

A persistent weakening of the winter monsoon during the last 580 kyr

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The Indian monsoon is a complex climatic phenomenon characterized by seasonal shifts in winds, rainfall, and ocean currents. The monsoon strongly influence the climate and ecosystems of the region. The reconstruction of the past monsoon variations can help to understand the potential drivers of the monsoon. The eastern Arabian Sea is a dynamic marine region that is influenced by various oceanographic processes, including the advection of upwelled water from the western Arabian Sea during the summer and convective mixing during the winter season. We used the relative abundance of planktic foraminifera from the sediments drilled during the International Ocean Discovery Program Expedition 355 Site U1457 to reconstruct the summer and winter monsoon variability during the last 580 kyr. *Globigerinita glutinata* was the most abundant species, prior to Marine Isotopic Stage (MIS) 12. Its relative abundance decreased post MIS12, suggesting weakened winter monsoon. We further report that the relative abundance of *G. glutinata* was high during the glacial cycles as compared to the interglacials, suggesting strengthened winter monsoon induced increased convective mixing in the eastern Arabian Sea. The relative abundance of *Globigerina bulloides* was higher during interglacials, suggesting intensified summer monsoon. From the cumulative relative abundance of summer and winter monsoon assemblages, it is evident that the winter monsoon consistently weakened during the last 580 kyr.