Single particle analysis of Saharan dust sampled on Jungfrajoch

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Saharan mineral dust has an influence on the Single Scattering Albedo (SSA). During Saharan Dust Events (SDE) an inversion of the wavelength dependence of the SSA is observed [1]. Such a behavior of the SSA can be modelled assuming a change in the particle size distribution (PSD) and the presence of a strong absorber like hematite [2]. The goal of this study is to quantify the change of PSD and to determine the morphology and the mineralogy of aerosol particles from SDE's.

For this purpose PM10 and PM1 samples were collected actively onto Nuclepore® filters respectively on Transmission Electron Microscopy (TEM) grids at the research station Jungfraujoch (CH) during a SDE that occurred from May 26-29.5.2008. The samples were analysed by Computer Controlled Scanning Electron Microscopy (CCSEM) and TEM, both equipped with Energy Dispersive X-ray Spectroscopy (EDX).

Calculated back trajectories show that the source region of the collected Saharan dust was East Libya and Tunisia. The particle size distribution, obtained by CCSEM changed clearly during the SDE. The increase of particle number concentrations of particles with sizes between 400 nm and 1 μm was more pronounced than the one of coarser particles. However, no differences in the mineralogical/chemical composition of samples before and during the SDE could be detected by CCSEM. The dominant particles are clays, followed by feldspars, gypsum, quartz and carbonates. No individual hematite particles are present. Detailed TEM observations, however, showed that iron and titanium oxide particles with sizes between 10 nm and 200 nm are common within clay particles from the SDE.

The obtained results corroborate the assumption used in the model of the SSA inversion [2].

[1] Collaud Coen *et al*. (2004) *Atmos. Chem. Phys*. **4**, 2465–2480. [2] Sokolik & Toon (1999) *J. Geophys. Res*. **104**, 9423–9444.

Macrofaunal transport dynamics in marine sediments as inferred from 2D images

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Biologically induced mixing dominates the redistribution of both particulate and dissolved substances in many coastal sediment settings, and the activity of burrowing organisms shapes both the benthic environment as well as the flux of nutrients to the overlying water column. While the distribution of natural tracers (e.g. excess Pb isotope profiles) allow one to constrain overall magnitude of transport processes, the patchy distribution of benthic organisms and temporal variability of their activity hampers the quantification of transient macrobiological transport events important to biogeochemical processes.

To gain insight into the spatio-temporal dynamics – important because they relate to local biogeochemical conditions that ultimately are relevant for nutrient transformations – we used thin benthic observatories ('ant farms') to visualize macrobenthic activities. Our results show distinct zone of high solute and solid transport associated with vertical shaft of Arenicola marina. Using time series images solid phase movement is assessed - without additional tracers – from observed changes in sediment texture in high-resolution photographs. Solute exchange rates were quantified using a fluorescent dye injected in actively flushed burrows. Analysis of the solute dye distribution over time reveals the zones of rapid solute displacement.

Employing conservation of mass and fluid incompressibility, we assess the potential and limitations to quantiatively estimate flow dynamics from time series of 2D concentration fields. The approach developed here may also be applicable to the quantification of biogeochemcial dynamics as captured by high-resolution 2D datasets emerging from the use of planar optodes.