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Reconstruction of Southwest African Climate during the Middle and Late Miocene using Grain Size Analysis on ODP Core 1085

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Sedigraph analyses were performed on silt samples from the Late Middle to Early Late Miocene sediment section in order to trace shifts in the terrigenous sediment record that occurred during this prominent interval of global cooling. The sampled core site ODP 1085A is situated about 260 km southwest of the Orange River mouth in 1713 m water depth (Wefer et al., 1998). Additionally, today this site is affected by dust supply from the Namib. The grain size distributions of the silt samples were then assigned to transport processes with consideration of the proportions of the clay and sand fractions. Possible transport processes for the silt fraction are (1) bottom currents, (2) winds and (3) fluvial incorporation and transport by ocean currents. Turbiditic downslope transport can be excluded as a transport mechanism, because no turbidites were found in the studied section. Also there is no evidence for bottom current transport documented in the silt grain size pattern. Wind transport in this region is always connected with dry and relatively cool climates, whereas fluvial incorporation appears to be confined to wet and warm climates.

With respect to this climatic constellations the record has been differentiated into three time slices. During the first phase from 13.8 to 11.8 Ma a stable humid climate with low pelagic and terrigeneous mass accumulation rates (MAR) prevailed. There is no dependence between MAR and the Mi-events 3 and 4 (Miller et al., 1991; Westerhold et al., 2005). From 11.8 to 10.2 Ma in the second phase the climate tended to be cooler, however, but not yet drier and shows a clear relationship to an Antarctic glaciation which is documented by the Mi-5 event (Miller et al., 1991, Westerhold et al, 2005).

This cooling favoured nannofossil productivity in the Southeast Atlantic (Krammer et al., 2006). During the third phase from 10.2 to 9.0 Ma the climate cooled, went drier and seaward wind activity was enhanced. This is documented in higher fraction contents of coarser terrigeneous silt (10-63 μm) and a rising mean grain size in this silt fraction (Kastanja et al., 2006).

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