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Interannual rainfall variability over the northwest Java, Indonesia

*Rahmat Hidayat, Kentaro Ando, Yukio Masumoto and Jing-Jia Luo
Research Institute for Global Change (RIGC), JAMSTEC, Japan

Indonesia Maritime Continent is vulnerable to climate disasters such as drought and floods. Extreme dry events lead to devastating drought with losses in crop production. On the contrary, persistent heavy rains have lead to flooding and landslides over the region, which cause hardship for several hundred million people through their significant impact on economics and societies with loss of human lives and properties.

The present study describes interannual rainfall variability over the northwest Java island (i.e. Jakarta and surrounding area) using JRA25 reanalysis data and 3-month lead forecast from a coupled general circulation model known as the Scale Interaction Experiment-Frontier Research Center for Global Change (SINTEX-F) for the period 1982-2010. To begin with, the observed annual variability of the northwest Java rain index is derived by taking area average over the same domain as that of the model index (i.e. 106.25-107.75^{0}E; 6.75-6.25^{0}S). The model simulates the Jakarta rain and its variability quite realistically with a wet season that peaks in January and a dry season that peaks in August.

In the present study, we investigate the impact of the large-scale climate variability such as El Nino-Southern Oscillation (ENSO) and Indian Ocean dipole mode (IOD) events on the Jakarta rain. A number of previous studies pointed out that rainfall variability over Indonesia are significantly affected by ENSO and IOD events. In order to separate the influence of ENSO and IOD on the Jakarta rain, a partial correlation technique is employed. The partial correlation between the Jakarta rain and sea surface temperature (SST) anomalies around Indonesia shows higher positive correlation (about 0.7) when the influence of ENSO is removed (Fig. 1). Furthermore, the strong relationship between IOD and the Jakarta rain is supported by significant correlation between Dipole mode index (DMI) and the Jakarta rain for the seasons of boreal summer and fall in both model and observed data. Therefore, the analysis of model result and observed data reveals that the influence of the IOD on Jakarta rain is significantly as large as the influence of ENSO. The SINTEX-F results can provide skillful forecast rainfall at 3-month lead in northwest Java.

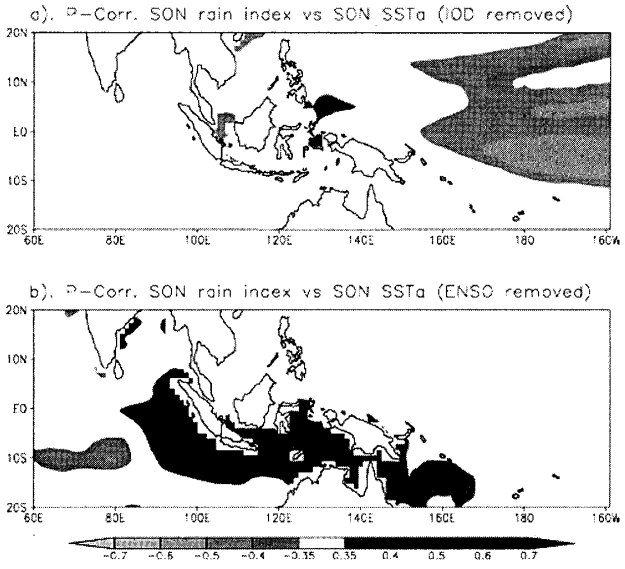

Figure 1. Partial correlation of the model SST anomalies with rain index (a) where the IOD influence is removed, (b) where the ENSO influence is removed. Shaded are statistically at 95% level.