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Profiling Saharan Airborne Dust with UAV-based in-situ Instrumentation during the ASKOS Experiment in Cape Verde

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The ASKOS experimental campaign of European Space Agency (ESA) was organised by the National Observatory of Athens, and aimed at the calibration and validation of the Aeolus satellite aerosol/cloud product. Airborne observations were performed by the Climate and Atmosphere Research Centre (CARE-C) team of the Cyprus Institute at the Cesaria Evora International Airport of the island of São Vicente in Cape Verde between 10 and 30 June 2022. These in-situ aerosol measurements were conducted using the advanced Unmanned Aerial Vehicles (UAVs) of the Unmanned System Research Laboratory (USRL), equipped with specialised aerosol in-situ sensors, capturing the Saharan Air Layer (SAL) from ground up to 5.3 km Above Sea Level (ASL). The new custom-designed Composite Bird (CoBi) USRL and Skywalker UAVs (Kezoudi et al., 2021), were equipped with Optical Particle Counters (OPCs), samplers and backscatter sondes.

25 UAV vertical flights were performed in total, with 11 of them during night. The altitude of the Marine Boundary Layer (MBL) was mainly observed from ground up to about 1.0 km ASL, whereas during most of the flights, high concentrations of dust particles were found between 1.5 and 5.0 km ASL. Results obtained from OPCs show the presence of particles sizing up to 20 µm within MBL and up to 40 µm within SAL. Further information on morphology and mineralogy of observed particles will be given by the offline analysis of collected samples under Scanning Electron Microscope (SEM). COBALD observations alongside ground-based lidar measurements agree on the presence of non-spherical particles within dust layers.

Ongoing exploitation of airborne observations along with coincident and collocated ground-based measurements will provide a complete picture for comparison with Aeolus data, particularly in

relation to aerosols, where we have the most to learn.