

Quasi-biweekly Oscillation of Convection around Sumatra and Low-level Tropical Circulation

MIN WEN¹ and RENHE ZHANG¹

¹State Key Laboratory of Severe Weather, Chinese Academy of Meteorological Sciences

The quasi-biweekly oscillation (QBWO) of the tropical convection around Sumatra and its relation to the low-level circulation over the tropical Indian Ocean in boreal spring (MAM) is investigated. The results show that the oscillation of convection activities in 10-20-day period is pronounced around Sumatra during the transition season of the Asian monsoon from March to May. Time-lag correlations between the QBWO of the convection and wind field in the lower troposphere reveal the possible mechanism of the QBWO maintaining. When the winds, including the southerly from the Southern Hemisphere, the northerly from the Northern Hemisphere and the westerly over the equatorial Indian Ocean, are convergent over Sumatra, the convection is intensified. The atmospheric Rossby wave response to the convective heating produces twin cyclones to the west of the convection area. The development of twin cyclones, in turn, gives rise to the divergence over Sumatra where the convection is intensified, which eventually leads to the decay of the convection. In the similar manner, the anticyclonic pair triggered by the convection in the cold phase is the causation of the following strengthening of the convection. Consequently, the feedbacks among the convection, the Rossby-waves excited by convection and the low-level wind fields maintain the QBWO in the tropical area. Further studies are also performed on the relation of the convection to the equatorial westerly. From March to May, the convection over Sumatra intensifies continuously. The twin cyclones are triggered to the west of Sumatra and move westward one by one due to the westward propagation of the equatorial Rossby waves. The equatorial westerlies induced by the equatorial Rossby wave extend westward. Finally, the equatorial westerly prevails over the whole equatorial Indian Ocean, which plays an important role in the Asian summer monsoon onset.

Keywords: Tropical convection, Quasi-biweekly Oscillation, Low-level tropical circulation

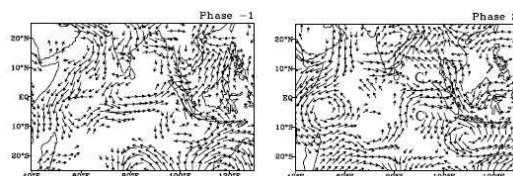


Figure 1: The time-lag correlation coefficients of the North Sumatra TBB with the 850hPa wind. The correlation vector is defined as $\vec{R} = -R_{y8T_{10}}\vec{i} - R_{x8T_{10}}\vec{j}$. The vectors less than 5% significance level are omitted.