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551·576·11 : 551·508·79 (548·4)

Heights of cumulonimbus cloud tops over the Deccan Plateau and adjoining plains of Andhra Pradesh and east Maharashtra : A preliminary radar study

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ABSTRACT. A radar study of heights of tops of cumulonimbus clouds over the Deccan Plateau and adjoining plains of Andhra Pradesh and east Maharashtra is presented in this paper. The study is based on all routine and non-routine weather radar observations taken and recorded by the Meteorological Office, Begumpet Airport, Hyderabad during a two-year period from June 1969 to May 1971. The weather radar at Hyderabad has a maximum range of 400 km.

1. Introduction

The study on heights of tops of cumulonimbus clouds has been very inadequate in India and the information available on this is very little as stated by Kulshrestha (1962). He has made a radar study on the heights of tops of cumulonimbus clouds over north India. Similar studies have been made for the Gangetic valley of West Bengal (Bhattacharya and De 1966) and for the area around the Agartala Airport in Tripura (Kundu and De 1969).

For the first time a medium powered X-band weather radar has been installed at Begumpet Airport, Hyderabad and is in operation from 29 March 1969. Incidentally, it may be mentioned here that this is the first Indian made weather radar manufactured by Bharat Electronics Ltd., Bangalore. It has a peak power of 200 kw and its beam width is 1° both in the vertical as well as in the horizontal. The maximum and effective range of the radar is 400 km and therefore covers practically the entire Deccan Plateau and adjoining plains of Andhra Pradesh.

In the present communication the author has made a study on the percentage distribution of cumulonimbus clouds of various heights based on all routine and non-routine radar observations taken and recorded at Hyderabad. Although the radar was made operational on 29 March 1969, the observations upto the end of May 1969 have not been considered, as the performance of the radar during this initial period was not satisfactory. Observations from June 1969 to May 1971 have been utilised for this study and as the period is for two years only, this may be considered as a preliminary study.

2. Procedure

All the routine and non-routine radar observations taken and recorded round the clock, during the period June 1969 to May 1971 were considered. All echoes having vertical development and whose tops were having heights of 6 km or more were sorted out. Such echoes depict cumulonimbus clouds at various stages, some in developing stage, some in mature and some in dissipating stage. In one particular observation there may be cumulonimbus clouds at various stages. The echoes sorted out as above were classified into four groups as follows : Cumulonimbus cloud tops having heights 6 to 8 km were classified as Group A, heights 9 to 11 km as group B, heights 12 to 14 km as group C and heights 15 km and above as group D (The heights have been corrected for errors due to the curvature of the earth and for the errors due to the finite width of the radar beam. The heights are, strictly speaking, heights above the altitude of Begumpet Airport. As the terrain in the area under study consists of plateau and plains, some errors are likely to crop up. But these errors can be neglected, as the height of Begumpet Airport which is on the plateau is only about 0·5 km a.s.l. and this is within the limit of accuracy in determining heights by this radar). The total number of echoes in each of the above groups was found for every month taking into account all the observations taken and recorded during the month. Then the percentage frequency for each group has been worked out.

3. Results

The percentage frequencies thus worked out for each month from June 1969 to May 1971 have been represented graphically in Fig. 1.

Further, in order to determine the distribution

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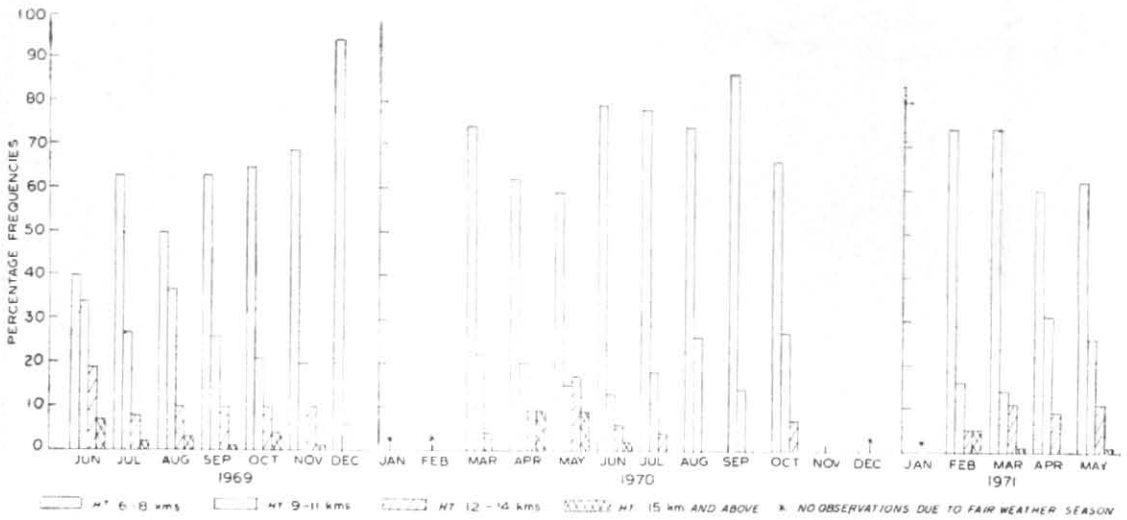

Fig. 1

TABLE 1

Frequency distribution of *cb* cloud tops among different height intervals during pre-monsoon and monsoon seasons (Both the years 1969-70 and 1970-71 taken into account)

Group Height (km)	Pre-monsoon period (Mar-May)		Monsoon period (Jun-Sep)	
	No. of cases	Frequency (per cent)	No. of cases	Frequency (per cent)
A (6-8)	1044	61	1579	68
B (9-11)	384	23	539	23
C (12-14)	203	12	160	7
D (15 and above)	64	4	36	2

during different seasons,, the data were divided into two groups : (*i*) Pre-monsoon season, March to May and (*ii*) Monsoon season, June to September. The total percentage frequency distribution among different height intervals in these seasons is shown in Table 1.

On a scrutiny of the figures as well as Table 1, the following inferences can be drawn —

(*i*) Cumulonimbus clouds of group A, *i.e.*, those having tops at height of 6 to 8 km, predominate in any season over the area of 400 km around Hyderabad.

(*ii*) Cumulonimbus clouds of group B, *i.e.*, those having tops at heights of 9 to 11 km come next in order in the percentage frequencies in all seasons.

(*iii*) Cumulonimbus clouds of groups C and D, *i.e.*, those having tops at heights of 12 to 14 km, and 15 km and above respectively, have greater percentage frequencies during the pre-monsoon season ; the highest percentage frequency being in May. This means that the cumulonimbus clouds attain greater heights over the area under study during the pre-monsoon season than during the monsoon season, whereas, over north India Kulshrestha (1962) has found that cumulonimbus clouds attain greater heights during the monsoon season than during the pre-monsoon season. This is because of the axis of the monsoon trough being over north India during the monsoon season giving rise to more of convective activity there. On the other hand, convective activity is more during the pre-monsoon season over the area under study because of the seasonal low over there and the resulting wind discontinuity that often occurs.

(*iv*) During the monsoon season, apart from the fact that there is a decrease in the percentage frequencies of cumulonimbus clouds of groups C and D, compared to the pre-monsoon season, it is interesting to note that there is a gradual fall from June to September of percentage frequencies of cumulonimbus clouds having tops at 12 km and above, *i.e.*, groups C and D put together.

(*v*) There is a marked abrupt rise in the percentage frequencies of cumulonimbus clouds having tops at 12 km and above in October. This is entirely due to the post monsoon depressions that affect greatly the southern-half of the area under study in October.

(*vi*) Cumulonimbus clouds having tops at 12 km and above are more abundant during the two-month period May-June compared to the rest of the year.

REFERENCES

Bhattacharya, P. and De, A. C.	1966	*Indian J. Met. Geophys.*, **17**, pp. 591-596.
Kulshrestha, S. M.	1962	*Ibid.*, **13**, pp. 167-172.
Kundu, M. M. and De, A. C.	1969	India met. Dep. Sci. Rep., No. 90.