

Southern ocean circulation and weathering inputs over the last 13 Ma: Radiogenic Nd and Hf isotope evidence from the Agulhas Ridge.

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Seawater radiogenic isotope composition of hafnium (Hf) and neodymium (Nd) were measured in bulk sediment leachates and foraminifera of ODP leg 177 Site 1088 from a water depth of 2082 m on the Agulhas Ridge to reconstruct changes in ocean circulation patterns and continental weathering inputs since the mid Miocene. The extraction of seawater Hf isotope signatures from authigenic coatings of carbonate sediments (up to 95%) is not a standard procedure and has been developed further as part of this study. Past oceanographic changes at the intermediate water depth of the core on the Agulhas Ridge sensitively reflect changes in mixing of North Atlantic Deep Water (NADW) with Circumpolar Deepwater (CDW) and potentially Antarctic Intermediate Water (AAIW) and have thus been sensitive to changes of the strength of the Atlantic meridional overturning circulation (AMOC).

Downcore Nd isotope compositions (ϵ_{Nd}) are in the range of -7 to -11 with glacial ϵ_{Nd} values generally about 1-2 ϵ_{Nd} units more radiogenic than during interglacials for the Quaternary. This is consistent with previous results and is explained as a result of diminished glacial export of unradiogenic NADW and/or larger contributions of CDW/AAIW during glacial periods. In contrast, Hf isotope compositions (ϵ_{Hf}) show a gradual change from more radiogenic values ($\sim+10$) at 12 Ma to less radiogenic values ($\sim+2$) in the late Quaternary. This may either be an indicator of increasing weathering inputs from Antarctica and/or a change in weathering regime on the surrounding continents.