EGU22-7591, updated on 12 Aug 2022
https://doi.org/10.5194/egusphere-egu22-7591
EGU General Assembly 2022

Characterizing dust aerosols with lidar and UAV based measurements (Cyprus Fall campaign 2021).

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Due to its geographical location, Cyprus is often affected by dust storms arriving from the largest deserts of the planet, the Sahara, the Arabian Peninsula and the Syrian. In order to characterize dust properties, the Cyprus Atmospheric Observatory (CAO) and the Unmanned Research Laboratory (USRL) of the Cyprus Institute (CYI), in collaboration with the Cyprus Atmospheric Remote sensing Observatory (CARO) of the ERATOSTHENES Centre of Excellence (ECoE) of the Cyprus University of Technology (CUT), performed a research campaign in Fall 2021. Measurements were performed with ground-based aerosol remote sensing systems (lidars, ceilometers and sunphotometers), and UAV based in-situ instruments (OPCs, backscatter sondes, and impactors able to collect dust samples). As part of the remote sensing observations, two depolarized lidars performed measurements from different locations, one from CYI premises in Nicosia and the second one from ECoE-CUT premises in Limassol. The lidar signals provide information about the vertical aerosol profile at the two locations, which can be used to derive the optical properties of dust at different altitudes. Here, we will present first results on the synergy between the continuous vertically extended measurements of lidars and the in-situ measurements from UAV instrumentation during the periods of dust outbreaks. Two dust events occurred from 25 October to 1 November and from 13 to 18 November 2021. During these dust events, the lidars observed depolarized aerosol layers from ground up to 5 km above sea level. The lidar measurements provided the temporal and spatial development of these dust layers, and were also used in real-time for planning the UAV flight schedule. According to backward trajectory analyses, the two dust events had different origins with the first arriving from the Sahara and the second one from the Middle East.