

Tracing water mass mixing and terrestrial inputs in the Arabian Sea with radiogenic neodymium isotope and concentrations along GI 10 transect

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The dissolved neodymium concentration (dNd) and isotopic composition (ϵNd) have been measured in the Arabian Sea (AS) water column along the GEOTRACES India transect GI10 to investigate the water mass mixing and terrestrial inputs. The vertical profiles of Nd show higher values in the surface water, followed by the minima at 200-300m, and then increase with depth. This typical profile shows Nd contribution from the aerosol, riverine inputs, and sediment dissolution in the surface water, scavenging on biogenic/lithogenic particulates in the subsurface water, and subsequent release in the deep water. In the southeastern AS, comparatively low saline surface waters along with a higher concentration of dNd ($18.2\text{--}21.9 \text{ pmol kg}^{-1}$) and less radiogenic Nd isotopic composition (ϵNd : -10.9 to -12.0) suggests the advection of Nd rich-less radiogenic Bay of Bengal surface water to this region during the winter monsoon period due to the reversal of coastal currents. The surface waters of the North-central AS region contain lower dNd concentration ($9.4\text{--}14.5 \text{ pmol kg}^{-1}$) than the southeastern AS and show more radiogenic ϵNd (~ -6) signature, resulting from the dissolution of aeolian dust originating from the Arabian Peninsular source region. The Arabian Sea High Saline Water (ASHSW) shows a distinct, more radiogenic signature (ϵNd : -6.5 to -7.5) at around 75-150 m depth in the North-central part, which decreases in the southeastern part resulting from the dissolution of less radiogenic particulate materials advecting from the BoB through coastal currents. Below ASHSW in the northern AS, the presence of Persian Gulf Water (PGW) and Red Sea Water (RSW) can be identified by their less radiogenic (ϵNd : -8 to -9) signature. The deeper Arabian Sea is filled with the Antarctic Bottom Water (AABW) indicated by a distinct signal of ϵNd : -8.5 ± 0.4 .