



Stratospheric Control of Madden-Julian Oscillation and Its Teleconnection

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Interannual variation of seasonal-mean tropical convection, especially that over the Indo-Pacific region, is primarily controlled by the El Niño-Southern Oscillation (ENSO). For example, during El Niño winters, seasonal-mean convection around the Maritime Continent becomes weaker than normal, while that over the central to eastern Pacific is strengthened. Similarly, subseasonal convective activity, that is associated with the Madden-Julian Oscillation (MJO), is influenced by the ENSO. The MJO activity tends to extend farther eastward to the dateline during El Niño winters and contract toward the western Pacific during La Niña winters. However, overall level of MJO activity across the Maritime Continent does not change much in response to the ENSO.

It is shown that the boreal-winter MJO amplitude is closely linked with the stratospheric Quasi-Biennial Oscillation (QBO) rather than the ENSO. The MJO activity around the Maritime Continent becomes stronger and more organized during the easterly QBO winters. The QBO-related MJO change explains up to 40% of interannual variation of the boreal-winter MJO amplitude. This result suggests that variability of the MJO and the related tropical-extratropical teleconnections can be better understood and predicted by taking not only the tropospheric circulation but also the stratospheric mean state into account. The seasonality of the QBO-MJO link and the possible mechanism are also discussed.