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Effects of the cross equatorial northerly surge to interannual rainfall variability over northwestern Jawa

Jun-Ichi Hamada[1*], HATTORI, Miki[1], WU, Peiming[1], MORI, Shuichi[1], MATSUMOTO, Jun[1], YAMANAKA, Manabu D.[1], HARYOKO, Urip[2], LESTARI, Sopia[3], SYAMSUDIN, Fadli[3]

[1]JAMSTEC/RIGC, [2]BMKG, [3]BPPT

Hamada et al. (2012) investigated that interannual rainfall variability in northwestern Jawa over the Indonesian maritime continent and its relation to the Indian Ocean Dipole (IOD) and El Nino-Southern Oscillation (ENSO) events. IOD events clearly influence interannual rainfall variation in the dry season (May-October) in northwestern Jawa. Droughts conditions during the dry season occur in conjunction with simultaneous development of positive IOD and El Nino events, whereas wet conditions tend to appear in negative IOD (with our without La Nina) rather than single La Nina events.

On the other hand, interannual rainfall variation in the rainy season (November-April) is not closely related to ENSO/IOD, but rainfall tends to be abundant in neutral (non-ENSO/IOD) years. From the correlation analysis among rainfall, SST, and wind, the rainy season rainfall may be influenced by Asian winter monsoon strength and/or variability. Hattori et al (2011) statistically showed that cross-equatorial northerly surges (CENS) over South China Sea and Jawa Sea were related to increased rainfall over the northern coastal region of Jawa Island in the rainy season. Thus, in this study, we aim to investigate effects of Asian winter monsoon, especially for the CENS events, to interannual rainfall variability in the rainy season over northwestern Jawa.

By following the definition of Hattori et al (2011), the CENS event was defined as the area-averaged northerly wind exceeding 5 m/s over South China Sea and Jawa Sea (105E-115E, 5S-EQ) based on the QuikSCAT sea surface wind data. During the analysis period (December 1999-March 2008), 53 CENS events were extracted. We used surface daily rainfall data at 9 stations in northwestern Jawa to investigate the rainfall variability and its relation to the CENS events.

As for the intraseasonal variations, CENS events and northwestern Jawa average rainfall peaks were well-corresponded including the Jakarta flood events in January 2002 and February 2007. Greater rainfall amount was observed during the CENS events (18.0 mm/day) in the rainy season (average is 10.1 mm/day). This rainfall increase tends to be dominated in the coastal stations than the inland stations. Though the occurrence frequency of CENS events was about 20%, the contribution of CENS rainfall amount to the total rainfall amount in the rainy season was about 30-40%.

As previous studies pointed out, interannual rainfall variations in the rainy season over northwestern Jawa were not closely related with ENSO. On the other hand, interannual variations of CENS events rainfall were well-corresponded to the interannual variations of the rainy season rainfall (simultaneous correlation coefficient is 0.82). Thus, it is suggested that CENS rainfall is one of the important factor to determine rainy season rainfall. It will be also suggested the CENS events would influence the rainfall variability in the rainy season over the southern part of the maritime continent, especially for the northern coast of the islands.

Keywords: maritime continent, rainfall variability, monsoon, ENSO, rainy season