Multiple time scale impact of zonal sea surface temperature anomaly contrast over the Indian-western Pacific Oceans on Asia-Pacific summer monsoon system

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Asia-Pacific monsoon is a hemispheric scale summer monsoon system that covers a large area from South Asia to western North Pacific (Wang and Linho, 1993), although the characteristics, intensity, and phase of seasonal march are differenc from region to region.
Associated with the research about the impact of ENSO on the Asian monsoon system, anomalous anti-cyclonic system prevailing over the western North Pacific has been focused as the link between the Pacific Ocean and Indian ocean. Terao and Kubota (2005) and Xie et al. (2009) pointed out the importance of the zonal sea surface temperature (SST) anomaly contrast over the Indian and Paciric Ocean in the impact of Asian monsoon. Terao et al. (2013) suggested that the impact of zonal SST anomaly contrast over the Tropical Indian-Pacific oceans extends even to the Indian monsoon trough region, and stimulates heavy rainfall in Northeastern Indian subcontinent. Recently, Indian Pacific Ocean Capaciter mode was proposed (Xie et al. 2009, 2016; Kosaka et al. 2013), that elucidated the importance of the atmosphere-ocean interaction over these oceans. Upcoming post MAHASRI research initiative will play important role to investigate the Asia-Pacific monsoon system.
The present study focused on the description of impacts of zonal SST anomaly contrast on the Asia-Pacific monsoon system in different time scales that includes climate change, interannual variability, seasonal march, and intraseasonal variations. We will focused on the intimate relationship between the western North pacific and Indian summer monsoon system. This combind monsoon system also undergo active interaction between SST anomaly contrast and the monsoon troughs.
The onset of the western North Pacific summer monsoon (WNPSM) is strongly related with the seasona march of the Indian monsoon trough. The onset of WNPSM shifts the Indian monsoon trough to south, making the reduction of rainfall over the Northeastern Indian monsoon rainfall. If the timing of the onset of WNPSM delays, the reduction of rainfall over the Northeasern Indian subcontinent, which occurs in August usually, also delays, and heavy flood tends to happen. The timing of the onset of WNPSM was associated with that of the reversal of zonal SST contrast. If the zonal SST anomaly contrast with positive in Indian Ocean develops in early summer, the reversal of zonal SST contrast and the onset of WNPSM delay.
The zonal SST anomaly contrast plays a role in the intraseasonal time scales also (Fig. 1). The WNP monsoon westerly correlated with the MJO phases (Wheeler and Hendon 2004), where westerly intensified during the active MJO phases over the western Pacific Ocean (Phases 4-6, Fig. 1a) and suppressed during the break MJO phases (Phases 8-2, Fig. 1b). Fig. 1c shows that this intrasesonal westerly variation accompanied variations in zonal SST anomaly contrast.
Acknowledgment: Part of this study was supported by the JSPS KAKENHI (No. 26220202).

Keywords: Asia-Pacific summer monsoon, SST anomaly, monsoon westerly, seasonal march, interannual variability, intraseasonal variability