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Nd isotopic composition in the northern Indian Ocean from late Quaternary to the present a combined study of modern seawater and foraminifera

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Constraining the dissolved neodymium (Nd) cycle in the ocean is paramount for using Nd isotopic composition (ε_{Nd}) as a tracer to reconstruct deep-sea paleocirculations or continental weathering on different time scales. Dissolved ε_{Nd} has been measured in seawater samples from six hydrological stations collected along ~ 89°E North-South transect in the Bay of Bengal (BoB) in order to assess the impact of seasonal freshwater and sediment discharges from the continental river system. Seawater samples collected in this study during June 2012 reveal more radiogenic ε_{Nd} (a difference of ~2 Epsilon units for the upper 2000 m, and ~0.5 Epsilon unit below 2000 m) and ~3-8 pmol/kg lower Nd concentrations than the reported values of nearby seawater samples collected in November 2008. These observations are most plausible explained by a seasonal variation in dissolved Nd concentrations and ε_{Nd} in the BoB, induced by seasonal variations in the freshwater and sediment discharges from the G-B river system. Based on the modern seawater Nd results, ε_{Nd} of mixed planktonic foraminifera from core MD77-176 from an intermediate depth in the Northern Indian Ocean are selected to reconstruct the past evolution of intermediate water during deglaciation. The ε_{Nd} record in the Northern Indian Ocean displays two pulse-like shifts towards more radiogenic Southern Ocean values during the deglaciation, and these shifts coincide with excursions in $\Delta^{14}C$ and ε_{Nd} records in the Pacific and Atlantic Oceans. These results suggest invasion of Antarctic Intermediate Water (AAIW) into the Northern Hemisphere oceans associated with enhanced Southern Ocean ventilation during deglaciation. Our new ε_{Nd} record strongly supports the close linkage of AAIW propagation and atmospheric CO_2 rise through Southern Ocean ventilation during deglaciation.