DKT-11-5, 2018
11. Deutsche Klimatagung

Long-term observations of Saharan Dust over Germany based on DWD's ceilometer network

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Triggered by the eruptions of Eyjafjallajökull/Iceland in spring 2010, European Meteorological and Hydrological Services started to establish a European network for aerosol profiling based on Lidars and ceilometers. Nowadays ceilometers allow for the detection of aerosol layers in the atmosphere up to the tropopause region (Wiegner et al (2014)). Harmonization of national networks with respect to routine operations, data exchange and data formats was mainly driven in the past by the COST action EG-CLIMET (ES0702) and the EUMETNET project E-PROFILE (http://www.eumetnet.eu/e-profile) whereas harmonization of aerosol profile retrievals was supported by EARLINET, the European Aerosol Research Lidar Network, and COST action TO-PROF (ES1303, http://www.toprof.imaa.cnr.it/). Such combined networks of ceilometers and advanced lidar systems have already shown their value for providing the four-dimensional aerosol distribution over larger areas (Pappalardo et al (2014)).

The Deutscher Wetterdienst (DWD) contributes to this European ceilometer network with its currently 113 CHM15K Nimbus instruments (as of September 2017), which are all connected to the Internet. The DWD instruments provide freely available quick looks of the attenuated backscatter coefficient which can be accessed through the ceilomap web site hosted by DWD under www.dwd.de/ceilomap.

Ceilometer observations were analyzed manually for Saharan dust episodes from August 2013 until August 2017. Evidence for dust episodes originates from a combination of texture analysis of time-height cross-sections of the backscattered radiation, sun photometer measurements of AERONET stations in Germany, depolarization measurements of DWD's aerosol lidar RALPH at the Hohenpeissenberg Meteorological Observatory, trajectory analyses and satellite imagery. A comparison with in-situ aerosol observations including particle size, mass and number concentration and chemical analysis of filter probes shows that a large number of events does not reach the atmospheric layers close to the ground.

Pappalardo, G. et al. (2014) Atmos. Meas. Tech. 7, 2389–2409, doi:10.5194/amt-7-2389-2014.
Wiegner, M. et al. (2014) Atmos. Meas. Tech. 7, 1979–2014, doi:10.5194/amt-7-1979-2014.