Geophysical Research Abstracts
Vol. 12, EGU2010-2931, 2010
EGU General Assembly 2010

Mixing state and size-resolved chemical composition of Saharan aerosol in the Cape Verde region – results of airplane taken samples

Kirsten I. Lieke (1), Konrad Kandler (1), Carmen Emmel (2), Martin Ebert (1), Bernadett Weinzierl (3), Lothar Schütz (2), Andreas Petzold (3), and Stephan Weinbruch (1)

(1) Institute of Applied Geosciences, Technische Universität Darmstadt, Darmstadt, Germany (kirstenlieke@gmx.de), (2) Institute for Atmospheric Physics, Johannes-Gutenberg-Universität Mainz, Mainz, Germany, (3) Institute of Atmospheric Physics, German Aerospace Center (DLR), Oberpfaffenhofen, Germany

The Saharan Mineral Dust Experiment (SAMUM) is dedicated to the understanding of the radiative effects of mineral dust. A field campaign was performed during the winter season in the region of Cape Verde Islands, where desert dust from the African continent, especially from the Sahel and Sahara regions mixes with aerosol from biomass burning (bush fires). Flights were conducted over the Atlantic ocean heading south, east and north, and above the Cape Verde islands to gain information about the spacial distribution and mixing state of this heterogeneous aerosol.

Samples were collected with a micro intertial impaction system for each flightlevel on constant altitude. The size-resolved chemical composition was determined by single particle analysis with electron microsocopy and a coupled energy-dispersive X-ray detection. In a second step, selected particles were analysed using transmission electron microscopy and electron diffraction.

The results reveal a vertical layer structure of biomass burning aerosol, dust layers and mixed layers. The chemical and mineralogial composition of aerosol of each layer was investigated. The dust layers contain high number abundances of silicate particles and silicate containing mixtures, whereby usually more than 90% of those mixtures contain sulfur.
Soot and soot agglomerates are the dominating particle group in the biomass burning aerosol layers. K/S and K/Cl ratios give evidence that the biomass burning aerosol is aged. Soot particles were imaged by transmission electron microscopy in high resolution in order to investigate their morphology and structure. Particulate potassium sulfate or chloride could not be observed in mixture with soot, but it is found instead as separate particles to a small extent. Potassium contents are elevated for all biomass burning samples.
Sulfate indices are high compared to other element indices for almost all flight samples, but a sulfate coating was not observed at high altitudes. Sulfate coatings, however, were detected for samples collected groundbased at Praia station, Cape Verde.
Ca/Al ratios are calculated in order to connect the sampled particles to possible source regions. The iron content and distribution in silicate particles is subject of recent studies.