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Depth-specific Deglacial Changes in Water Mass Sourcing in the Southern Indian Ocean: a Vertical Transect of Six ε_{Nd} Records from the Last Glacial Termination

CASSANDRE STIRPE[1], ELLEN MARTIN[2] AND ELISABETH L. SIKES[3]

[1]Oberlin College
[2]University of Florida
[3]Rutgers University

Glacial-interglacial variations in deep ocean carbon storage are critical for understanding the ocean's role in carbon cycling and climate change. Changes in ocean circulation that affect stratification, upwelling, and outgassing are a potential mechanism proposed to explain increased glacial carbon storage. Records of ε_{Nd} are one way of reconstructing glacial-interglacial changes in deep ocean circulation, but global coverage varies. One region that remains relatively understudied is the Indian Ocean. Here we present multiple new deglacial (~30 – 2 ka) ε_{Nd} records from the southern Indian Ocean, in addition to the previously published record from TT1811-34GGC. From the shallowest core 84GGC (1678 m) to the deepest core 24GGC (3816 m), our 6-core vertical transect captures more than 2000 m of the water column. This depth transect is a unique opportunity to examine changes in Upper Circumpolar Deep Water (UCDW), Lower Circumpolar Deep Water (LCDW), Antarctic Bottom Water (AABW), and their glacial equivalents. Each of the six cores has a unique ε_{Nd} record, and together they offer insight into deep water sourcing, mixing, and stratification. Core 71GGC (2598 m) shows an abrupt deglacial switch from εNd values resembling those of deeper cores to those of shallower cores, suggesting a shoaling in the boundary between UCDW and LCDW during Heinrich Stadial 1, ~15–16 ka. In comparison, 24GGC shows a more muted ε_{Nd} change relative to the mid-depth cores, particularly in comparison to the second-deepest core, 34GGC (3167 m). Relative to 34GGC, the record from 24GGC shows more nonradiogenic values during the Last Glacial Maximum and more radiogenic values at the beginning of the Holocene, consistent with the influence of AABW, specifically bottom waters sourced from the Ross Sea. The persistent offset between 24GGC and 34GGC throughout the record suggests the continuous influence of AABW at the site during the interval studied. Taken together, this suite of ε_{Nd} records demonstrates that while major glacial-interglacial changes in water mass sourcing occurred at depths currently bathed by LCDW, glacial UCDW and AABW experienced less change and maintained greater similarities to their modern counterparts.