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Tracing the Southwest African climate development during the Miocene – changes in elemental distribution and clay mineral composition at DSDP Site 530A (southeastern Angola Basin)

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During the middle and late Miocene the climatic system in Southwest Africa was reorganized leading to generally drier conditions as known from today. The reason for this was the cooling of the coastal-near ocean by the initialization of the Benguela Current. Thus the temperature difference between the continent and the sea increased and a system of seaward blowing winds developed. This lead to (1) the development of the Benguela Upwelling System in front of the Namibian coast and (2) it prevented the landward flow of humid air masses.
The Mid-Miocene climate change in SW-Africa has been shown by data-sets from the Cape Basin and the Walvis Ridge (Kastanja et al., 2006; Westerhold et al., 2005; Diester-Haass et al., 2002; Roters & Henrich, in press). The DSDP Site 530A is situated in the SE corner of the Walvis Basin at the toe of the Walvis Ridge in a water depth of 4629 m. Today the distance to the coast is about 285 km. The idea is to trace the climatic development between 19 and 9 Myr with the help of (1) a clay mineral record and (2) the results of XRF-scanning of the core. The sediment is carbonate-depleted, which, inversely, enriches the terrigenous components. On the other hand mass accumulation rates are low and the age control of the sediments is difficult. XRF scanning was done on the archive cores at the MARUM, Bremen in a resolution of about 10 kyr, while the clay mineral contents were measured in the isolated clay fraction ($< 2\mu$m) on a XRD machine at the AWI, Bremerhaven in a 100 kyr resolution.
By grain size analysis it was found that the content of clays (fraction $< 2\mu$m) of the sediments averages out to about 75%. The most prominent clays found in the samples are Illites. The remaining material is nearly completely composed of silt. The sediments could have been transported to site 530A by three different processes: (1) in the sediment load of the Kunene River and onwards by surface ocean currents, (2) with the dust load from the African continent and (3) by deeper ocean and bottom currents. In a previous grain size study of these sediments no indications for bottom currents were found. Material, which was suspicious to be transported by mass wasting events, has been excluded from this study. The grain size analysis showed a general coarsening of sediment after 11.5 Myr, when the Benguela Current system began to work. Also peaks of coarser material have been found before that general change. The scope of the here presented work is to trace these developments with chemical data and clay mineral contribution changes. First results show enrichment in Iron and Titanium contents after 11.5 Myr that is explained with higher dust input to the ocean.

Literature:
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