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Grain-size signature of Saharan dust over the Atlantic Ocean at 12°N

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Every year, an estimated 200 million tons of Saharan dust are deposited in the Atlantic Ocean. On its way from source to sink, the dust can be influenced by many climatic processes, but it also affects climate itself in various ways that are far from understood.

In order to constrain the relations between atmospheric dust and climate, we deployed ten submarine sediment traps along a transect in the Atlantic Ocean at 12°N, at 1200m and 3500m water depth. These have been sampling Saharan dust settling in the ocean since October 2012. Samples of seven of these sediment traps have been successfully recovered during RV Pelagia cruise 64PE378 in November 2013. The transect also includes three floating dust collectors and two on-land dust collectors, and all the instruments lie directly underneath the largest dust plume originating from the African continent.

This study focuses on the size of the dust particles, which can have an effect on the positive or negative radiation balance in the atmosphere. Small particles in the high atmosphere can reflect incoming radiation and therefore have a cooling effect on climate. Large particles in the lower atmosphere have the opposite effect by absorbing reflected radiation from the Earth's surface. Mineral dust also affects carbon export to the deep ocean by providing mineral ballast for organic particles, and the size of the dust particles directly relates to the downward transport velocity.

Here I will present the measured grain-size distributions of samples from seven sediment traps recovered from the 12°N-latitude transect. The data show seasonal variations, with finer grained dust particles during winter and spring, and coarser grained particles during summer and fall. Samples from multiple years should give more details about the dust's seasonality.

Also a fining trend of the grain sizes of the dust particles from source (Africa) to sink (Caribbean) is observed, which is also expected due to intuitive relationships between size and transport distance. Future work on the sediment trap samples will include grain-shape analyses, end-member modelling, specific particle fluxes (lithogenic particles, biogenic carbonates, organic matter, opal) and chemical composition analysis. In the near future, results will be complemented by data from the floating dust collectors and the on-land dust collectors.

This study is part of the NWO-funded TRAFFIC project, and is in close collaboration with the ERC-funded DUSTTRAFFIC project, consisting of associated studies on microbiological impacts and bioavailability of nutrients transported with the atmospheric dust. These projects can be followed at www.nioz.nl/dust