

Influences of the SST distributions and moistening processes on the determination of the MJO initiation region

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Although large-scale convection associated with the Madden-Julian Oscillation (MJO) is often initiated over the tropical Indian Ocean (IO), some of the MJO convective events start eastward propagation from the other regions such as around the Maritime Continent (MC) and the Western Pacific (WP) in boreal winter. This study is aimed at exploring what kinds of environments or processes can explain the diversity of the MJO initiation region to understand the conditions for the MJO onset. We perform a composite analysis of the atmospheric variables and sea surface temperature (SST) for the MJO onset in the IO (38 cases), southwestern MC (17 cases), and WP (13 cases) in boreal winter that is detected using only outgoing longwave radiation data in 1980-2012. The difference of SST distributions before the MJO onset in those three regions can be clearly seen. Before the onset in the southwestern MC (WP), an SST over the southeastern MC (central Pacific) is statistically significant warmer than the onset in the IO, which means the correspondence between an area with an anomalously greater eastward SST gradient and the initiation region deviated from the IO. This suggests that the location of warmer SST distributions, which is affected by the El Niño-Southern Oscillation and the MJO itself, and the magnitude of a resultant locally zonal SST gradient modulate the MJO initiation region. The differences and similarities in the moistening processes before MJO convective realization associated with the diversity of the initiation region will also be discussed.

Keywords: MJO onset, sea surface temperature, moisture accumulation