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Evolution of Convective Echo Top Heights Observed by TRMM Radar over the Indian Ocean and Maritime Continent during DYNAMO

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Radar data from the Tropical Rainfall Measuring Mission (TRMM) show the evolution of echo tops of convective elements over the Indian Ocean and maritime continent during the Dynamics of the Madden-Julian Oscillation (DYNAMO) field campaign of 2011-1012. Echo top heights exhibited a bimodal distribution wherein cumulonimbus of moderate height constituted a "shallow mode" while vertically extensive cumulonimbus made up a "deep mode." The intraseasonal time scale dominated variability in these modes from October to January over much of the Indian Ocean. The convection shifted from a shallow mode during suppressed MJO periods to a bimodal distribution during active periods within the southern hemisphere ITCZ. Over the maritime continent, there was no clear intraseasonal signal. Where the intraseasonal oscillation was detected, radar echoes evolved from being dominated by the shallow mode to being characterized by more deep mode convection on time scales of less than one week. The number of shallow echoes began to increase 4–6 days prior to the rise in number of deep echoes. During the October and November MJO events, convective onset near Addu City occurs prior to or concurrently with onset at locations throughout the equatorial Indian Ocean. These satellite-derived results confirm that the time scale for convective deepening on the large-scale is consistent with that seen at individual DYNAMO observational sites. Gradual build-up of convection as depicted by the "discharge-recharge" hypothesis does not appropriately describe evolutions of convection prior to MJO events observed during DYNAMO.