Water mass provenance and mixing in the Angola Basin inferred from neodymium isotopes

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Abstract

Radiogenic neodymium (Nd) isotopes are widely used tracers for the investigation of present and past large-scale water mass mixing processes, enabled by their quasi-conservative behavior and average oceanic residence time of 300-1000 years. Nd is released into the oceans via rivers, aeolian dust and exchange with shelf and slope sediments.

In contrast to the well understood and rapidly circulating deep Western Atlantic Ocean, only limited Nd isotope data exist from the more restricted Angola Basin in the South Eastern Atlantic Ocean. The only available data from one station in the central Angola Basin revealed unradiogenic εNd signatures (up to -14) in surface and intermediate waters [1] which cannot be explained solely by mixing of the main water masses NADW, AABW and AAIW.

Here we present a new and high-resolution Nd isotope section from the GEOTRACES-cruise GA08 based on over 60 water samples from 12 stations in the western Angola Basin (3° to 30° S at 0° E). Our data confirm the unradiogenic Nd signatures (εNd up to -17) in the upper 500 m water depth between 7.5° and 28° S. The surface circulation pattern of the SE Atlantic Basin suggests that neither the Namib Desert, nor the Congo River provide the unradiogenic surface water signatures, but rather dissolved and particulate inputs from large rivers draining Precambrian rocks from Southern Africa, and advected northwest by the Angola Current. The NADW shows a homogeneous isotopic signature of εNd ~ -13.5 in the entire northern Angola Basin, suggesting a significant contribution by dissolution of unradiogenic particulate inputs. Near 20 °S, this signature is separated sharply from the northward advecting and more radiogenic AAIW and Southern Ocean deep water.

[1] Rickli et al. (2009) *EPSL* **280**, 118-127.