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Characterization of long-range transported Saharan dust across the Atlantic Ocean; dual-wavelength lidar measurements during SALTRACE

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Mineral dust is a major component of the atmospheric aerosol load which main source region is the Saharan desert. Dust layers can be transported over thousands of kilometers and thus they cannot be considered as regional phenomenon. During long-range transport the particles are influenced by aging and mixing processes altering the microphysical and thus the optical properties of Saharan dust. But the influence of long-range transport on the particle properties and their effect on the Earth's radiation budget is still not well understood.

To study aging processes of transported Saharan dust as well as the microphysical, optical and radiative properties of long-range transported dust the Saharan Aerosol Long-range Transport and Aerosol-Cloud-Interaction Experiment (SALTRACE) took place at Barbados in June and July 2013. SALTRACE was designed as closure study combining ground-based and airborne lidar and in-situ measurements with Satellite observations, long-term measurements at Barbados, and model calculations. During SALTRACE four main dust events occurred with column integrated AOD of up to 0.6. The vertical aerosol distribution was characterized by a three layer structure consisting of a marine dominated boundary layer, a highly variable mixing layer often affected by clouds, and a Saharan dust layer in heights between 2 km and 3.5 km in some cases even up to 5 km.

We will present first results of the ground-based measurements with the dual-wavelength lidar system POLIS of the Meteorological Institute of the Ludwig-Maximilians Universität, München. In particular we will investigate measurements of the particle linear depolarization ratio and the lidar ratio of the different aerosol layers. We compare our findings with results of the Saharan Mineral Dust Experiment (SAMUM) studying Saharan dust close to the source region in Morocco and at the beginning of the long-range transport on the Cape Verde Islands. In addition, we assess the influence of long-range transport on the optical properties of Saharan dust by combining lidar measurements with analyses of active dust source regions and processes during dust transport.