

Patterns of basin-wide warming in the Indian Ocean and their possible mechanisms

*Natsumi Tanji¹, Hiroaki Ueda²

1. College of Geoscience, School of Life and Environmental Sciences, University of Tsukuba, 2. Faculty of Life and Environmental Sciences, University of Tsukuba

After the peak phase of El Niño, usually emerges in the boreal winter, positive sea surface temperature (SST) anomaly appears in the entire Indian Ocean (IO) toward the succeeding summer. This basin-wide warming induces anomalous anticyclone (AAC) over the northwest Pacific through the Kelvin wave-induced Ekman divergence, which has a great impact on the Asian climate including rainfall and tropical cyclone frequency. In the present study, we examine the physical processes involved in the individual coherent events, specifically its seasonal evolution and spatial pattern in terms of the heat flux changes at the ocean surface and zonally propagating ocean waves in the thermocline. Region of the strongest warming in the IO usually seen in the boreal winter moves across the equator toward the summer season. Statistically, major factors for the eastern IO warming can be ascribed to increased solar radiation together with decreased evaporative cooling. In addition to this, we confirmed that the ocean processes such as the downwelling Rossby wave and Kelvin wave contributes to the warming in the tropical IO. The diagnosis for the 1991-92 ENSO event shows absence of the basin-wide warming. Meanwhile, SST anomaly in the Atlantic Ocean exhibits unique feature in comparison with the statistically derived relationship. It is conceivable that the IO SST could be regulated by the Pacific Ocean as well as the Atlantic Ocean, implicating presence of trans-basin interactions.

Keywords: El Niño, Indian Ocean basin-wide warming, warming mechanisms