Influence of Large-scale circulation features and El Nino conditions on Southwest Monsoon Rainfall 2015 in Sri Lanka

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ABSTRACT

In this study, rainfalldata from 80 rainfall stations and JRA 55 reanalysis data are used to analyse rainfall anomaly distributions over Sri Lanka and large scale circulation anomalies present during SWM 2015. Those circulation anomalies are compared with El Nino composites to see the influence of current El Nino episode on SWM rainfall 2015 over Sri Lanka. Weakening of Mascarene high and Indian low is responsible for diminishing of cross equatorial pressure gradient during SWM 2015. Hence weakening of Somali jet is evident with anomalous north easterly to northerly wind component over Somali area at 850mb level. Weakening of Monsoonal flow with waning of lower tropospheric and mid tropospheric monsoonal wind flow at 700mb and 500mb with anomalous north easterly wind over western Indian ocean and weakening of upper tropospheric tropical easterly jet at 250mb level with anomalous westerly wind component over Sri Lanka is apparent in 2015. Weakening of monsoon flow over Sri Lanka, reduce the orographic rainfall over western slopes of central hills resulting a deficit of seasonal SWM rainfall over that area. With the weakening of monsoonal flow over Sri Lanka coastal convergence may have played an important role of bringing above normal rainfall over southwestern coastal areas. Spatial distribution of rainfall anomaly in SWM 2015 captures the features of spatial distribution of rainfall during El Nino years.

Key words: Monsoon, El Nino, Somali Jet, Tropical easterly jet

1. Introduction:

South West Monsoon (SWM) rainfall 2015 over Sri Lanka has been significantly below normal over interior parts of the Southwest quarter (Fig. 2) where the mid-elevations of the western slops (Ginigathhena- 3267 mm, Watawala- 3252 mm, Norton- 3121 mm) receives highest rainfall in SWM season according to the Department of Meteorology records. By the end of September, 2015 the water levels in major reservoirs had come down to 35 percent and the hydropower generation had been reduced to 20 percent according to the System Control General Manager of Ceylon Electricity Board (CEB).

Extremes in year-to-year variations of long-term mean precipitation of SWM manifest themselves in the form of large-scale floods and droughts (Parthasarathy and Mooley, 1978; Shukla, 1987; Mooley and Shukla, 1987) and cause devastating human and economic loss and adversely affect the agricultural production in the region (Parthasarathy et al., 1988; Webster et al., 1998; Abrol and Gadgil, 1999).

Asian monsoon and El Nino Southern Oscillation (ENSO) are two of the most important components of the tropical coupled ocean atmosphere system. The tropical temporal climate variability is controlled by life cycles of these large scale climate systems, which also interact with each other. For example, the Asian Monsoon is a part of strong annual tropical cycle. On the other hand the main source of tropical interannual variability is ENSO. Both monsoon and ENSO are also mutually and inversely related through large scale convective and circulation patterns in the atmosphere (Lau and Yang, 1996).

Objective of this study is to analyse large scale circulation anomalies associated with SWM 2015 and to identify the possible influence of large scale teleconnections for the deficit of SWM rainfall especially over interior parts of Southwest quarter of the island.

2. Data and Methodology