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Evolution of the southeast Atlantic thermocline during Marine Isotopic Stages 6-5: is it related to variations in the Agulhas Leakage?

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The inter-basin exchange of Indian Ocean waters into the South Atlantic via the Agulhas Leakage (AL) is considered a modulator of Atlantic Meridional Overturning Circulation. Paleoceanographic studies show that increased inputs of saline and relatively warm Agulhas Current waters are associated with late Pleistocene deglaciations. This suggests that this transfer of water masses may effectively regulate the buoyancy of the (South) Atlantic Ocean, and consequently the strength of the Atlantic thermohaline overturning. Our aim is to detect changes in the southeast Atlantic thermocline that may be dynamically linked to variations in the intensity of the AL. To test this relationship, within the frame of EU Marie Curie GATEWAYS project, we are studying a marine sediment record from the central Walvis Ridge, a site that is presently underneath the trajectory of northwest migrating Agulhas Rings. We focus on the δ18O and Mg/Ca ratio of certain planktic foraminifera species that are known to dwell at different depths in the upper ocean, in order to reconstruct the properties of water masses during the last two glacial cycles. The results so far show changes in the δ18O difference ($\Delta\delta$18O) between surface and thermocline species along Marine Isotopic Stage 6. Such difference is interpreted as a proxy for the thermal gradient of the upper ca. 400 m of the water column. We conclude that the observed changes in the southeast Atlantic thermocline do not coincide with the AL peaks as indicated by published faunal counts (Peeters et al. 2004). The Mg/Ca paleotemperature proxy will be implemented to improve the interpretation of the hydrographic mechanisms underlying the observed changes in thermocline properties.

Ref.: Peeters, F.J.C. et al., 2004. Vigorous exchange between the Indian and Atlantic oceans at the end of the past five glacial periods. Nature, 430(7000): 661-665.