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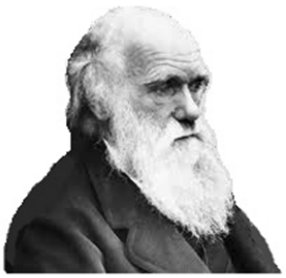

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Rainfall Variability of South-West Monsoon: a Special Study Based on Ratnapura District, Sri Lanka

M. I. M. Kaleel

Department of Geography, South Eastern University of Sri Lanka, Oluvil, Sri Lanka

E-mail address: kaleelmim@yahoo.com

ABSTRACT

This study was conducted using secondary data from the Meteorological Department obtained from five stations in Ratnapura District: Ratnapura, Eheliyagoda, Balangoda, Lellopitiya, and Embilipitiya. The objective of the study was 'to identify rainfall trend and variability analysis in the study area and to find the impact of climate changes on rainfall variability in the study area'. The average rainfall in the selected stations are: in Embilipitiya - between 112 mm to 170 mm, in Balangoda - from 170 mm to 230 mm, Lellopitiya – from 230 mm - 290 mm, and in both, Ratnapura and Eheliyagoda - 290 mm to 360 mm. To identify the rainfall variability, the moving average technique was employed, using data of 7 years. According to the results of this study, climate change has impact on rainfall variability in the Ratnapura District.

***Keywords*:** Rainfall variability, Climate change, Moving average, Meteorological Department, Ratnapura District, Sri Lanka

1. INTRODUCTION

The Asian monsoon climate is significantly dominated by Indian summer monsoon rainfall [1]. Sri Lanka also receives rainfall from three types, namely monsoonal rainfall, convectional rainfall, and depression rainfall. Monsoon rain occurs during the two monsoon periods, namely, the South - west and North - east, and is responsible for nearly 55% of the annual precipitation. Convectional rainfall occurs during the inter monsoon periods, mainly in the afternoon or evening, and is likely to be experienced anywhere over the Island. Depression

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rainfall also occurs during the inter-monsoon periods, particularly during the second inter-monsoon (October to November) [5]. Rainfall during the South - west monsoon is mostly over the South - western parts of the Island. At the beginning, it occurs in the South - western low country. As winds strengthen, it spreads gradually to the interior, with considerable heavy rain in the hill country from June to August. South - west monsoon rainfall exceeds 3,000 mm (118") at a few places in the Kegalle and Nuwara Eliya districts [4].

This south-west monsoon rainfall is causing impacts in the Ratnapura District in Sabaragmuba province. The soil types and plants reflect the climate of this area. The Ratnapura district is one of the wet zones in Sri Lanka which receives the higher rainfall during the south-west monsoon. The main weather observation center is situated in Ratnapura area. It has more than 120-year's annual average rainfall. 1889 – 2009 rainfall data from sub- weather observations center's data were used to the statistical process. More than 120-year's rainfall data were used to explain scientifically, and the variability of south-west monsoon and changes of seasonal trends were identified using the 7-year's moving average trend [2, 3, 6-10].

2. STUDY AREA

Ratnapura District, being 3,239 km^2 in an area, is situated between 6 15 to 6 55 North Lattitude, and 80 57 East longitude in Sabaragamuva Province (**Figure 1**). It has 17 Divisional Secretariats and 575 Grama Niladhari Divisions. The boundaries of the area are [11-16]:

- North - Kegale, Nuwara eliya
- East – Moneragale, Badulla
- South – Galle, Matara, Hambantota
- West – Colombo, Kalutara.

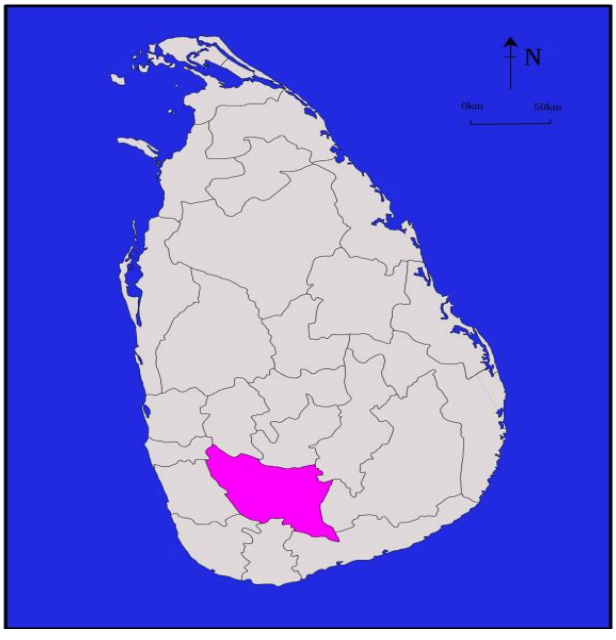

Figure 1. Study area

3. MATERIALS AND METHODS

This study was conducted using the secondary data from the selected meteorological stations, such as Ratnapura, Lellopitiya, Balangoda, Eheliyagoda and Embilipitiya, Sri Lanka. Statistical method, such as moving average of 7 years, was found and shown using the descriptive graphs.

4. OBJECTIVE OF THE STUDY

- To identify rainfall trend and variability analysis in the study area
- To find the impact of rainfall variability in climate changes.

5. RESULT AND DISCUSSION

7 years' moving average of Embilipitiya meteorological station, from 1940-1992, is shown in **Figure 2**. The trend of the rainfall in Emilipitiya meteorological station has gradually been reducing. 1969 is the peak (26.0 mm) of 7 years' moving average and the lowest (7.8 mm) moving average is shown in 1983. According to this result it is forecasted that in forthcoming set of years the rainfall trend would be decreasing, based on the trend line. The annual average rainfall in this area ranges from 112 mm -170 mm. In total 48 years, average of the 7-years'moving average is 16.2, of which almost 20 years more than 16.2, whereas 28 years are included less than that.

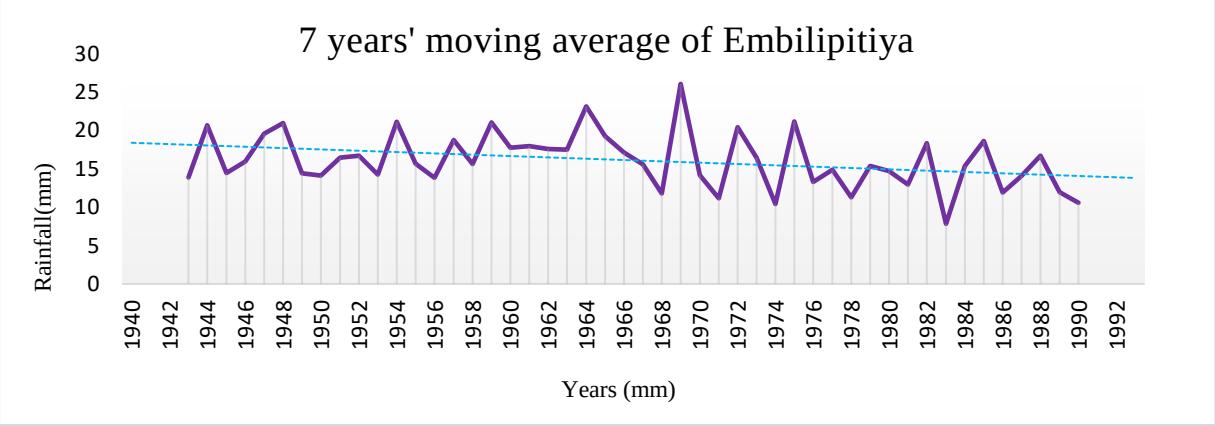

Figure 2. 7 years' moving average of Embilipitiya meteorological station

In Balangoda station (**Fig. 3**) the average rainfall ranges from 170 mm to 260 mm, whereas the average of 7 years' moving average is 335.9 mm. In total, 50 years' moving average, approximately 23 years received more than 335.9 mm rainfall as total 7 years' average. Rest of others are less. The trend of the 7 years' moving average has slightly been reducing in the Balangoda station.

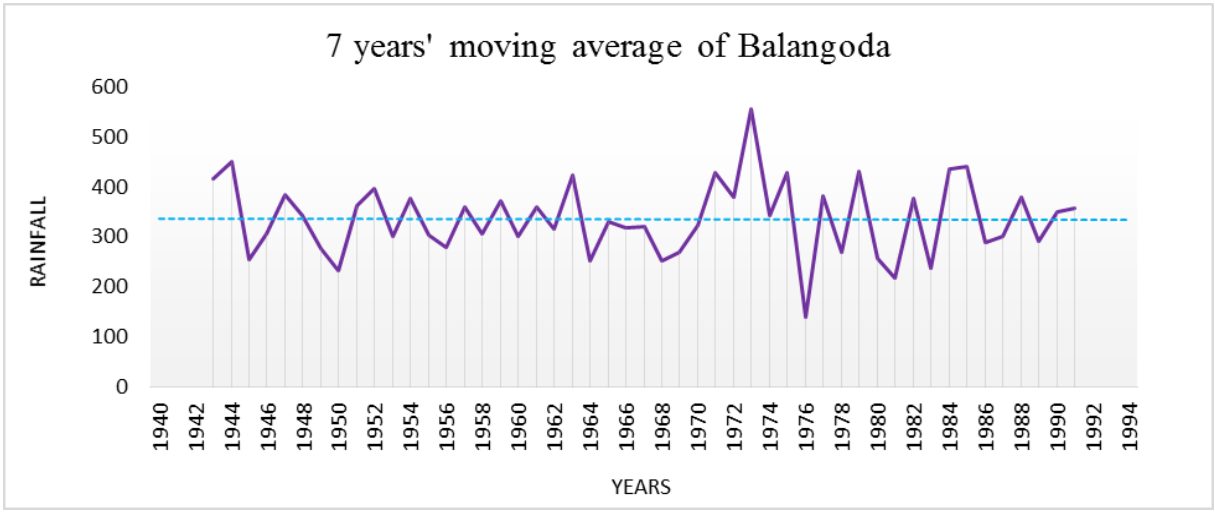

Figure 3. 7 years' moving average of Balangoda station

The average of 7 years' moving average of the Lellopitiya satiation is 534.1 mm. Thus, the average annual rainfall of Lellopitiya station ranges from 230 mm to 290 mm. In total 33 years more than half of years received the average of 7 years' moving average. The trend of 7 years' average rainfall of Lellopitiya stations has also been reducing, according to **Figure 4**.

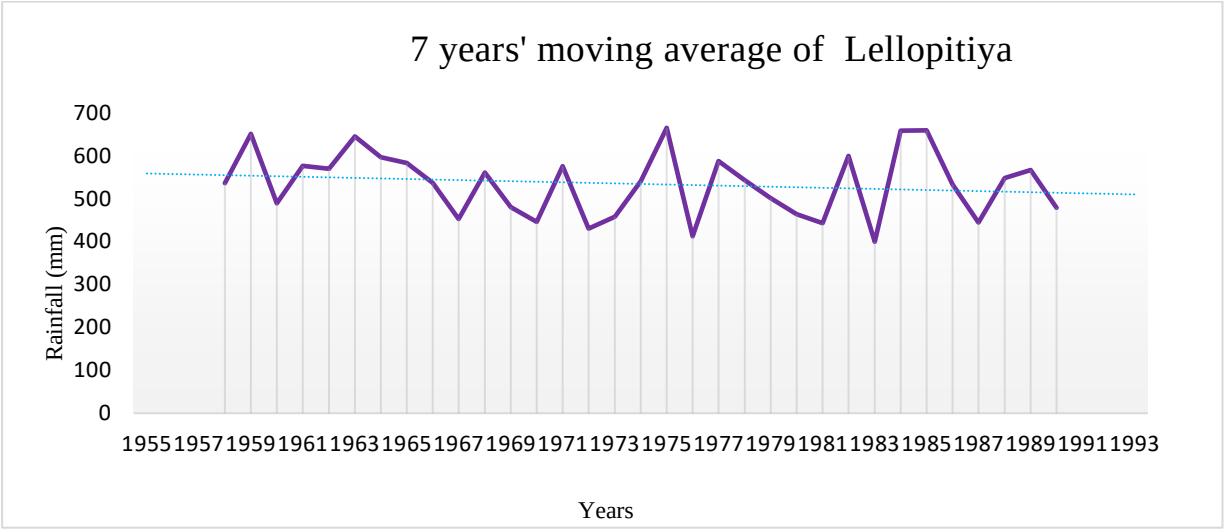

Figure 4. 7 years' moving average of Lellopitiya station

According to **Figure 5**, the average rainfall of Ratnapura station ranges from 290 mm to 360 mm. The average of 7 years' moving average is 52 mm. In total of 56 years, 50 percent of the years have more than the average of 7 years' moving average. The 1878 and 1915 years have the peak value 66.4 mm and 65.7 mm, respectively; and the lowest value was 29.3 mm in 1900. In this station, the rainfall trend has minimally been increasing.

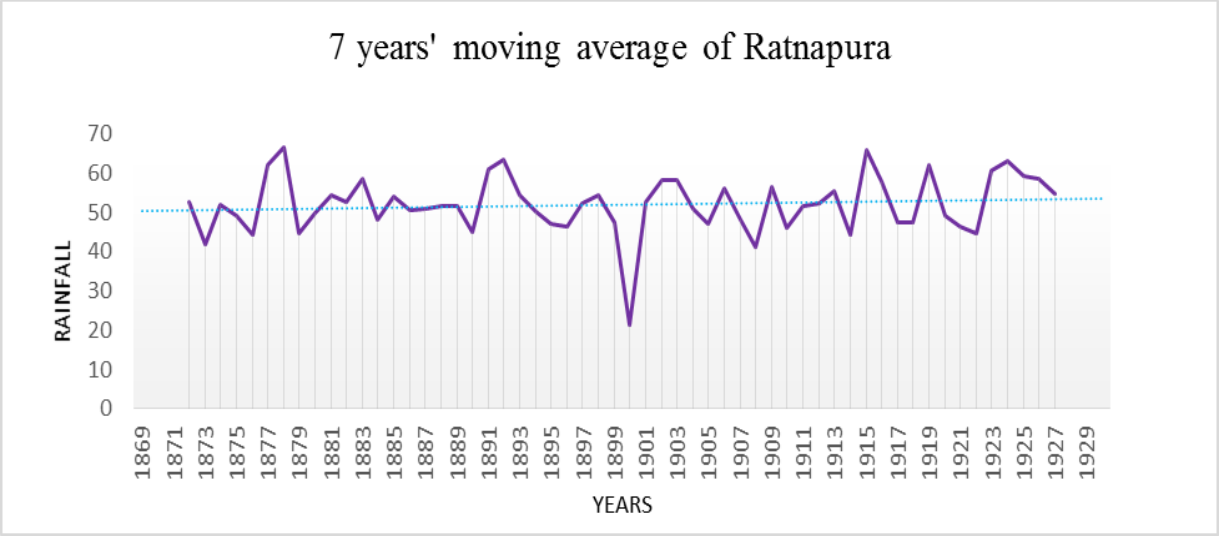

Figure 5. 7 years' moving average of Ratnapura station

The average rainfall of Eheliyagoda station ranges 290 mm to 360 mm, according to the **Figure 6**. The peak value of Eheliyagoda station was 857.1 mm in 1923. The lowest moving average values of this station are 484.5 mm, 469 mm, and 484.5 mm in the years of 1945, 1973, and 1977, respectively. The rainfall pattern in the Eheliyagoda station has slightly been reducing.

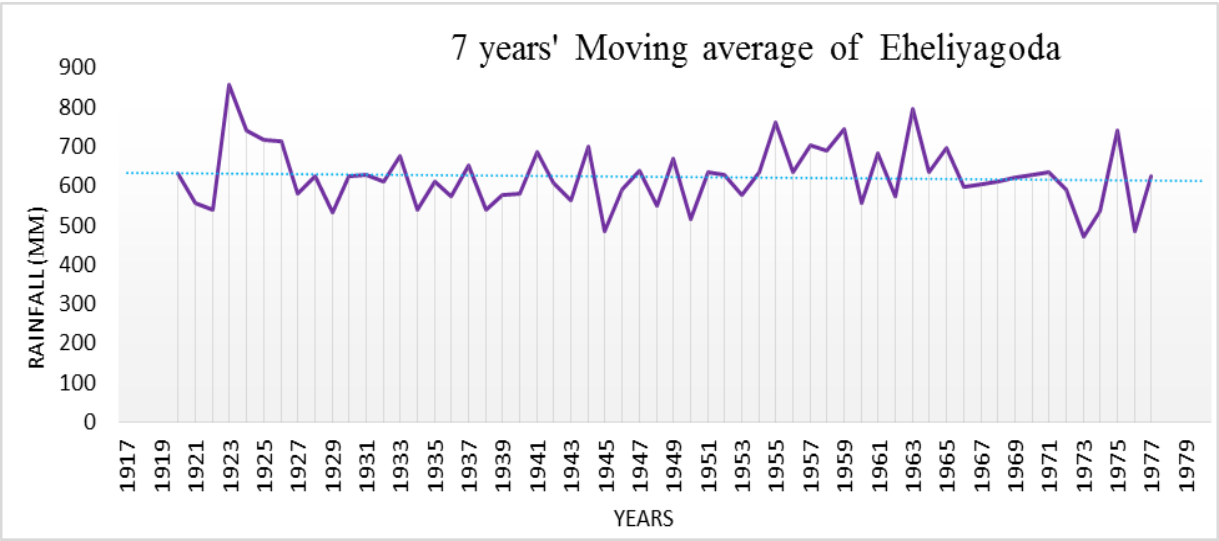

Figure 6. 7 years' moving average of Ehelityagoda station.

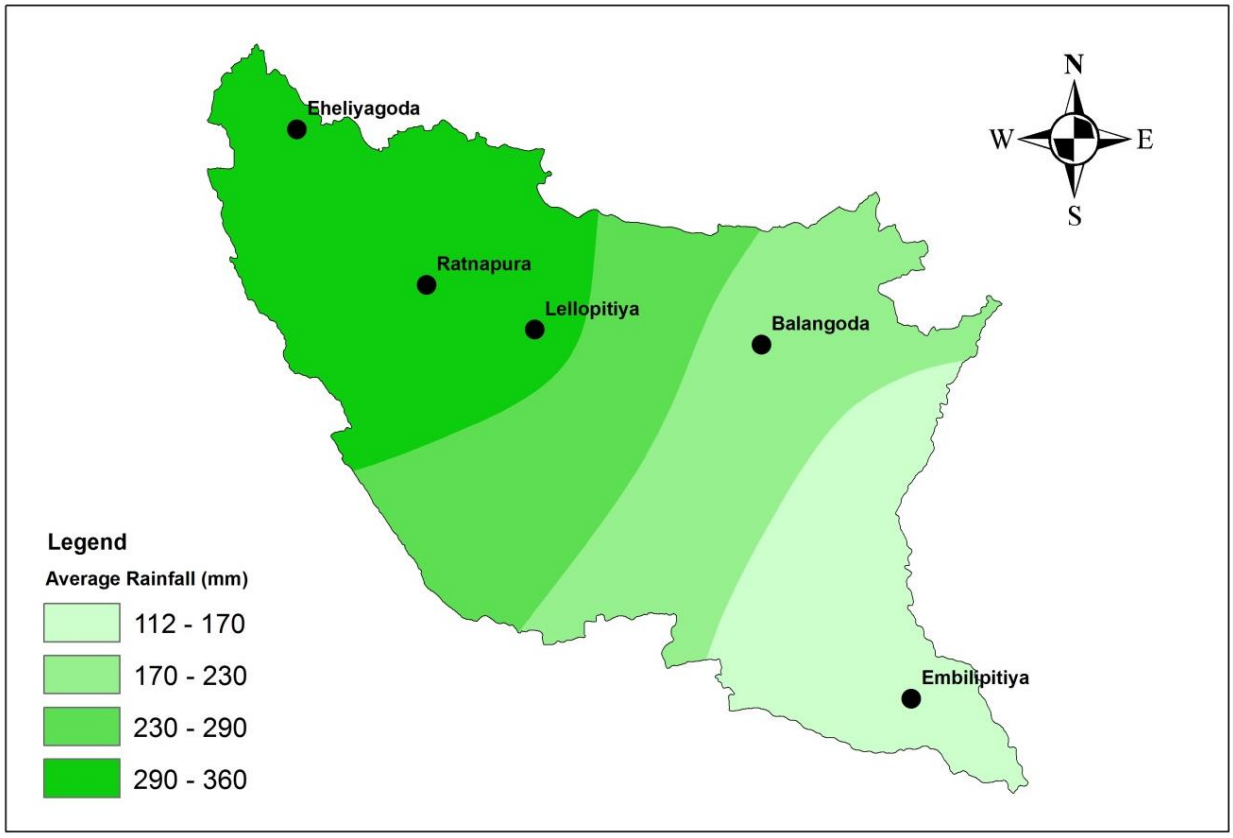

Figure 7. The annual average rainfall intensity of Ratnapura District.

5. 1. Impact caused by the rainfall in the study area

- Frequent occurrence of Landslide in the study area
- Loss of agriculture in the study area due to the extreme events, such as flooding and drought
- Changes in the land use pattern
- Water-borne diseases.

6. CONCLUSION

The south-west monsoon of Sri Lanka causes rainfall variability in the study area (**Figure 7**). It is impossible to control the natural events but it should be managed using proper mitigation plans. The long-term rainfall variability clearly shows the climate changes and the extreme events as well. Based on the trend of the average rainfall it is obvious and important to make future plans in the study area to control and conserve the worse conditions.

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