Climate variability in the northern Indian Ocean since the Last Glacial Maximum

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The Indian Ocean is climatically important region marked by seasonally reversing monsoonal winds throughout its northern part and intermonsoon westerlies driving significant changes along the equator. During summer (June-September), strong southwest (SW) monsoon winds sweep the northern Indian Ocean providing moisture source (summer rains) to fauna and flora of the Indian subcontinent/South Asian region. In winter (December-February), winds are northeasterly which are dry and variable. The summer monsoon rains are critical for food production, water supply and for economic growth of the Indian subcontinent. Almost two third of India's food production depends on summer rains, so are the rivers that cater to the domestic needs of the region. A narrow band of westerlies (7^oN to 7^oS) sweep the equatorial Indian Ocean during the April-May and October-November intermonsoon seasons. These Indian Ocean equatorial westerlies (IEW) are closely related to the Indian Ocean Dipole (IOD), which determines the moisture content in East Africa and Australasian region and also impacts the Indian monsoon. A stronger IOD coincides with a wetter equatorial East Africa, a drier Australasia and a stronger Indian summer monsoon, indicating that the IOD plays an important role in driving climate change in East Africa, Australasia and South Asia. The present study analyses changes in population abundances of planktic foraminifer *Globigerina bulloides*, a proxy for the strength of monsoon or intermonsoon winds, from the Arabian Sea and equatorial Indian Ocean, and combines this dataset with that from the Indonesian region to understand linkages between the Indian monsoon, IOD and climate of the east African and Australasian regions. Both monsoonal and IEWs were weaker during the LGM suggesting that equator also witnessed significant change on millennial time scale contrary to the belief that equatorial climate did not respond to changes on glacial-interglacial time scales. The IEWs have intensified whereas monsoonal winds show abrupt changes since the LGM. The summer monsoon was weaker during 11000-10000 cal yrs BP roughly coinciding with the Younger Dryas (YD), and intensified during the early Holocene 10,000-7,000 cal yrs BP. The summer monsoon weakened during 7,000-2,000 cal yrs BP and has intensified over the past 2,000 cal yrs BP. The IOD, on the other hand, shows no change during the YD but continuously weakened (stronger IEWs) since the LGM coinciding with an increase in precipitation in the Australasian region.