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Combined aerosol in-situ measurements during the SALTRACE field experiment for the investigation of Saharan mineral dust microphysical and CCN properties and their spatial-temporal evolution during trans-Atlantic long-range transport

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The Saharan Aerosol Long-range Transport and Aerosol-Cloud-Interaction Experiment (SALTRACE) was a field experiment conducted in June/July 2013, which aimed to investigate the transport and modification of Saharan mineral dust from the Sahara across the Atlantic Ocean to the Caribbean. In addition to ground-based measurements and satellite remote sensing, the DLR Falcon research aircraft was equipped with a number of aerosol in-situ instruments to gain direct information on the properties of airborne aerosol such as size distributions, microphysical, optical and cloud-condensation nuclei (CCN) properties. For the first time, several outbreaks of Saharan dust were probed with the same airborne instrumentation on both sides of the Atlantic.

During transport, various processes may take place that modify the aerosol composition. Dry and wet deposition lead to a size-dependent aerosol removal. In case of wet deposition, the removal additionally depends on the particle's ability to act as CCN. Processes in the aqueous phase in subsequently re-evaporating cloud droplets can further alter microphysical and CCN properties of re-released particles. All resulting changes in the size distribution and particle properties impact the radiative feedback and CCN activity of the aged aerosol.

This study aims to use combined airborne in-situ measurements to retrieve and compare vertically resolved aerosol size distributions, microphysical and CCN properties for both, short-range transported Saharan dust in the Cape Verde region and long-range transported dust in the Caribbean. We use this data to investigate the influence of long-range transport and associated processes on those properties.

We will present vertical profiles of size-resolved aerosol concentrations and volatile fractions as well as CCN activated fractions and draw conclusions for aerosol mixing state, CCN activation diameters and particle hygroscopicities. We will discuss differences in vertical profiles and variabilities between the Cape Verde region and the Caribbean and possible reasons.