

Abstract for MJO Field Data and Science Workshop, Kohala Coast, Hawaii, 4-8 March 2013.

Equatorial waves and November 2011 MJO Initiation

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The role of Kelvin and Rossby waves in November 24th 2011 MJO initiation event is studied using the DYNAMO observations, coupled mesoscale model (coupled COAMPS) forecasts and analysis as well as shallow water model experiments. It is shown that the November MJO developed due to the interaction between eastward propagating multiple Kelvin waves and the westward moving tropical depression, which subsequently became the Tropical Storm TC5 near Sri Lanka and moved into the Arabian Sea.

Two Kelvin waves related to DYNAMO November MJO were evident in TRMM precipitation as well as DYNAMO soundings. Before the MJO initiation the first Kelvin wave was associated with increased westerlies and the circulation related to tropical depression provided the moisture convergence into the Kelvin wave convective area. The merge of the waves lead to rapid development of westerly flow, allowing for extracting energy accumulated in the ocean. The November 24th westerly burst was followed by the relatively suppressed period and redevelopment of convection related to the passage of the second wave.

The role of SST diurnal cycle in this process is investigated. It appears that the diurnal variability of SST contributed to increased convection on the leading edge of the Kelvin wave/MJO. Rapidly changing SST could also provide the variability of the convective heat sources that triggered the multiple Kelvin waves.