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Frequency of thunderstorms in South India

S. D. WILLIAMS

Meteorological Office, Madras

ABSTRACT. In this paper the average frequency of days of thunder in the different states of South India based on data for the years 1946 to 1956 have been discussed. Kerala State has the highest annual frequency of 57 while Madras has 37 and Mysore and Andhra Pradesh 29 each. In Madras State, there is a marked decrease of thunderstorm frequency along the coastal regions compared to the interior and this is very pronounced as one goes south.

1. Introduction

Although there have been a few studies on the frequency of days of thunderstorms in India in the past (India met. Dep. 1929, Venkiteshwaran 1932, 1933) they are subject to the serious limitation that most of these data relate to observatories which were manned by part-time staff. Due to the large increase in the number of stations with full-time staff since 1945, only later data from 1946 to 1956 have been utilised for the present study.

2. Data used

The number of thunderstorms reported in the *Monthly Meteorological Registers* of the observatories in the states of south India, *viz.*, Madras, Mysore, Kerala and Andhra Pradesh have been considered for working out the frequencies. A day of thunderstorm is one on which thunder has been heard. For purposes of frequency, whatever the number of occasions on which thunder has been heard on a day, it is counted as one. The average frequency for any state is the average of the values of the observations in the state. Frequencies above 2·0 are given in whole numbers.

3. Discussion and results

Table 1 indicates the mean monthly and annual number of days of thunder in the various states of south India. Kerala has the highest with an average annual frequency of 57, while Madras has 37 and Mysore and Andhra Pradesh 29 each.

The maximum frequency in Kerala occurs during the premonsoon months of April-May and the post-monsoon months of October-November when the wind system undergoes changes, *i.e.*, from northeast to southwest and from southwest to northeast. There is greater frequency during the premonsoon period than during the post-monsoon period, probably due to the additional factors of higher temperature, favouring insolation. The higher frequency of Kerala State may also be attributed to two other local factors, *viz.*, orography and sea breeze effect. The importance of orography has been referred to in the Report of the Thunderstorm Project, U.S.A. (Byers and Braham 1949). Besides orography, sea breeze also may be a significant local factor for contributing to the high frequency of thunderstorms in Kerala State. The westerly sea breeze ascends over the Ghats and gives the required lift for the thunderstorms to materialise near the foot of the Ghats and the thundercloud then passes west according to the prevailing winds aloft. This aspect of the question will, however, need more detailed analysis.

The mean monthly and annual frequency of thunderstorms in these states divided into coastal and interior regions are also given in Table 1. In Madras State, there is a marked decrease of frequency in the coastal regions compared to the interior, the annual frequency being 25 for coastal Madras compared to

TABLE 1

Mean monthly and annual frequency of thunderstorms in the coastal and interior regions of South India

	MADRAS			ANDHRA PRADESH			KERALA			MYSORE		
	Coastal	Interior	Combined	Coastal	Interior	Combined	Coastal	Interior	Combined	Coastal	Interior	Combined
Jan	0·1	—	0·1	—	—	0	1·3	0·2	1	0·3	0·1	0·1
Feb	0·3	0·6	0·5	0·1	0·2	0·1	3	0·7	2	0·2	0·2	0·2
Mar	0·4	2	1·4	0·4	0·8	0·7	6	2	5	1·5	1·1	1·2
Apr	1·5	7	5	2	3	3	13	8	11	7	6	6
May	2	9	7	4	6	5	11	6	10	8	7	7
Jun	3	4	3	5	3	3	4	3	4	6	1·7	2
Jul	3	4	3	3	2	3	1·6	2	1·7	2	0·9	1·1
Aug	3	5	5	4	3	3	0·9	1·4	1·0	1·3	1·5	1·7
Sep	4	6	5	6	5	5	3	3	3	2	3	3
Oct	5	8	7	4	6	5	8	6	8	7	5	5
Nov	1·4	1·9	2	1·1	1·2	1·6	9	3	7	5	0·8	1·3
Dec	0·3	0·4	0·4	—	0·1	0·1	3	0·6	1·1	1·1	0·2	0·3
Annual	25	48	37	31	29	29	63	35	57	43	27	29

48 for the interior. This is pronounced as one goes south along the Madras coast; Madras having 51, Cuddalore 30, Nagapattinam 14 and Pamban barely 4 thunderstorms in the year. This feature is not evident in Andhra Pradesh. The comparison of coastal and interior regions of Kerala and Mysore may not be quite correct since in Kerala, there is only one station (Palghat) to represent the interior while there are four (Alleppey, Cochin, Kozhikode and Trivandrum) to represent the coastal region. Similarly, for Mysore there is only one station (Mangalore) representing coastal Mysore while there are several to represent interior (Honavar and Karwar data have not been considered due to the poor quality of the data of these stations). Even with the above limitations, the frequency figures do indicate that there is a marked difference in thunderstorm frequency in coastal and interior areas of Kerala and Mysore States. The differences noticed between the coastal and interior area in these states may probably be due to the fact that while in Madras, insolation is the most significant factor contributing to the thunderstorms, in Kerala and Mysore States, orography is the most significant factor.

4. Summary

(1) Among the states of south India, Kerala State has the highest frequency of days of thunder.

(2) Except in Andhra Pradesh the frequency of thunderstorms is a maximum during the transition periods. Again, there is generally a greater frequency during the period of higher temperature.

(3) Orography and sea-breeze are important factors for higher frequency of thunderstorms in some of these states.

(4)(*a*) In Madras State, there is a marked decrease of thunderstorm frequency along the coast compared to the interior, and this is all the more pronounced as one goes south along the Madras coast.

(*b*) In Kerala and Mysore States there is a marked increase in the frequency in the coastal regions.

(*c*) Probably, in areas where insolation is the most significant factor for thunderstorms, interior regions will have a markedly higher frequency than the coastal regions, whereas, in areas where orography is the most significant factor for thunderstorms, coastal regions will have a markedly higher frequency.

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