

# Onset of South West monsoon over Kerala with reference to climate change

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**Abstract** - The Onset of Kerala is the most anxiously awaited weather singularity in Indian subcontinent as it heralds the rainy season and marks the end of hot summer. Sixty percent of countries population are deriving its livelihood from agriculture. Therefore, any failure or even late arrival of monsoon rain has a strong impact on Indian economy. According to IMD criteria the normal onset of monsoon over Kerala is June 1<sup>st</sup> but due to climate variation we are observing early onset as well as late onset of south west monsoon. For this study it has been classified June 1<sup>st</sup> as normal onset day and date below June 1<sup>st</sup> as early the date above June 1<sup>st</sup> as delayed onset.

**Index Terms** - Onset, Normal Onset, Early Onset, Delayed Onset, Climate Change, South West Monsoon.

## I. INTRODUCTION

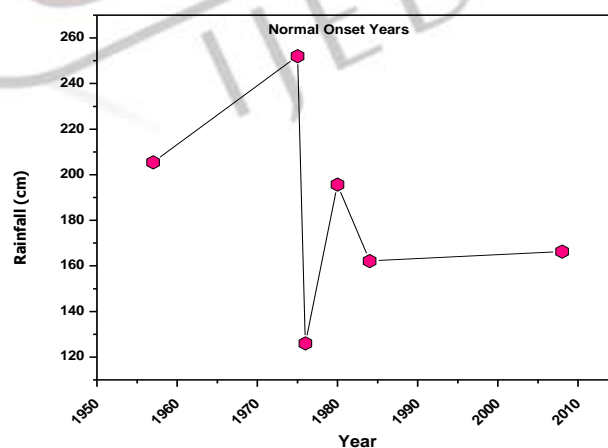
The climatic condition of earth has been changing over the past years. The climate change in weather has their effect influence on Kerala. Human activities are the main causes of climate change. The issue of climate change due to human activities can be looked at from two broad angles emission of green house gases and damage to environment. Climate also change due to the over exploitation of nature, pressure on climate system due to land exploitation, deforestation, destruction of eco system, environmental pollution etc. Onset dates of South West monsoon over India is a very important event because its activity over the country is very useful to farmers and Indian economy [1]. Dates of monsoon onset and its associated features have been studied Bhullar (1952), Subramayya et.al (1984) and Dhar et. al (1980) found that quantum of rainfall during monsoon season does not have any association with onset dates [2-4]. The feature of variability of onset, withdrawal and duration of monsoon will certainly help the agriculturalist, farmers and planners of the country, various users and also facilitate weather forecaster [5]. The monsoon onset over India is assessed through sudden intensification in the rainfall activity over Kerala situated in the southwest part of Indian Peninsula [6].

## II. DATA AND METHODOLOGY

The date of the monsoon starts over Kerala is variable and can be categorised as early, normal and delayed. The onset data for the study have been collected from IMD Pune. The dates of monsoon onset over Kerala were fixed for individual years 1900-2013. The time series is used to study the trend of normal, early and delayed onset years of Kerala.

## III. RESULT AND DISCUSSION

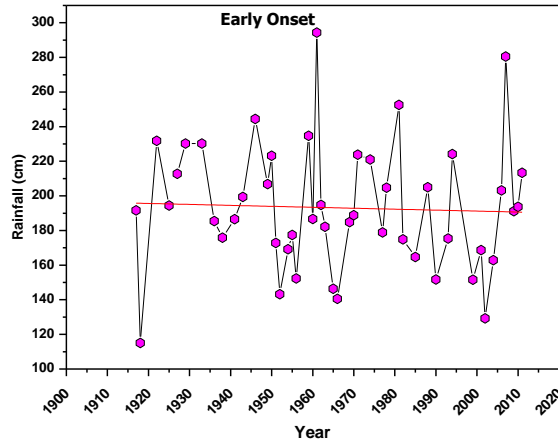
### Normal Onset years



**Fig. 1 Normal Onset year and rainfall**

The figure 1, shows a variation in total rainfall over Kerala during normal monsoon. Onset year for the study revealed a decreasing trend in rainfall. Out of one hundred twelve year study, the following years 1957, 1975, 1976, 1980, 1984, 2008 show normal onset year. During the normal onset 1975, shows the peak total rainfall of 252.1cm. The rainfall for the next year has much reduced to 126cm. This drastic change of rainfall may be attributed to the enhanced variation over the regional climate triggered due to global climate change. It may be also contributed to the industrial revolution initiating on 1970 marking a successive decline.

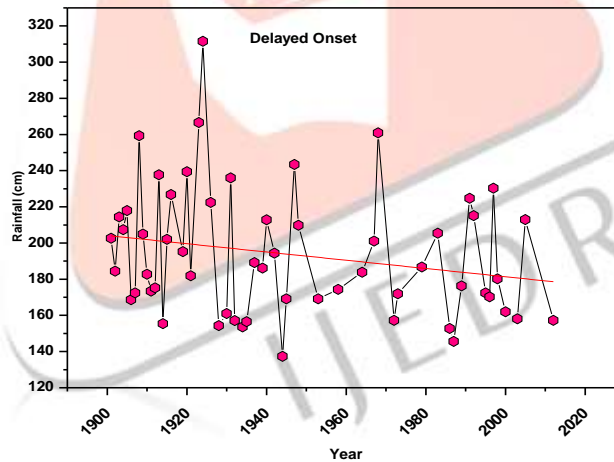
### Early Onset Years



**Fig. 2 Early Onset years and rainfall**

The figure 2, shows that the total rainfall over Kerala during early onset years of monsoon. The following years 1917, 1918, 1922, 1925, 1927, 1929, 1933, 1936, 1938, 1941, 1943, 1946, 1949, 1950, 1951, 1952, 1954, 1955, 1956, 1959, 1960, 1961, 1962, 1963, 1965, 1966, 1969, 1970, 1971, 1974, 1977, 1978, 1981, 1982, 1985, 1988, 1990, 1993, 1994, 1999, 2001, 2002, 2004, 2006, 2007, 2009, 2010 and 2011 show the early onset years. The analysis showed that a decreasing trend of total rainfall with primary minimum rainfall during 1918 (115cm) and secondary minimum during 2002 (129.2cm). Similarly, the maximum rainfall obtained during 1961 of 294.3cm and secondary maximum of 280.5cm during 2007. An earlier or delayed onset of the monsoon and break periods in the monsoon rainfall may have devastating effects on agriculture, even if the mean rainfall in the monsoon season as a whole is normal. As a result, understanding the dynamical mechanisms of the monsoon variability on time scale ranging from weeks to months is an issue of considerable interest.

### Delayed Onset Year



**Fig. 3 The delayed onset years and rainfall**

The delayed onset years and its rainfall are given in figure 3; the study shows a decreasing trend in rainfall over Kerala with a magnitude of  $-0.2281 \pm 0.1337$  cm. The primary and secondary maximum of rainfall have been observed during the year 1924 (311.5cm) and 1968 (260.9 cm), the same for minimum rainfall are observed during delayed onset years 1944 (137.4cm) and 1987(145.6cm).

#### IV. CONCLUSIONS

Out of one hundred and twelve year study only the six years shows the normal onset years. The above study appeals a decreasing trend in rainfall. This drastic change of rainfall may be attributed to enhanced variation over the regional climate triggered due to global climate change. The early onset of monsoon during 48 years and delayed onset of monsoon during 56 years show a decreasing trend indicate a sign of climate change. According to IMD criteria the normal onset of monsoon over Kerala is June 1<sup>st</sup> but due to the climate variation we are observing early onset as well as late onset of South west monsoon.

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