INTRODUCTION

The Bay of Bengal (BoB) receives sediments from various sources including the Himalaya, Trans–Himalayan plutonic belt (TPB; Mishmi Hills), Indo–Burman Ranges and the Peninsular India through the major rivers, the Ganga, Brahmaputra, Irrawaddy, Salween, Godavari, Mahanadi and the Krishna. In these river basins, erosion is regulated by both the southwest (summer) and the northeast (winter) monsoons. There are evidences to show that the intensity of these monsoons varied over millennial timescale (Duplessy, 1982; Prell and Kutzbach, 1987; Sarkar et al., 1990; Tiwari et al., 2005; Herzschuh, 2006). These variations in turn have the potential to influence the erosion pattern over the source regions and the sediment delivery to the BoB. Therefore, the variations in the sources of sediments deposited in the BoB hold clues to changes in the monsoon intensity.

In earlier studies, temporal variations in the provenance of sediments of the BoB have been tracked using Sr–Nd isotopes (France-Lanord et al., 1993; Colin et al., 1999; Pierson-Wickmann et al., 2001; Ahmad et al., 2005; Kessarkar et al., 2005; Galy et al., 2008). Over Ma timescale, the sources of sediments to the BoB have remained roughly the same since the Miocene (Bouquillon et al., 1990; France-Lanord et al., 1993). The sources are dominated by contributions from the Higher Himalaya (HH) with subordinate supply from the Lesser Himalaya (LH). However, on millennial timescale, there are evidences of variations in the provenance of sediments related to climatic changes (Colin et al., 1999; Goodbred, 2003; Ahmad et al., 2005; Bookhagen et al., 2005, 2006; Kessarkar et al., 2005; Clift et al., 2008; Rahaman et al., 2009). This is consistent with the important role that climate has on the present-day erosion over the Himalaya, with most of sediments delivered to the BoB by rivers during the southwest monsoon (Islam et al., 1999; Goodbred, 2003). In contrast, some of the studies carried out in the Nepal Himalaya (Burbank et al., 2003), have decoupled climate and erosion and have highlighted the important control of tectonics on erosion. Compared to the Himalaya, there has been paucity of information on the paleo-erosion pattern of the Peninsular India river basins and their controlling factors. Based on clay mineralogy and Sr–Nd isotopes of marine sediments from the south-west margin of India, Kessarkar et al. (2003) concluded that these sediments are mainly from the Peninsular India and the Himalaya (Indus basin) and that their provenance and transport pathways remained the same during the late Pleistocene and Holocene.

These limited information on the monsoon-erosion relation in the Himalaya and the Peninsular India regions, warrant a detailed study. The western Bengal fan receives Sr–Nd isotope composition of the Bay of Bengal sediments: Impact of climate on erosion in the Himalaya

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A temporal high-resolution analysis of Sr–Nd isotopic composition, Fe, Al and V concentration and magnetic susceptibility (MS) has been carried out in a sediment core from the western Bay of Bengal to trace sediment sources. Significant variations in the Sr and Nd isotopic composition and corresponding MS and elemental Fe/Al and V/Al ratios are observed in the sediment core with depth (time) indicating variable contributions from sources. The observed changes in the sediment provenance correlate well with the climatic record of the region, highlighting the important influence of climate over erosion. Relatively lower 87Sr/86Sr and higher εNd corresponding to the Last Glacial Maximum (LGM) suggests proportionally reduced sediment contribution from the Himalaya. Erosion rate over the Himalaya decreased during LGM due to combined influence of reduced intensity of the southwest monsoon and larger extent of glaciations over the Higher Himalaya, the main source of sediments to the Bay of Bengal.

Keywords: Himalaya, Bay of Bengal, erosion, climate, Sr–Nd isotopes

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