Single particle analysis of a Saharan dust event on Jungfraujoch

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Sahara Dust events (SDE) have a pronounced effect on the single scattering Albedo (SSA). During such events an inversion of the SSA wavelength dependence is observed [1]. It is, however, not well understood which aerosol properties are responsible for the observed change. PM10 samples were therefore collected activily onto Nuclepore® filters at the high altitude research station Jungfraujoch, Switzerland, before and during a very strong SDE which occurred between 26.-29.5.08. Calculated back trajectories show that the air masses before the SDE came from the West (France, Southern Spain) and during the SDE from South. The source region for dust collected during the SDE was Tunisia and East Libya.

Chemical and stereological single particle analyses were performed by automated Scanning Electron Microscopy (SEM) and Energy Dispersive Spectroscopy (EDS) on 2000 particles for each sample. Samples have also been directly collected on carbon coated copper grids for analysis by Analytical Electron Microscopy (AEM).

The mineralogy of the aerosol collected before and during the SDE was not clearly different. All samples are dominated by clay minerals, followed by feldspars, gypsum, quartz, carbonates and iron oxides. During the SDE a dramatic increase of the total aerosol mass concentration is observed, which raises from 100–200 ngm^{-3} prior to the SDE to values > 10'000 ngm^{-3}. The concentration of iron oxide particles, which are possible candidates responsible for the SSA wavelength dependence inversion, does not correlate well with the occurrence of the SDE. An obvious correlation is, however, visible in the particle size distribution. For all days with an SSA ratio blue (450 nm)/red (700 nm) ≤ 1.0, the concentration of particles with diameters smaller than 1 μm are proportionally enhanced. The mineral type contributing most to this class are the clay particles. The first analysis of the data suggests, therefore, that the inversion of the SSA wavelength dependence is mainly due to relative changes in the size distribution of the aerosol particles.

[1] Collaud Coen *et al.* (2004) *Atmos. Chem. Phys.* **4**, 2465-2480.

Regolith pre-exposure observed in sediment-dispersed extraterrestrial chromite grains from an asteroid collision 470 Myrs ago

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We have analyzed 32 individual sediment-dispersed extraterrestrial chromite (SEC) grains (63 – 150 μm) from an Ordovician limestone in southern Sweden. Several fossil meteorites have been found in the same limestone and have been attributed to the L chondrite parent body breakup event ~470 Ma ago [1]. At least 30 of the SEC grains contain surface-implanted helium and neon of fractionated solar wind composition, implying that these grains were probably transported to Earth as individual micro-meteorites.

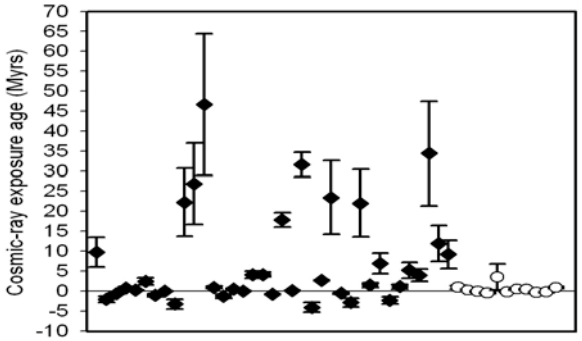

Figure 1: CRE ages for extraterrestrial (black) and terrestrial (white) chromites from the same limestone bed.

Cosmogenic ^{21}Ne was found in several grains and cosmic ray exposure (CRE) of up to 50 Myrs were calculated. These ages exceed both dynamical lifetimes for micrometeorites of this size as well as CRE ages for fossil meteorites found in the same sediment bed [2],[3]. We discuss different models to explain these ages and argue that some of the SEC grains have been pre-exposed to cosmic radiation in the regolith layer of the pre-breakup L chondrite parent body asteroid. We also compare our results with recent micrometeorites [4].

[1] Schmitz *et al*. (2001), *EPSL* **194**, 1-15, [2] Heck *et al*. (2004), *Nature* **430**, 323-325, [3] Heck *et a*l. (2008), *MAPS* **43**, 517-528, [4] Maurette *et al*. (1990), *Nature* **351**, 44-47