (341) 2717 7060*
*Fax: ++49 (341) 2717 99 7060*
**Follow us on Twitter:**
@TROPOS_de


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