

ϵ_{Nd} in the Arabian Sea: Water mass mixing vs particle – water interaction

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Arabian Sea is characterized by the presence of oxygen minimum zone in its intermediate waters resulting from high productivity in the region sustained by upwelling during monsoon. It receives significant amount of particulates from the rivers such as the Indus, the Narmada etc and atmospheric dust from adjoining arid landmasses. An extensive study of Nd isotope composition in the Arabian Sea has been carried out to characterize the various water masses present and quantify the Nd sourced from the fluvial and Aeolian particles by their interaction with the seawater. Several water profiles were collected onboard Sagar Sampada during April 2012 in the Arabian Sea along 68°E meridional section between equator and 21°N.

Nd isotope composition were determined using MC-ICP-MS after pre-concentrating and purifying it from ~20 liters of seawater. ϵ_{Nd} in the Arabian Sea vary significantly from -14.37 to 5.57 with less radiogenic values in the northern Arabian Sea and more radiogenic Nd in the surface waters between 4°N and 16°N. The ϵ_{Nd} results demonstrate the significant presence of Antarctic Bottom Water (AABW) and North Atlantic Deep Water (NADW) in the bottom and deep Arabian Sea respectively. Persian Gulf water (PGW) and Red Sea Water (RSW) are present at water depth 400 to 1000 m between 4°N to 16°N.

Important features of this study are the non-radiogenic Nd in the northern Arabian Sea and the radiogenic Nd in the surface water of the Central Arabian Sea, between 4°N to 16°N. Northern Arabian Sea is dominated by less radiogenic Nd resulting from its release from the lithogenic particles with $\epsilon_{Nd} \sim -14$ brought by the river Indus. Radiogenic Nd of the surface water of the Central Arabian Sea is contributed by dissolution of Aeolian dust having $\epsilon_{Nd} \sim -6$. Particle – water interaction seems to have a dominant control on the Nd budget of the Arabian Sea with Nd contribution from fluvial particles increases towards northern Arabian Sea whereas Aeolian contribution decreases towards northern and eastern Arabian Sea.