A STUDY OF RAINFALL FLUCTUATIONS IN THE HOMOGENEOUS RAINFALL REGIMES IN SRI LANKA

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ABSTRACT

The major aim of this study was to investigate the rainfall fluctuation pattern in Sri Lanka on the basis of homogeneous rainfall dominant regimes and find teleconnection signals in the seasonal and annual rainfall of Sri Lanka.

In order to justify need for a study of this nature a comprehensive literature review has been carried out. Following this the weather and climate of Sri Lanka has been thoroughly re-examined. As part of the study on weather elements, moisture regimes and thermal regimes are classified using cluster and discriminant analysis.

An attempt was made to quantify the seasonality and two seasonality regimes (high and moderate) were identified from the statistical analysis carried out on the index of seasonality. Rainfall variability pattern was studied with the aid of variability indices i.e. coefficient of variability, relative variability and relative sequential variability. The relationship between these indices and standard deviation was examined on a seasonal and an annual basis. It was found the seasonal and monthly variability were higher than that of annual and they were inversely correlated with the annual rainfall. Rainfall intensity was studied in terms of the mean number of wet days and the occurrence of rain per wet day. It was found that the former increases with the increase of mean rainfall probability of occurrence of mean rainfall. Probability of occurrence of a wet day was also studied in terms of a monthly, seasonal and annual basis. Correlation analysis was carried out between rainfall and amount of rain per wet day for seasonal and annual rainfall according to the rainfall regime. Probability analysis of rainfall has been done by (**a**) percentage probability (**b**) constant probability methods on a monthly, seasonal and annual rainfall according to rainfall regimes. The derived values are given in table form.

Homogeneous rainfall regimes, **Macro, Meso & Micro** which emerged from the cluster and discriminant analysis is the firm base of this study. The macro regime referred as the dry and wet zones and a new definition for demarcating these regimes has been given and it was compared with the definitions given on the previous classifications. Three meso scale regimes have also been elucidated and referred to as rainfall dominant regimes i.e. **SWM** dominant regime, **NEM** dominant regime and **IM II** (**A&B**) dominant regime. The boundary between **NEM** and **IM II** is a significant finding like new boundary suggested for dry and wet zones. Further, an **intermediate zone** between **dry/wet zones** is also identified. The micro scale rainfall regimes, particularly the 30 and 40 cluster groups have significant value for the planning purposes. A brief account of each of the 30 micro rainfall regimes has also been given.

Rainfall fluctuations have been studied by serial correlation and power spectrum analysis. Prior to the application of these techniques to the rainfall series, trend analysis was carried out and the significance of trend was tested by Mann-Kendall rank statistics. Those series with significant trend were subjected to a de-trending procedure in order to remove trend. The findings of serial correlation and power spectrum analysis have been discussed on the seasonal and annual basis for each of the dominant regimes. The analysis reveals that both the series of an Individual station and the region as a whole, have high frequency variation. The rainfall fluctuation ranges between 2 to 16 years among the rainfall dominant regimes. The major types of fluctuations, i.e. Quasi - biennial oscillation, 3 - 4 year oscillation, quasi 5 - 6 year oscillation and 8.7 - 11 year oscillation are compared with similar fluctuations found elsewhere in the tropics.

Teleconnection signals have been identified by cross correlation analysis between the Southern Oscillation Index and seasonal rainfall and annual rainfall of the rainfall regimes. The analysis reveals that during **El Nino** (***La Nina***) events, the **SWM** monsoon suffers from below (above) normal rainfall. This seasonal rainfall could be predicted one season ahead. The **SOI** Signals are more pronounced in the **IM II** season and with the aid of 501, the rainfall of this season could be predicted two season before. During **El Nino** (***La Nina***) the **NEM** receives above normal (below normal) rainfall. The nature of the winter monsoon can be predicted one season before its commencement. Echoes of teleconnection signals have also been found in the upper air circulating over Sri Lanka. Distinctive seasonal patterns of upper air Winds have been identified. Strong westerlies dominate up to 450 mb during April to October, Whilst strong westerlies are dominating above this level, However, during November to March wind directions Show predominantly an easterly component and easterly winds dominated both upper and lower levels during **NEM**, However, it was also found that the changes in wind directions in relation to **ENSO** phenomena during each rainfall seasons have been identified and demonstrated.

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