Physico-chemical characterization of Saharan dust and sea salt aerosol on Cape Verde Islands 2007

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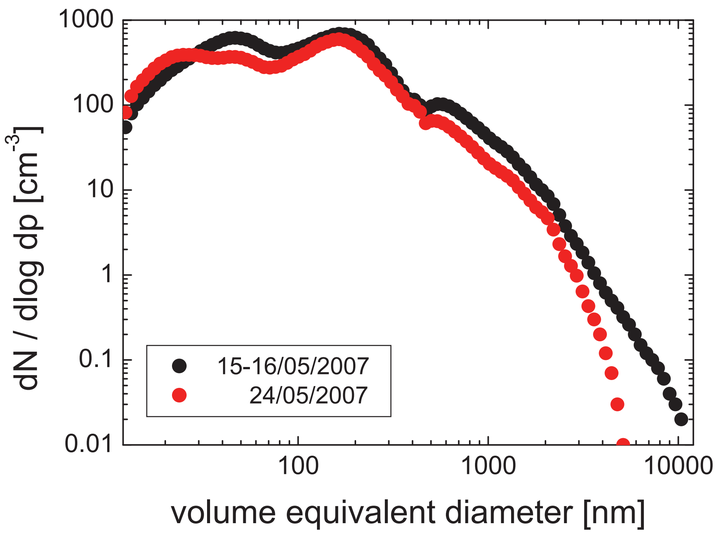

Fig. 1: Particle number size distribution for the last 2 days of Saharan dust input (black) and for an ordinary day (red) during the first intensive of SOPRAN.

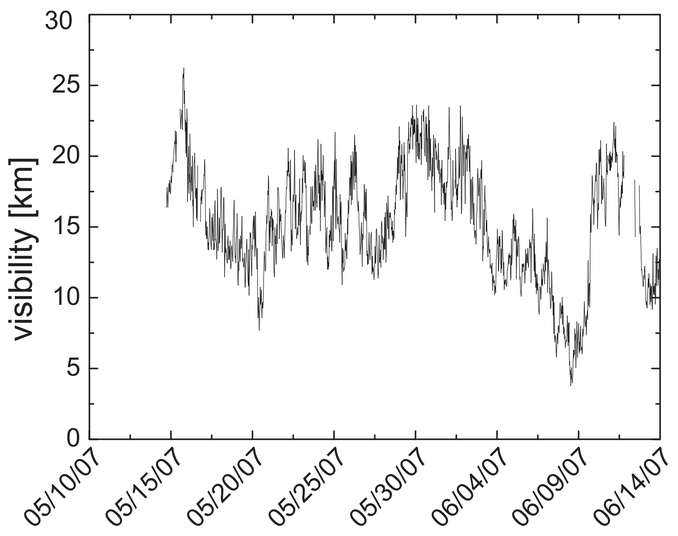

Fig. 2: Visibility measured with a visibility meter about 2.8 m above ground.

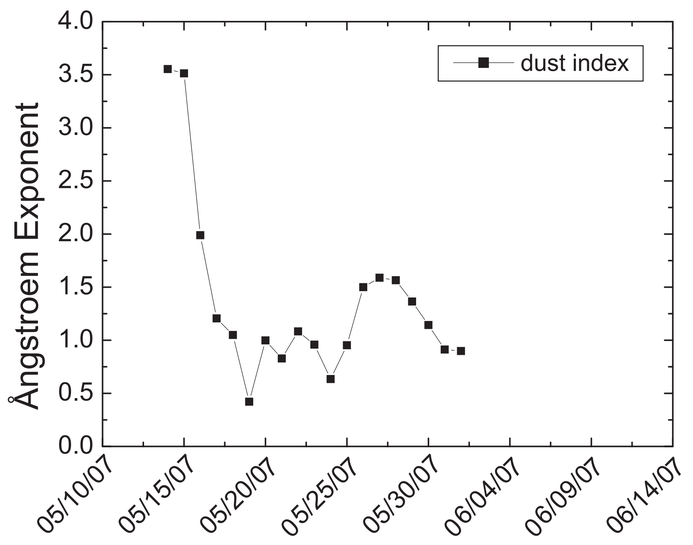

Fig. 3: Time series of the Ångstroem Exponent. The dust index is defined as the total Ångstrom Exponent - soot Ångstroem Exponent.

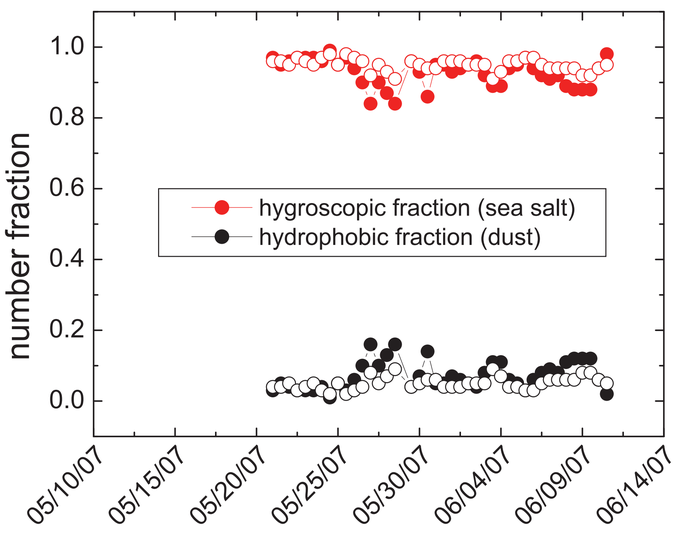

Fig. 4: Das ist eine Bildunterschrift.

Surface Ocean Processes in the Anthropocene

The IfT focuses on theme 1 of the SOPRAN-project called "Oceanic response to Atmospheric dust". The first intensive campaign took place from May, 10th to June, 14th, 2007 at the Cape Verde Atmospheric Observatory at São Vicente. Chemical and physical field measurements in different particle-size fractions, hygroscopic and optical characterizations were conducted.

Particle number size distributions were performed with a SMPS (Scanning mobility particle sizer) and an APS (aerodynamic particle sizer) in the size range of 10 nm to 10 µm. Hygroscopic properties in terms of number fraction were obtained with an H-DMA-APS (hygroscopic differential mobility analyzer aerodynamic particle sizer) and the spectral absorption coefficient for ambient dust and sea salt particles was measured with a SOAP (spectral optical absorption photometer).

Figure 1 shows a typical bimodal distribution for marine air in the submicrometer size range. In the supermicrometer size range, differences in concentration and broad of the mode can be seen. In Figure 3, a definition of the dust index is introduced. On a first look, results fit with chemical analysis. The number fraction for one-micrometer particles is shown in Figure 4. A very high hygroscopic fraction (> 80%) compared to a low hydrophobic fraction indicates huge sea salt amounts. Just a few cases show a slightly higher number fraction for "dust".

A high volume DIGITEL DHA-80 sampler and a 5-stage BERNER-impactor on top of the 30 m-tower were operated in 24 h and 48 h-modes providing samples for chemical analysis. The samples were analysed for concentrations of mass, ionic, organic and carbonaceous species.

The R-factor in Figure 5 can give a first hint for dust events (high mass and low ion concentrations --> low R- factor), which agrees for the two chosen satellite imagages in Fig. 6. The sugars as part of the organic fraction and the carbonaceous fraction with OC/EC in Fig. 7 and Figure 8 suggest anthropogenic influenced air masses from the African continent or the Canarian Islands.

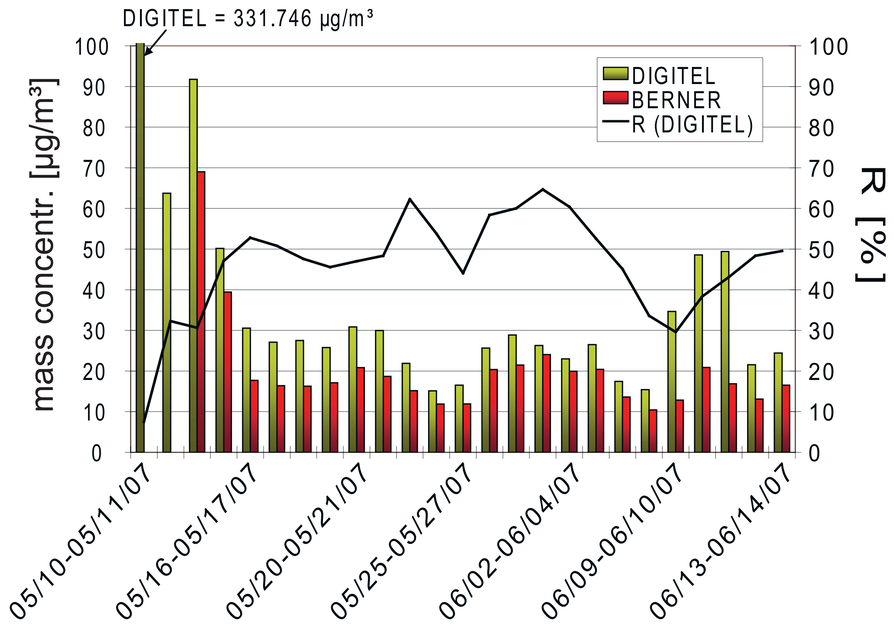

Fig. 5: Mass concentration in direct comparison of DIGITEL and BERNER-samples [µg/m3]; R [%] = total ion fraction/ total mass, R < 40% indicates possible dust events. [Ion concentration determined with Ionchromotography (UV-detector)]

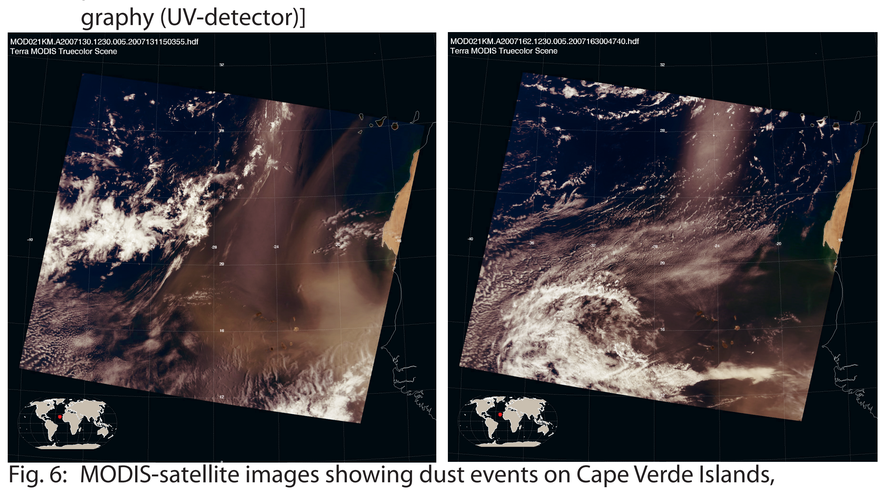

Fig. 6: MODIS-satellite images showing dust events on Cape Verde Islands, 05/10/07 (left), 06/12/07 (right). (© http://modis-atmos.gsfc.nasa.gov,2008.)

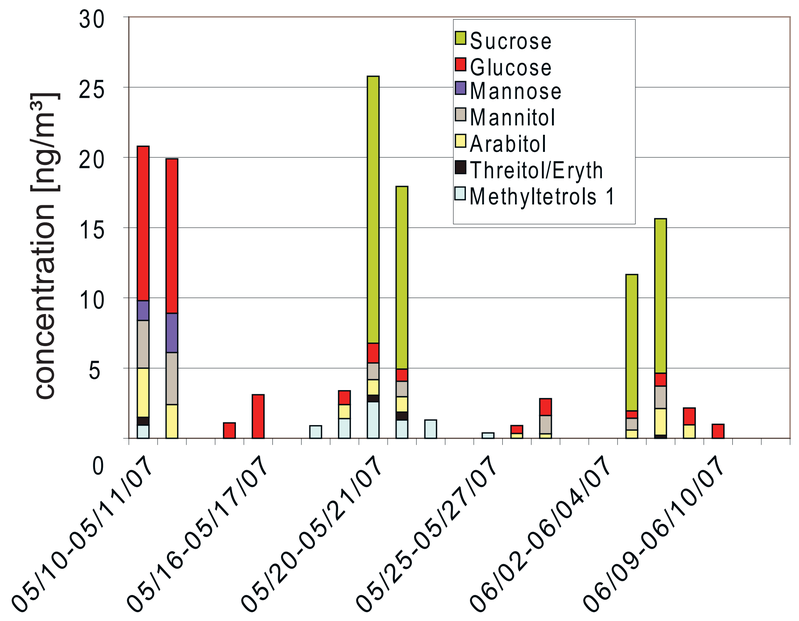

Fig. 7: Sugar measured on DIGITEL-filters by Ionchromatography (electrochemical deterctor).

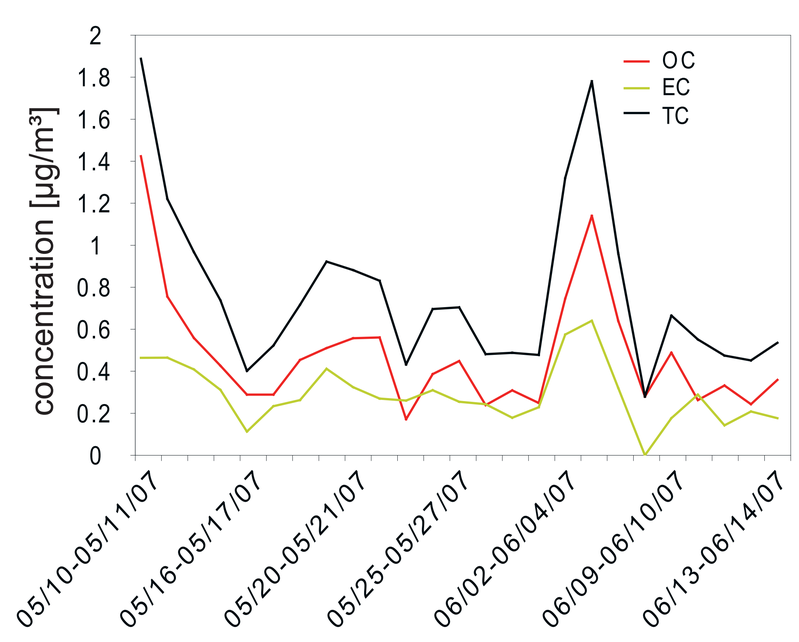

Fig. 8: Organic carbon (OC), elemental carbon (EC) and total carbon (TC) determined by thermography.