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Long dry spells of short return periods during southwest monsoon along the Konkan coast

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ABSTRACT. The southwest monsoon strikes the Konkan coast in the first week of the June and withdraws by the first week of October. The period June to September, being not the period of continuous rain, the pulsatory character of the monsoon is a very important feature. Since temporary monsoon breaks cause great anxiety in the country, an attempt has been made to examine how prolonged, on the average, are the monsoon breaks for various return periods, for certain stations along the west coast of India. As Lawrence (1957) after calculating the frequencies of runs of dry days of different lengths for some stations in southern and eastern England using 'Jenkinson probalility' method found that it does not provide reasonsable estimates of frequencies, the author has analysed the data by the techniques of extreme values statistical analysis. The values of length of runs of dry days during the southwest monsoon for 2, 5, 10 and 25 years return period for Karwar, Marmagoa, Ratnagiri, Bombay (Colaba) and Surat have been found.

1. Introduction

The southwest monsoon strikes the Konkan coast in the first week of June. It gradually extends northwards and establishes itself over the entire Konkan coast by the end of the second week of this month. The monsoon withdraws from this region approximately by the first week of October. The period June to September is known as the southwest monsoon period. The period is not one of continuous rain, and the pulsatory character of the monsoon is a very important feature. Since agriculture in India depends to a very large extent upon the rainfall of this season, the delay in the commencement of the monsoon, its earlier retreat and temporary break during this period cause great anxiety in the country. The purpose of this paper is to examine how prolonged, on the average, are the monsoon breaks for various return periods. The length of a spell of dry days of any return period is the maximum value of length which will be equalled or exceeded once every N years on the average over a long period of time. Since the length of run of dry days (*i.e.*, sequences of days with nil or trace rainfall) corresponds generally to the length of the monsoon break, an estimate of the former, for the various return periods will give an idea to the weather forecaster and agricultural planner, of the frequency and length of the probable monsoon breaks.

2. Methods of approach

Fisher and Tippet (1928) showed that extreme values found in meteorological data satisfy a functional equation. A general solution of this equation and a method for calculating the probable maximum value of meteorological element expected once in a given period of years, was found by Jenkinson (1955). Using 'Jenkinson's probability' method Raman and Krishnan (1960) calculated the probable maximum length of runs of dry days of various return periods for certain stations along the west coast of India. Lawrence (1957) calculated the frequencies of runs of dry days of different lengths for some stations in southern and eastern England using 'Jenkinson's probability' method and found that 'Jenkinson probability' method does not provide reasonable estimates of frequencies. In this paper an attempt has been made to analyse the actual data by the techniques of extreme values statistical analysis without assuming any particular distribution law.

3. Data

Daily rainfall data of 5 stations, *viz.* Karwar, Marmagoa, Ratnagiri, Bombay (Colaba) and Surat in the Konkan coast for the period 1921 to 1950 and for the months June to September were examined. A day on which recorded rainfall is nil or trace has been taken as a dry day.

4. Method of analysis

All the recorded runs of dry days for each of the above mentioned stations were arranged in descending order according to their lengths and given rank numbers. If the run of certain length has occurred n times and there were m runs of length higher than this run, the rank number of this run has been taken as $m+n$. The return period of run of any length was then calculated as T/R, where T is the number of years of record and R ($R=m+n$) is the rank number. The values of length of runs were plotted against return period

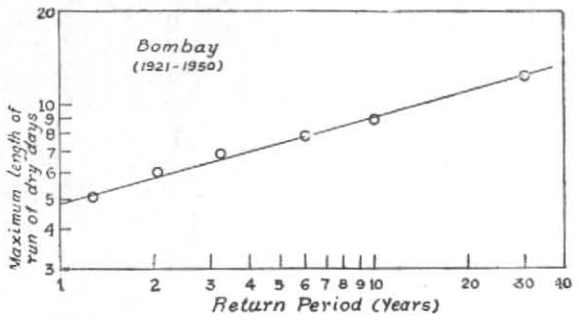

Fig. 1

on logarithmic paper and the smooth curve of best fit was drawn by inspection. It was found that the curves so fitted had very small departure from straight lines. The plotting for Bombay (Colaba) is shown in Fig. 1. From this curve 2, 5, 10 and 25 years' values of length of run of dry days were obtained. The 2-year value of length of run is the maximum length of run of dry days which will be equalled or exceeded on the average once in two years. The values of length of runs for various return periods for five stations for which the study has been carried out, are given in Table 1.

5. Conclusions

(1) Once in 2-year period the maximum break in monsoon (*i.e.*, sequence of days with nil or trace rainfall) occurs on the average for 6 days or more at Karwar, Ratnagiri and Bombay; for 7 days or more at Marmagoa; and for 11 days or more at Surat.

TABLE 1

Station	Maximum length of run likely to be equalled or exceeded at once in T years			
T=	2	5	10	25
Karwar	6·2	8·3	10·2	13·5
Marmagoa	6·8	10·0	12·0	14·8
Ratnagiri	6·0	8·1	10·4	14·0
Bombay (Colaba)	5·9	7·7	9·1	12·4
Surat	10·9	13·2	15·4	18·4

(2) On the average, once in 5-year period the maximum break in monsoon occurs for 8 days or more at Karwar, Ratnagiri and Bombay; for 10 days or more at Marmagoa, and for 13 days or more at Surat.

(3) Once in every 10-year period on the average the maximum break in monsoon occurs for 9 days or more at Bombay; for 10 days or more at Karwar and Ratnagiri; for 12 days or more at Marmagoa, and for 15 days or more at Surat.

(4) Once in every 25-year period on the average the maximum break in monsoon occurs for 12 days or more at Bombay; for 13 days or more at Karwar; for 14 days or more at Ratnagiri; for 15 days or more at Marmagoa; and for 18 days or more at Surat.

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