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Variability of seawater Rare Earth Element (REE) concentrations and radiogenic neodymium isotopes in the Bay of Bengal

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The Bay of Bengal receives large freshwater inputs from major rivers fed by the South Asian Summer Monsoon and one of the world's largest particulate fluxes [1]. However, knowledge on the resulting geochemical cycling of trace elements in this region remains limited. Radiogenic neodymium isotopes (εNd) serve as a tracer for continental inputs and water mass mixing, while yttrium and rare earth element concentrations (YREE) also reflect particle-seawater interactions [2]. Previous studies in the region found seasonally elevated YREE concentrations and more radiogenic εNd values occurring after peak monsoon discharge [2] while the current study was conducted at the end of the dry season under low river discharge.

To investigate the impact of sediment-derived Nd release and freshwater inputs on the Nd isotope and YREE signatures of the Bay of Bengal, water samples were collected between 8°N and 16°N during research cruise Sonne-305 (April – May 2024). Surface waters were collected using a towed fish, while full-depth profiles were obtained at three stations with a CTD (conductivity-temperature-depth) rosette system equipped with Niskin bottles. Additional small-volume samples (125 ml) from the towed fish, the CTD and Go-Flo bottles provide higher spatial resolution of the REEs data.

First results show a northward increase in Nd and subsurface REE variability around 50 m depth. A comparison of E-W transects along 13°N and 15°N reveals greater subsurface REE heterogeneity at 15°N, suggesting a stronger continental influence in the North.

Previous studies highlighted the influence of riverine inputs and sediment-water interaction [2–4] in controlling dissolved Nd isotope composition. To investigate the influence of particulates on YREE distributions we compared filtered and unfiltered samples but found for most sample couplets that there was no significant excess of Nd released in the weak HCl (0.1%) used for sample preservation.

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