

The observed interaction between westward-propagating tropical waves and the MJO during boreal summer

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Interactions between the convection and circulation fields of the boreal summer Madden-Julian Oscillation (MJO) and higher-frequency tropical wave activity are examined through a statistical analysis of 22 years of data. During the convectively active phase of the MJO, westward-propagating mixed Rossby-gravity (MRG)/tropical depression (TD)-type wave activity is enhanced within the low-frequency MJO convective envelope, and is strongly correlated with low-frequency 850-hPa westerly anomalies. A case study of an MJO event during July-September 1987 illustrates these statistically derived relationships. The enhanced phase of the MJO is shown to consist primarily of westward-propagating higher-frequency variability, including seven named tropical cyclones in the western Pacific, two of which project onto MRG/TD-type modes as they propagate westward across southeast Asia into the Bay of Bengal. The successive eastward development of three tropical storms appears to be associated with an eastward dispersion of energy in the MRG/TD mode. Based on the statistical results and the 1987 case study, it is suggested that the high-frequency, westward-propagating MRG/TD disturbances and tropical cyclones comprise a significant portion of the low-frequency MJO signal during northern summer, perhaps contributing to its eastward propagation.