ABSTRACT

The impact of intraseasonal oscillations on weather and climate of Sri Lanka has been studied using station rainfall data, gridded rainfall data, reanalysis data, real time multivariate MJO (RMM) index, BSISO index, and satellite observations such as Outgoing Long wave Radiation (OLR) from 1981 to 2010.

Within the broad range of 20 to 90-day periods, two period ranges, with periodicities between 20 and 30 days and 40 and 60 days, are particularly prominent over Sri Lanka region.

To investigate the influence of the MJO on rainfall in Sri Lanka, composites are constructed for each of the eight phases of the MJO using the RMM index, and daily rainfall data over Sri Lanka for four climatic seasons. Composites of lower tropospheric wind and convective anomaly are also investigated in order to examine how the local rainfall anomalies are associated with large-scale circulations. The greatest rainfall impact of the MJO over Sri Lanka occurs in the Second Inter-Monsoon (SIM), and Southwest Monsoon (SWM) seasons. Enhanced rainfall over Sri Lanka occurs during RMM phases 2 and 3 when the MJO convective envelop is located in the Indian Ocean, and conversely suppressed rainfall in phases 6 and 7. This rainfall impact is due to the direct influence of the MJO's tropical convective anomalies and associated low-level circulations in the Bay of Bengal. In contrast, the MJO influence during the Northeast Monsoon (NEM) season is slightly less than during the SWM and SIM seasons as a result of the southward shift of the MJO convective envelop during boreal winter. Occurrence of extreme rainfall events is most frequent during

phase 2 in FIM (First Inter-Monsoon), phases 2 and 3 in SWM, phases 1, 2 and 3 in SIM and phases 2 and 3 in NEM seasons. The analysis of this study provides a useful reference of when and where the MJO has significant impacts on rainfall as well as extreme rainfall events during four climatic seasons in Sri Lanka.

To investigate the influence of the BSISO on rainfall in Sri Lanka, composites are constructed for each of the eight phases of the BSISO1 and BSISO2 indices using daily rainfall data during SWM season. For BSISO1, positive rainfall anomalies are evident from phase 1 to 3 and negative rainfall anomalies are evident from phase 5 to 7. Widespread positive rainfall anomalies are apparent in the phase 1 and widespread negative rainfall anomalies are evident in phase 5 of BSISO2. Enhanced rainfall from phases 2 to 3 and suppressed rainfall from phases 6 to 7 are evident over the Southwest quarter of Sri Lanka for BSISO2.

The analysis provides a useful reference of when and where the MJO and BSISO has significant impacts, and can be used as a prediction tool to complement the suite of extended range forecast tools used at the Department of Meteorology, Sri Lanka. In addition, the composites of 850-hPa circulation anomalies created for all four climatic seasons, implies that the rainfall variability is largely influenced by the MJO and BSISO modulated circulation over Sri Lanka. It is demonstrated that there is potential forecast skill in the SWM and SIM seasons, by using the MJO composites, provided that the dynamical or statistical tools can accurately predict the MJO phase.