Northeast Tropical Workshop Abstracts

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MJO Circulation Signals In the Western Hemisphere at Convective Onset over the Indian Ocean

MJO convection in the tropics is intrinsically coupled with the global atmospheric circulation. In response to convection, extratropical planetary waves and Kelvin waves circumnavigate the globe. Intraseasonal and synoptic Rossby waves are guided back into the tropics of the Western Hemisphere on background westerly wind. These waves modulate momentum in the equatorial waveguide. This presentation will show momentum budget analysis of observations and reanalysis data that demonstrates the dynamical source of upper tropospheric easterly wind anomalies on the equator that develop over the Western Hemisphere in advance of most high amplitude active convective phases of the MJO over the Indian Ocean.

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The Intraseasonal Atmospheric Angular Momentum Associated with MJO Convective Initiation

This study investigates the influence of the equatorial intraseasonal atmospheric angular momentum (AAM) state on the subsequent development of initiating Madden-Julian Oscillation (MJO) convection over the Indian Ocean. In the presence of Western Hemisphere upper-tropospheric easterly wind, MJO convection tends to develop a stronger enhanced convective envelope when the initiation occurs during the negative intraseasonal AAM state, which strengthens and extends the upper-tropospheric easterly wind in the Western Hemisphere. When the AAM anomaly is positive, it tends to induce stronger mid-tropospheric convergence above the region of convective initiation, thereby suppressing the lower-tropospheric updraft and suppressing the further growth of convection. The role of gross moist stability is also examined, but it does not explain the difference in the strength of MJO convection over the Indian Ocean. Contrary to previous studies, normalized gross moist stability is found positive and greater in the MJO convective events with negative AAM anomaly, which developed stronger convection. The results show that the combined effects of the Western Hemisphere circumnavigating circulation and the AAM can influence the subsequent development of MJO convection over the Indian Ocean.

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A Composite Assessment of Relationships between the Madden-Julian Oscillation, Tropical Cyclones, and the Extratropical Circulation

Numerous studies have addressed relationships between the Madden-Julian oscillation (MJO) and tropical cyclones (TCs) in different tropical ocean basins. Comparatively few studies, however, have assessed the extent to which the evolution of large-scale circulation anomalies associated with the MJO depend upon the presence or absence of TCs in the vicinity of the MJO convective envelope, and the extent to which the presence or absence of TCs modulates the structure and evolution of the MJO itself.

We present composite assessments of 300-hPa geopotential height and outgoing longwave radiation (OLR) anomalies during boreal autumn (September-October-November) to highlight sensitivities in the structure and evolution of the MJO and extratropical circulation pattern to the presence or absence of TCs over the western North Pacific basin. Composites are centered on days in which the MJO was considered active (the RMM index exceeded one standard deviation) during RMM 6 and a tropical cyclone was either present or absent in the vicinity of the Philippines. Results show statistically significant differences in the structure of the MJO convective envelope between the two sets of composites. The extratropical circulation response pattern also differs between composite sets, suggesting extratropical sensitivities to the presence or absence of TCs in conjunction with an active MJO.