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Reconstructing late Quaternary ocean surface productivity and deep-water mass geometry off E-Africa at 7°S

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Knowledge of past ocean productivity and changes in Indian Ocean water mass geometry is critical to understand climate variability in the east African tropics. Today, for example, the development of a more or less pronounced Oxygen Minimum Zone (OMZ) in the Somali Basin is triggered by monsoonal strength and weak thermocline ventilation. Up to now, however, Somali Basin paleoceanographic changes during Quaternary times are poorly investigated.

Here we present results of micropaleontological, geochemical and sedimentological investigations on two 14CAMS-dated sediment cores from the southern Somali Basin, off Tanzania. Cores were retrieved during Meteor cruise M75 in 2008. Position and water depth of one core from 446 m water depth was chosen such that variations in intensity and extension of the OMZ, as well as changes in the influence of northern sourced Red Sea Water (RSW) and southern sourced Antarctic Intermediate Water (AAIW) were monitored on millenial timescales. A second core site at 1449 m water depth was selected to determine variations in spreading of northern sourced Indian Deep Water (IDW) and southern sourced Upper Circumpolar Deep Water (UCDW) on orbital time scales. In particular, we determined (i) δ18O values and Mg/Ca ratios of planktic foraminifera G. ruber and G. tumida to reconstruct ocean surface salinity and temperature changes and thermocline depth, and (ii) the benthic foraminiferal assemblage composition including δ13C values of epifaunal and deep infaunal species to account for changes in amount and seasonality of ocean surface productivity and deep-water ventilation. In addition, X-ray fluorescence analysis and measurements of magnetic suceptibility were carried out to facilitate easy intercorrelation between cores, and to decipher changes in the amount of terrestrial input.