

EARLINET: 12-years of aerosol optical properties profiles over Europe

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In 2000, a group of European aerosol lidar scientists started to systematically cooperate under the auspices of FP5 setting up EARLINET (European Aerosol Research Lidar Network) (Bosenberg et al., 2001; Pappalardo et al., 2014). Borne as a network of researchers, EARLINET has been, and still is, a continuously improving network fostering cooperation within and outside lidar community, and more and more oriented toward operational applications and user-oriented products. Nowadays, EARLINET has reached a high maturity level in terms of quality checks and products. EARLINET today is also an important research infrastructure offering access and services. EARLINET is currently one of main component of ACTRIS (Aerosol Clouds and Trace gases Research Infrastructure).

EARLINET assures high quality products in terms of aerosol optical properties profiles thanks to quality assurance and quality check protocols. Every 2 years, EARLINET quality checked data are published on the CERA database of the world data center for climate (WDCC) (cera-www.dkrz.de/WDCC/ui/Index.jsp). Data are freely available, as soon as stations PI finalize them, through EARLINET (www.earlinet.org) and ACTRIS data portal (actris.nilu.no). Additional datasets and products tailored for specific interests are moreover freely available on request (e.g. data on 4D distribution of the plume related to the volcanic eruption in Iceland in 2010).

In 2013, first volumes of EARLINET data were published (The EARLINET publishing group 2000–2010, 2014a, b, c, d, e). The long-term aerosol observations collected within EARLINET allows a climatological study of aerosol properties over Europe. Measurements are performed following a fixed scheduling 3 times per week. Additional measurements are also performed in order to monitor special events (as volcanic eruptions and desert dust intrusion), for satellite data evaluation, integrated studies and intensive measurement campaigns.

As unique lidar network mainly based on Raman aerosol systems, EARLINET is the only “tool” able to provide the climatology of aerosol extinction profiles. This permits, first of all, to measure directly the aerosol optical depth (AOD), a key parameter for understanding the aerosol role on radiation budget. The comparison of EARLINET AOD measurements vs MODIS and AERONET ones, allows on one hand to confirm the high quality of EARLINET data and on the other hand to investigate the representativeness of our network regular scheduling for climatological studies. EARLINET long-term analysis show that the AOD in Europe is generally decreasing in agreement with both passive-sensors and in situ measurements. The free troposphere contribution to AOD and the altitude of lofted layers are provided thanks to the vertical profiling capability of the lidar technique. Mean vertical profiles and aerosol intensive properties are also investigated for improving knowledge about aerosol property modifications and trends over the European continent.

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