



## Potential impacts of the Agulhas Leakage on the Atlantic Meridional Overturning Circulation during glacial, deglacial, and interglacial times

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Freshwater injection to the northern North Atlantic derived from the demise of continental ice is a prime factor in weakening the Atlantic Meridional Overturning Circulation (AMOC). The degree to which the effects of freshwater perturbation in the north can be compensated by buoyancy transports to the South Atlantic via the leakage of warm and salty thermocline waters from the Indian Ocean, the so-called Agulhas Leakage (AL), remains a matter of debate. Model simulations and proxy-based paleoceanographic reconstructions suggest that the strength of the AL is sensitive to latitudinal migrations of the South Atlantic Subtropical Front (STF) on decadal and glacial-to-interglacial timescales. Yet, a comprehensive understanding of the potential impacts of the AL on the AMOC under different boundary conditions has been hitherto inhibited by the dearth of fine-scale, continuous, quantitative paleo-reconstructions of the AL changes and South Atlantic STF meridional displacements during glacial, deglacial, and interglacial periods.

We have generated a suite of multi-centennial-scale paleoceanographic records from the Agulhas Corridor along IMAGES cores MD96-2080 (Agulhas Bank) and MD02-2588 (Agulhas Plateau), which are located in the path of the Agulhas Leakage and Agulhas Return Current that straddles the South Atlantic STF on its return to the Indian Ocean. The records document surface ocean variability throughout a full climatic cycle, from Marine Isotope Stage (MIS) 7c (~225 ka BP) to MIS 5c (~90 ka BP). Paired planktonic foraminiferal (*Globigerinoides ruber*, *Globigerina bulloides*)  $\delta^{18}\text{O}$  and Mg/Ca profiles at the core sites reveal millennial sea surface temperature and salinity variability. The most pronounced of these events occurred during the penultimate deglaciation (Termination II), between ~134 and ~126 ka BP, and featured a 2°-3°C warming and a marked salinity increase in the Agulhas Corridor. This event was coincident with a southward displacement of the STF.

When viewed in the context of contemporaneous records of interhemispheric climate and ocean change from polar ice cores and eastern North Atlantic marine cores, the timing and magnitude of several of the millennial events in the Agulhas Corridor are indicative of an involvement of the Agulhas Leakage in abrupt AMOC reorganizations under glacial, deglacial, and interglacial conditions.