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An Observation on the Relationship between IOD/ENSO and River Discharges of the Citurum Basin, Indonesia

○Netrananda SAHU, Yosuke YAMASHIKI,Kaoru TAKARA

The climate pattern of Indian Ocean rim countries has been influenced by the Indian Ocean Dipole (IOD) and El Nino Southern Oscillation (ENSO) along with Asian Monsoon and other local patterns. Spatially located Indonesia has been influenced by both the IOD and ENSO as well. The western Indonesia is influenced by the Indian Ocean and Eastern Indonesia is influenced by the Pacific Ocean because of their proximities to the respective ocean basins. A positive (negative) IOD event brings drought (wet) to the Indonesian region. Likewise, an El Nino (La Nina) causes drought (flood) over the region.

The main focus on this research is to make a scientific analysis to link the discharge variability with rainfall-runoff and Sea Surface Temperature (SST) variations of both the ocean basins on daily time scales. Historically ENSO has a strong relationship with Indian Monsoon. However, in the last couple of decades the frequent IOD occurrence has weakened the ENSO and Monsoon relationship. Many studies have been done on the relationship between interannual variability of the Asian Summer Monsoon and ENSO and influence of IOD on Southern Oscillation.

The climatology of stream-flow at the Nanjung gauge station of the Citarum River in Indonesia shows significant flow during November to April and very less flow during June-September. The variation in this seasonal stream-flow significantly affects the human population. So, it is important to understand the underlying mechanisms that cause that variation. Since the variability of climatic conditions in the tropical Indian and Pacific Oceans are main driver of the rainfall variability over the Maritime Continent, their roles in river stream-flow is explored in this study. A scientific analysis is made to link the stream-flow variability with the rainfall and sea surface temperature (SST) variations over the Indian and Pacific Oceans on daily time scale. The observed stream-flow discharge data from 1974-2008 (35 years) at the Nanjung station, the down most outlet of the upper catchment, shows a strong correlation with the Indian Ocean Dipole (IOD) and the El Nino/Southern Oscillation (ENSO) events.

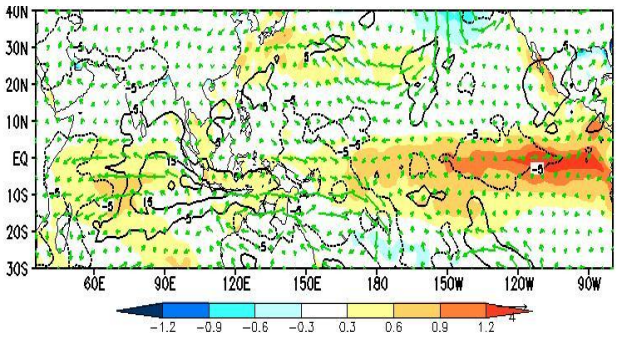

Fig. 1 Composite index (includes the exact number of extreme events days one week ahead for both the Extreme high and low discharges cases and excludes all the events prior to 1981) of SST (shaded), surface wind (vector) and OLR (contoured) for DJF Extreme High discharges cases. Unit for SST is °C, for wind is m s^{-1}, and for OLR is w/m^2.