TRMM observations of convective variability associated with the austral summer MJO, Kelvin wave, and equatorial Rossby wave.

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It is widely known that equatorial atmospheric waves are often accompanied with systematic progress in convective activity (shallow to deep and convective to stratiform) at various time scales. It has not been satisfactorily understood yet how convection is organized by and impacts on different phases of large-scale wave dynamics in some coherent manner. In this study, 9-season observations from the Tropical Rainfall Measuring Mission (TRMM) are analyzed for diagnosing the convective variability in association with the austral summer Madden-Julian Oscillation (MJO) as well as the Kelvin and equatorial Rossby (ER) waves.

The result confirms the development of shallow and cumulus congestus clouds in prior to MJO peak convection and the subsequent increase of extending high clouds. The Kelvin and ER waves also accompany the preceding development of shallow clouds, while these waves exhibit no clear evidence for lingering high clouds. Moisture convergence appears to lead humidity by a day or two for the Kelvin and ER waves, which is not as evident for the MJO. Sea surface tends to warm more than a week before MJO convection peaks, while no prior increase in SST is found for the Kelvin and ER waves. A hypothesis that MJO convective burst could be brought by the frictionally modified Kelvin wave interacting with the ER wave is discussed in attempt to explain the present findings.