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Observation and Couple Model Study of CINDY/DYNAMO MJO Suppressed Phase

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The diurnal variability and the environmental conditions that support the initiation of two MJO events observed in October-December 2011 during the CINDY/DYNAMO campaign is investigated using a cloud resolving fully air-ocean-wave Coupled Ocean Atmosphere Mesoscale Prediction System (COAMPS). During each MJO suppressed phase analyzed, an increase in the water vapor in the air column was followed by dry periods evident in both the observation and COAMPS. Spectral density analysis of the satellite precipitation and total precipitable water analyzed from soundings taken within the equatorial central Indian Ocean and COAMPS reveals both diurnal and two-, and six- day oscillation exist during the suppressed phase preceding the MJO initiation. The ocean has a similar oscillation time-scale as well as a 20-30-day oscillation. Observations further reveal the moisture resurgence in the suppressed phase consists of several 3-4 days events that begin with an intense equatorial heating followed by a combination of organized and isolated convection. COAMPS sensitivity runs on one of these evens occurs on 12 Nov, 2011 suggest the local-air-sea interaction and horizontal moisture transport associated with the westward and eastward moving Mixed gravity Rossby and inertial gravity waves play an non-negligible role in modulating the rate of moisture resurgence during the MJO suppressed phase. Model domain averaged results suggest a positive feedback loop wherein high SST anomalies that develop in the suppressed phase act to increase low-level convergence that leads to increased moisture and precipitation. Model-simulations show there is a strong diurnal coupling of precipitation, low-level convergence, and total condensate as well as SST during the suppressed phase. We will discuss the relative role of large-scale waves and local air-sea interaction in this moisture resurgence process.