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Indo-Pacific warm pool during the glacial-interglacial intervals: Implications for future warming

Dharmendra Pratap Singh (1,2), Rajeev Saraswat (1), Dinesh Kumar Naik (1), and Andreas Mackensen (3)

(1) National Institute of Oceanography, Goa, India (dp.nio@hotmail.com), (2) MARUM, Marine Sedimentology, Germany, (3) Alfred Wegner Institute for Polar and Marine Research, Bremerhaven, Germany

The Indo-Pacific Warm Pool (IPWP), comprising of the western equatorial Pacific and the eastern equatorial Indian Ocean, is the warmest region of the world ocean. It is the largest source of heat and moisture and drives the majority of the atmospheric circulations including Walker and Headley circulation. The mean state of the IPWP is crucial for the precipitation in entire Asia, the most populated region of the world. The recent hiatus in global warming is also attributed to the excess heat storage in both the Pacific and the Indian Ocean. The preferential heat storage in either of these oceans will alter the zonal temperature gradient. At present, the eastern part of the IPWP is relatively warmer than the western part, which lies in the eastern equatorial Indian Ocean. The previous studies suggest, however, that the zonal temperature gradient was different during the last glacial interval. The available long-term paleotemperature record from a single location in the equatorial Indian Ocean, covered only the last glacial-interglacial cycle. Additional past temperature records from the core of the eastern and western parts of the IPWP, can provide further insight into the temporal stability of the IPWP. The temperature data if coupled with the precipitation changes can further help in understanding the link between the Pacific Ocean temperature and Indian monsoon. Here we present a new sea-surface temperature record covering the last 250 kyr, estimated from the elemental ratio of surface-dwelling planktic foraminifera Globigerinoidesruber (white variety), from a core collected from the eastern extreme of the IPWP. We report that the entireIPWP region was $\sim$2°C cooler than present, during the last glacial maximum. The region was $\sim$1°C warmer during the penultimate interglacial, as compared to the pre-industrial temperature. The sea-surface temperature at both the eastern and western extremes of the IPWP followed a uniform trend throughout the last two glacial-interglacial intervals. During the marine isotopic stage 7, however, the western Pacific Ocean was comparatively warmer than the Indian Ocean. Interestingly, the Indonesian throughflow region was warmer than both the eastern and western extremes of the IPWP throughout the glacial-interglacial interval. The deglacial warming precedes the depleted δ18O, suggesting warming lead over the melting of ice sheets. The difference in δ18O between the eastern equatorial Indian Ocean and western equatorial the Pacific Ocean was not consistent throughout the last glacial interval, suggesting a profound influence of regional precipitation. The difference in δ18Odue to a change in regional precipitation, suggests decoupling of monsoon from the thermal zonal gradient in the IPWP region. The findings have far-reaching implications to understand monsoon behaviour in a warming world.