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Evidence of Himalayan uplift as seen in Neogene records of Indian monsoon variability from ODP Hole 722B, NW Arabian Sea

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Abstract

The Indian monsoon is one of the most interesting climatic features on Earth impacting most populous countries of South and East Asia. It is marked by seasonal reversals of wind direction with southwesterly winds in summer (June-September) and northeasterly winds in winter (December-February). The monsoon not only impacts socioeconomic conditions of Asia but also brings important changes in fauna and flora, ocean upwelling and primary productivity in the Arabian Sea. The Himalaya has undergone several phases of rapid uplift and exhumation since the early Miocene which led to major intensification of the Indian monsoon. The monsoon is driven by the thermal contrast between land and sea, and is intimately linked with the latitudinal movement of the Inter-Tropical Convergence Zone (ITCZ). The effect of Indian monsoon variability and the Himalayan uplift can be seen in numerous proxy records across the region. In this study we discussed about the Indian monsoon intensification and the Himalayan uplift since the early Miocene based on multi proxy records such as planktic foraminiferal relative abundances (Globigerina bulloides, Globigerinita glutinata and mixed layer species), total organic carbon (TOC), $CaCO_3$ and elemental data from ODP Hole 722B (2028 mbsf), northwestern Arabian Sea. The TOC, $CaCO_3$ and elemental variations of the ODP Hole 722B suggest multi phase of monsoonal intensification and Himalayan uplifts. Our results suggest that in the early Miocene (23.03 Ma) to $\sim$15Ma, the wind strength and productivity were low. A major change is observed at $\sim$15 Ma, during which time numerous proxies show abrupt changes. TOC, $CaCO_3$ and Elemental analyses results reveal that a major change in the productivity, wind strength and chemical weathering starts around 15 Ma and extends up to 10 Ma. This suggests that a major Himalayan uplift occurred during $\sim$15-10 Ma that drove Indian monsoon intensification. A similar change is also observed during 5 to 1 Ma. These long-term paleoclimatic trends correlated to Himalayan uplift. Major peaks in various proxy records correspond with enhanced monsoonal strength and the Himalayan uplift.

Keywords: Indian monsoon; Himalayan uplift; Arabian Sea; Productivity; Planktic foraminifera; Total Organic Carbon