First Comparison of Asian and African transported atmospheric particles during desert dust events.

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Abstract: The African and Asian desert regions are the greatest production source for mineral dust from soil erosion, which has a significant impact on the atmospheric radiation field. Many investigations are done on both, but lacking a common basis for comparison and far away from an experimental closure. Analysed SEM/EDX samples originating from the SAMUM II field campaign, conducted 2008 on Cape Verde Islands and from a series of measurements from Amakusa, Japan, 2010, were classified the same way in order to compare their elemental composition and mixing state. When calculating the two different datasets, great differences appear. The following is a description of the attempt to compare two sets of samples with similar history.

Results and discussion: As shown in figures 1 to 3, the size resolved chemical composition shows a high dominance of aluminiumsilicate-particles, most of them iron containing. Another important particle group detected on Cape Verde samples are the sulfat-silicate mixtures (lilac, fig.1). The amount of sea salt (green) and aged sea salt is remarkably low during a dust event. Also, no mixtures of sea salt and dust particles where found, indicating that there is no mixing of dust and sea salt during long range transport, but maybe short before deposition. For samples from Amakusa Island (fig.2 and 3) the relative number abundance of sea salt is much higher. During two days of a dust period, the amount of seasalt is pushed back and replaced by sulphates (purple, fig. 3), whereby the relative number abundance of silicate particles, which mark the dust event, is not decreasing. Sulphate-silicate mixtures are found rarely on Amakusa, whereas mixtures of silicate with sea salt are occurring frequently. This indicates that there is a strong up and down ward mixing during transport. Sulphate silicate mixtures where plotted in Si-Al-Na ternary plots. It appears for all investigated samples from Amakusa, that the content of Na in particles is high compared to Cape Verde samples (see figs. 3 and 4).

Fig. 3. Size-resolved relative number abundances of the different particle groups for Cape Verde samples of Jan. 25th. 2008. n is the counted number of particles.

Methods: All samples regarded in this study were collected with a miniature impactor system. For the sampling of probes for single particle analysis carbon coated nickel grids and foils of polyvinyformal with carbon coating on nickel grids were used. On Cape Verde Islands, the sampling equipment was installed 4 m above ground (109 m above sea level). On Amakusa, Japan, the sampling site was located on a sightseeing platform of Mt. Aroade, 342 m above sea level.

The size resolved particle aspect ratio and the chemical composition is derived by means of electron-microscopic single particle analysis and energy dispersive X-ray analysis with an Environmental Scanning Electron Microscope FEI, Quanta 200 FEG at Institute of Applied Geoscience, Technische Universität Darmstadt.

Future questions: We are meeting a different meteorological situation. How does local meteorology influence the particle distribution and mixing state? We are gaining particles from different source regions. Can we compare the geo-chemical composition of the source region and therefore of the transported particles? Which role does mixing with sea salt, biomass burning and urban pollution aerosols play? How does the composition change within time?

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