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εNd IN SEAWATER RECORDS OCEAN TEMPERATURE CHANGES WITH A TIME DELAY

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The quaternary era is characterized by large glacial-interglacial cycles responsible for perturbations both in the global oceanic circulation and in the continental rainfalls, inducing changes in the discharge of rivers. The Bengal Gulf, with its gigantic sedimentary fan made of the sediments eroded from the Himalayas and carried away by the Ganges and the Brahmaputra, offers a case study for these changes. Gourlan et al., [2010] tackled the relations between the Himalayan erosion, the Indian Monsoon and the marine sedimentary records. Making use of the short residence time of Neodymium ($\leq$ 1000 years) compared to the time of global ocean mixing (3000 years), they determined the ancient seawater neodymium isotopic ratio (expressed in the usual εNd) recorded in the coatings and carbonates fractions of marine sediments from ODP Site 758 during the last 800 ka, and showed similar variations between δ18O and the εNd seawater. These co-variations were related to changes in the outflow of Ganga-Brahmaputra-Meghna (GBM) reaching the sea-surface at ODP site 758 during Glacial-Interglacial periods, themselves related to the ice-sheet growth/ decay and the tropical hydrological cycle. Here we focus on the precise quantification of time delays between the co-variations of δ18O and εNd seawater. The high frequency of sampling allows for a precise data interpolation of both series. We use a correlation technique to derive time delays for the dataset taken as a whole. The two datasets are filtered around periods of interest (44 ky and 100 ky), and the procedure is renewed. Despite strong limitations due to data scarcity and variable sampling frequency, we show that the εNd seawater curve is delayed by 2300$\pm$300 y for the 44 ky frequency and by 7800$\pm$300 y for the 100 ky frequency. The shift remains the same over the entire last 800 ky. This suggests that the seawater composition changes after the change in temperature as recorded by δ18O. In addition, the difference in delay between the 100 ky and 44 ky cycles could be related to the amplitude of the temperature change