Moisture Cycle of the Madden-Julian Oscillation, Convectively Coupled Kelvin Waves, and a Subset of Waves in Between

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Abstract:

The relationship between water vapor and rain rate are analyzed for the Madden-Julian Oscillation, convectively coupled Kelvin waves, and a subset of slow, zonally narrow eastward propagating waves in between the two. Waves are identified by the Realtime Multivariable MJO Indices from Wheeler and Hendon (2004) for the MJO and by indices created by Roundy for the CCKW and zonally narrow MJO. Columnar atmospheric water vapor and rain rate from the Tropical Rainfall Measuring Mission (TRMM) Microwave Imager (TMI) are used to demonstrate rainfall as a function of water vapor for phases in each category of waves. The Madden-Julian Oscillation phases and composite show more water vapor in the column before peak convection as water vapor and rain rate increase and decrease together. Convectively coupled Kelvin waves have larger differences between the phases and the composite shows more water vapor after peak convection. Slow, zonally narrow eastward moving waves have a moisture cycle comparable to the MJO just on a smaller temporal and spatial scale.