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The A-LIFE field experiment in the Eastern Mediterranean - Overview and selected highlights

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In April 2017, the A-LIFE aircraft field experiment (Absorbing aerosol layers in a changing climate: aging, lifetime and dynamics; (www.a-life.at) was carried out in the Eastern Mediterranean. The overall goal of the ERC-funded A-LIFE project is to investigate the properties of mixtures of absorbing aerosols (in particular mineral dust and black carbon) during their atmospheric lifetime to gather a new data set of key parameters of absorbing aerosol mixtures, to investigate their microphysical and optical properties, and to study potential links between the presence of absorbing particles, aerosol layer lifetime and particle removal.

In 22 research flights (~80 flight hours), several outbreaks of Saharan and Arabian dust, as well as pollution, biomass burning, and dust-impacted clouds were studied, and a unique aerosol and cloud data set was collected. During a number of flights, coordinated observations including overflights of the ground-based sites in Cyprus (Limassol, Paphos, Agia Marina), Crete (Finokalia), and over Austria (Vienna, Sonnblick Observatory) were performed. The A-LIFE campaign was carried out in close coordination with the 18-month field observations conducted in the framework of CyCARE (October 2016 – March 2018) organized by the Leibniz Institute for Tropospheric Research, and with the PreTECT initiative of the National Observatory of Athens.

To perform source apportionment, the Lagrangian transport and dispersion model FLEXPART (FLEXible PARTicle dispersion model) version 8.2 was used. Based on FLEXPART model results and aerosol measurements, the observations were classified into 12 aerosol types including background aerosol, clean and polluted mixtures without coarse mode aerosol as well as three sub-classes (clean, moderately-polluted and polluted) for Saharan dust, Arabian dust and mixtures with coarse mode. For each of the 12 aerosol classes, microphysical and optical aerosol properties were derived. One surprising finding of A-LIFE is that scattering properties of polluted dust aerosol do not show the typical dust signature, but rather show a wavelength-dependency of the scattering coefficient.

We will give an overview of the A-LIFE field experiment and available data sets, compare the properties of the different aerosol mixtures, and discuss the question which aerosol component (natural vs. anthropogenic) dominates the properties in mixed aerosols. We will also compare the A-LIFE dust observations with results from other field experiments (SAMUM, SALTRACE, ATom).

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