

Onset and Retreat of Rainy Season in the Dry Zone

D.U.J. Sonnadara

Department of Physics, Faculty of Science

Background

Sri Lanka is an island in the Indian Ocean, located off the southern coast of India. The climate of Sri Lanka is considered to be warm and tropical. The mean daily temperature ranges from about 16 °C in the central highlands, to a maximum of 33 °C in low-altitude coastal areas. There are predominantly two climatic zones in Sri Lanka, the central and the south-western part of the country, known as the wet zone and the southeast, east, and northern parts of the country, known as the dry zone. When considering the wind pattern, the year can be divided into four climate seasons, namely the two monsoons (South-West from May to September and North-East from December to February) and the two inter monsoons. There is high variability of rainfall in different parts of the country during these four seasons. Since Sri Lanka's economy depends on agriculture production, understanding temporal variation in climate in different parts of the country, especially the variations in the start and end of the rainy seasons is important to enhance agricultural productivity.

A number of methods have been adopted to determine the onset and retreat of rainy seasons (Odekunle, 2006). Studies carried out in Africa show that the percentage cumulative mean rainfall is one of the frequently used methods. Since rainfall is a readily available measurement, there are advantages in using it rather than using an associated variable. Since patterns of dry spells and wet spells at the start and end of rainy seasons are critical for crop growth, there is an advantage of developing an index to determine the start and end of rainy seasons based on the temporal patterns of rainfall events (Cook, G.D., Heerdegen R.G. 2001). The main objective of this study is to look into the feasibility of determining the onset and the retreat dates of the rainy season in the dry zone.

Data Sample

The data sample used in this study are daily rainfall measurements recorded during the period from 1961-2000 in three meteorology stations (Jaffna, Trincomalee and Baticaloa) maintained by the meteorology department of Sri Lanka. These stations were selected since they receive rainfall predominantly during northeast monsoons.

Results

Variation of cumulative rainfall

First the calendar year was shifted by 6 months so that the peak of rainy season comes in the middle of the 365 day year. In order to calculate the onset and retreat dates from rainfall amounts, 5 day totals of rainfall were calculated followed by a percentage of rainfall in the 5-day period. Then, the cumulative rainfall was calculated from the percentages (see Figure 1a). The onset and retreat of the rainy season is defined as the

maximum positive curvature point to the maximum negative curvature point (Odekunle, 2006). Figure 1b shows the curvature determined from the cumulative 5 day percentage of rainfall values. It is seen that this point roughly corresponds to 10% and 80% of the annual rainfall. The onset and retreat dates values extracted from this study are shown in Table 1.

Table 1: The timing of rainy season determined from cumulative rainfall

Station	Onset	Retreat	Length (Days)
Jaffna	87 (Sep 25)	183 (Dec 30)	97
Trincomalee	88 (Sep 26)	194 (Jan 10)	107
Bataloa	108 (Oct 16)	197 (Jan 13)	90

Variation of 5-day dry spells

In this analysis, a rainy day was defined as a day having greater than 3 mm of rainfall. Figure 2a shows the distribution of wet and dry spells for the Jaffna station. It can be seen that wet and dry spells follow different scaling properties. With 5-day running mean, the dry season was defined as the time of the year when the 5-day dry spells (5 consecutive days where daily rainfall is below 3 mm) were greater than 0.5 (Cook, G.D., Heerdegen R.G. 2001). Thus, during the northeast monsoon season, 5-day dry spells are expected to fall below the 0.5 threshold. Figure 2b shows the probability of observing 5-day dry spells. The onset and retreat dates extracted from 5-day dry spell probabilities are given in Table 2.

Table 2: The timing of rainy season determined from 5-day dry spells

Station	Onset	Retreat	Length (Days)
Jaffna	91 (Sep 29)	183 (Dec 30)	93
Trincomalee	69 (Sep 07)	204 (Jan 20)	136
Bataloa	74 (Sep 12)	227 (Feb 12)	154

Conclusions

This paper presents results of two methods used to determine the onset and retreat of rainy season in the dry zone based on daily rainfall data recorded in Jaffna, Trincomalee and Bataloa weather stations during the period 1961-2000. Of the two methods are used, one depend on the cumulative rainfall and the other on the temporal patterns of rainfall. In determination of length of rainy season, Jaffna showed the smallest discrepancy while Bataloa showed the largest discrepancy. Based on the preliminary results, cumulative rainfall is recommended to determine the onset and retreat dates for individual years.

References

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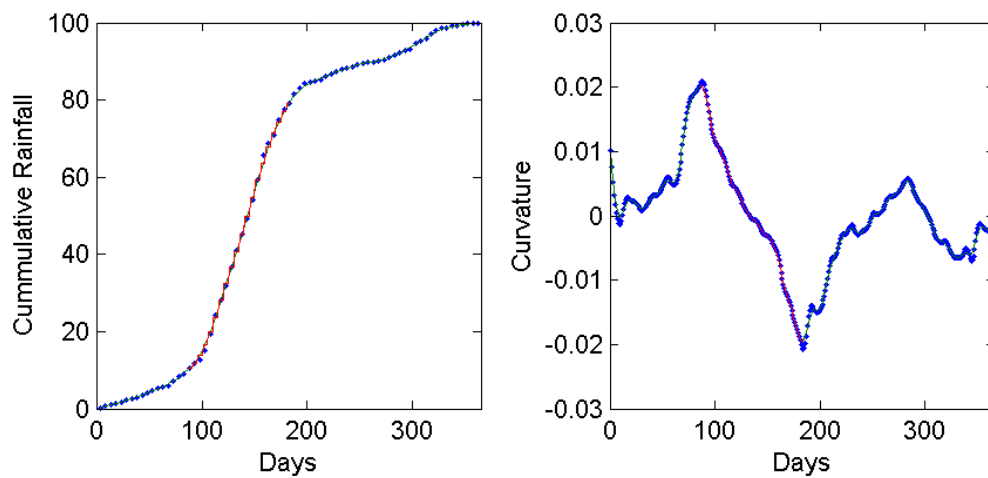


Figure 1: Jaffna (a) Cumulative rainfall (b) Variation of curvature

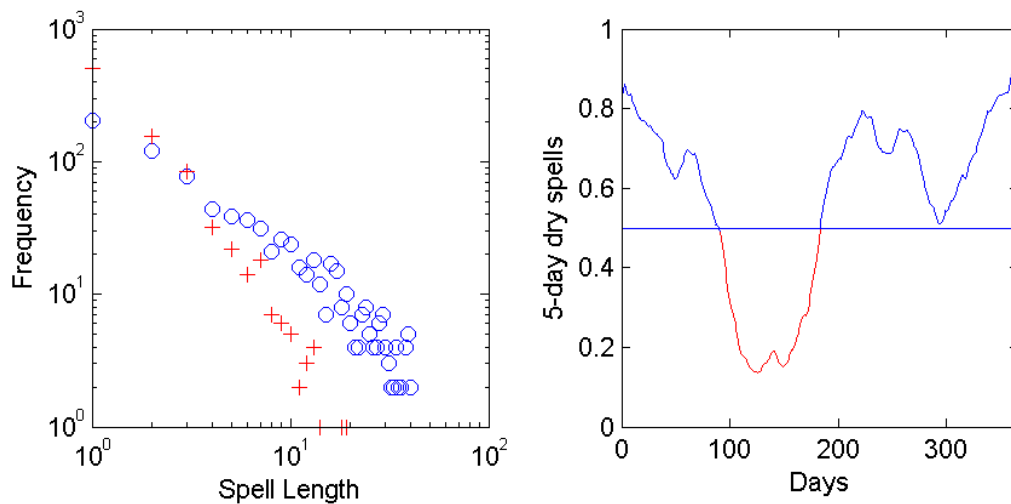


Figure 2: Jaffna (a) Distribution of wet and dry spells (b) Probability of observing 5-day dry spells