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Occurrence of extreme rainfall events associated with the Madden-Julian Oscillation

Rahmat Hidayat

Bogor Agricultural University

The relation between intraseasonal rainfall variability over Indonesia and the Madden-Julian Oscillation (MJO) is investigated as well as its relationship with large-scale atmospheric circulation, by using pentad-mean TRMM (Tropical Rainfall Measurement Mission) precipitation data. The focus is placed on the boreal winter when most of the country experiences rainy season. The frequency of occurrence of extreme rainfall in Indonesian region is examined for each phase of the MJO. To begin with, extreme rainfall events are defined by using a threshold value of 20 mm/day, which is determined based on detail examination of the rainfall histogram at various places. By assessing the frequency distribution of rainfall at each MJO phase at six selected areas (three from over the seas and three from over the land), it is found that frequency of extreme rainfall is significantly larger during the wet phase than the dry phase of the MJO over both the seas and the land. Thirteen and twenty extreme rainfall events are identified in central part of Sumatra and Java Sea, respectively, and the lagged composite of TRMM precipitation and OLR anomalies are made for each case. A spatially-coherent pattern of rainfall and OLR anomalies are observed as well as their eastward propagation in both cases, suggesting that the extreme rainfall in those regions is preferably induced during the MJO wet phase. A typical extreme event during November through December 2002 is further examined. By investigating rainfall anomalies and evolution of OLR and circulation anomalies, it is again shown that the frequency of occurrence of extreme rainfall is affected by eastward-propagating large-scale convective system of the MJO.