On the Relationship between Hf and Nd Isotopes in the Pelagic Clays of the Central Indian Basin

N.P.Sukumaran[1], G.Parthiban[2], Y .J. Bhaskar Rao[1] and B.Vijaya Gopal[1]

[1]*National Geophysical Research Institute (CSIR), Hyderabad 500 007, India*
[2]*National Institute of Oceanography (CSIR), Goa 403 004, India*

The chemical and isotopic compositions of the pelagic clays in the Central Indian Basin (CIB) show considerable variability from north to south across the basin. Clays from the northern part have usually more radiogenic Sr and relatively less variable unradiogenic Nd isotopic compositions than those from the south. Possible explanations include a larger contribution of terrigenous influx from the distal Bengal Fan in the north, and more authigenic contribution associated with the equatorial divergence and/or with process related to early diagenesis in the south. Rather interesting however is the decoupling of the time series results of Nd [1] and Hf [2] isotopes from a hydrogenous Fe-Mn crust (SS663) in the CIB. Whereas the Nd isotopic compositions do not show the imprint of Himalayan orogenesis, the Hf isotopes however do at least prior to 5Ma [2]. One possibility suggested for Nd is the trapping of particulate Nd on the shelves or within the Fan sediments [1]. But for Hf, if such entrapment of zircon occurs, one expects more radiogenic values.

Here we present the first measurements of Hf isotopes in the CIB pelagic clays along with Nd obtained by Multiple-collector ICPMS, at the NGRI. We focus on the clay size fractions (<2μm) from detrital (AAS-40/GC02) and siliceous ooze (AAS-27/GC01) in the CIB. Detrital clays have ε_{Nd} values between -15.68 and -8.80 (mean -13.49± 2.42 n=9) and ε_{Hf} between -2.72 and +2.52 (mean 0.78 ±1.74 n=9). They reveal an overall dominant continental signature. Siliceous clays in contrast, have extremely narrow ε_{Nd} between -8.76 and –7.55 (Mean -8.02 ± 0.40 n=7), and variable ε_{Hf} between +2.25 and +5.77 (mean 3.47 ±1.26 n=7) reflecting variable presence of detrital admixed with a dominant seawater source. On an ε_{Nd} vs ε_{Hf} space, both isotopes are coupled in their general trend at an angle with the seawater array, but distinctly above the mantle-crust array with the slope about 0.47 and a positive intercept of $7.1\varepsilon_{Hf}$ with R=0.74 (n=16). Closer look reveals shallower slope (0.36 with R of 0.5) for the detrital clays than for siliceous (0.8 with R of 0.3) relative to the overall trend. These trends reflect the present day behavior of the isotopes, the implications of which are discussed.

Keywords: Radiogenic isotope geochemistry; Indian Ocean; Pelagic clays.

References

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