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Glacial/interglacial variations in the range of the Inter-Tropical Convergence Zone and the resulting changes in paleoproductivity in the Bay of Bengal and Andaman Sea

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Asian monsoon precipitation is suspected to have a dynamic response to both regional climate drivers such as changes in orbital configuration, which affect summer insolation and the land-sea pressure gradient, as well as changes in global climate boundary conditions, such as sea surface temperatures and extent of northern hemisphere ice sheets and snow cover. For the Bay of Bengal region, we investigate both past Inter-Tropical Convergence Zone (ITCZ) extent using planktic foraminiferal εNd and the response of marine productivity using coccolith Sr/Ca ratios and sediment Ba/Ti ratios. Nd isotopes in planktic foraminifera track shifts of ITCZ precipitation among watersheds of contrasting lithology. The spatial pattern of εNd variation in the northern Bay of Bengal (RC12-343) suggests a shift from interglacial dominance of riverine Nd from the more northerly Ganges–Brahmaputra basin to LGM dominance of riverine Nd from the more southerly Arakan coastal rivers. This record suggests that ITCZ movement is driven by Northern Hemisphere cooling during 100 ky glacial/interglacial cycles, consistent with recent climate models. The nonlinear correlation of εNd with ice volume suggests that ITCZ movement responds to aerial coverage of ice sheets and snow rather than to ice thickness and volume. A smaller component of εNd variability occurs on precessional timescales. Marine productivity in the Andaman Sea exhibits a complex response to ITCZ movement. Productivity

records from the Andaman Sea and from the northern Bay of Bengal from 190 ky to 95 ky b.p. reveal a greater influence of global boundary conditions in the northern Bay of Bengal, contrasting with a greater influence of local precessional forcing in the Andaman Sea. Sr/Ca ratios in coccoliths track nutrient-stimulated productivity of coccolithophorid algae. Sr/Ca ratios in individually picked *Calcidiscus leptoporus* coccoliths in the RC12-343 core from the northern Bay of Bengal do not respond to precessional insolation changes during the penultimate glacial from about 160 to 135 ky b.p. Productivity rises sharply at about the time of the deglaciation around 130 ky b.p. and peaks during the interglacial. Ba/Ti ratios in the bulk sediment (a proxy for export production) show similar behavior. Productivity is thus high when Nd isotopic data suggest strong northward penetration of the ITCZ onto the continent. In this site, productivity is likely stimulated by eddy pumping from strong summer southwest monsoon winds and the establishment of the cyclonic gyre in the Bay. In contrast, in the more southern Andaman Sea (MD77-169), Sr/Ca ratios in *C. leptoporus* coccoliths show a strong precessional component with cycles of about 20 ky, peaking at about 170 ky, 150 ky, and 130 ky b.p. These peaks correspond with periods of high summer insolation and low surface salinity in the Andaman Sea. Peaks in productivity also coincide with reported peaks in the relative abundance of highly weathered clay minerals in this core, reflecting either more intense chemical weathering or more extensive flushing of floodplain soils due to increased precipitation. Thus, in the more southerly region the local precessional forcing exerts a dominant control on hydrology and productivity.