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MESOSCALE STUDY OF RAINFALL OVER DELHI

1. The earlier studies on mesoscale distribution of rainfall in Delhi region ($28^{\circ} 37'N$, $77^{\circ} 12'E$, 217 masl) by Agarwala (1961, 1963), Hariharan and Sajnani (1960) and Saha (1968) showed that the spatial distribution of rainfall is non-uniform in all the seasons and a good deal of difference in rainfall occurs even within a range of 2 km. The variability is more in rainy season than in all the other seasons. In the present note an attempt has been made to study the frequency of occurrence of rainfall and its spatial distribution and to delineate the precipitation potential areas in this region during different seasons.

2. The study is based on ten years (1975-1984) daily rainfall data of 21 raingauge stations located, as shown in Fig. 1, within 25 km around Rain and Cloud Physics Research Centre, New Rajinder Nagar, New Delhi.

3. Table 1 presents the percentage frequency distribution of mean rainfall per day in the region in different seasons. The mean rainfall of individual days has been obtained by summing up the rainfall of all the stations and then dividing by the number of stations. It may be seen from the table that the rainfall during winter, pre-monsoon, monsoon and post-monsoon seasons occurs in this region on 17.7,

31.1, 68.2 and 8.8 per cent of the days respectively. During winter, mean rainfall did not exceed 15.0 mm and during the post-monsoon the mean rainfall did not exceed 25.0 mm.

3.1. During pre-monsoon and monsoon seasons mean rainfall exceeded 25.0 mm on 0.6 and 5.7 per cent of the days respectively and only on 0.1 and 0.2 per cent days the mean rainfall exceeded 75.0 mm in the above two seasons respectively.

3.2. Prior to delineating precipitation potential areas it is pertinent to go through the spatial distribution of rainfall in the region. One mode of investigating the distribution is grading the rainfall. Basic criterion of gradation is given in Table 2. It has been found that out of total number of 3653 days, rainfall was not recorded by any of the raingauges on about 56 per cent of the days. It may be inferred from Table 3 that rainfall distribution is mostly scattered in nature during winter, pre-monsoon and post-monsoon seasons, whereas, during monsoon season appreciable rain occurs in all the grades except widespread grade. It is only monsoon season during which widespread rain is recorded (on 1.5 per cent of the days).

3.3. In the second mode of investigating the spatial distribution of rainfall, sector-wise analysis of the data has been made. For the very purpose mean rainfall for each of the eight sectors, as shown in

TABLE 1

Frequency distribution (%) of mean rainfall per day — seasonwise

Season	Mean rainfall (mm) per day										Total no. of days
	0.0	0.1 to 5.0	5.1 to 15.0	15.1 to 25.0	25.1 to 35.0	35.1 to 45.0	45.1 to 55.0	55.1 to 65.0	65.1 to 75.0	>75.0	
Winter (Dec-Feb)	82.3	15.4	2.3	—	—	—	—	—	—	—	903
Pre-monsoon (Mar-Jun)	68.9	26.1	3.2	1.2	0.2	—	0.1	0.1	0.1	0.1	1220
Monsoon (Jul-Sep)	31.8	37.1	18.9	6.5	3.1	1.4	0.7	0.2	0.1	0.2	920
Post-monsoon (Oct-Nov)	91.2	7.7	1.0	0.1	—	—	—	—	—	—	610

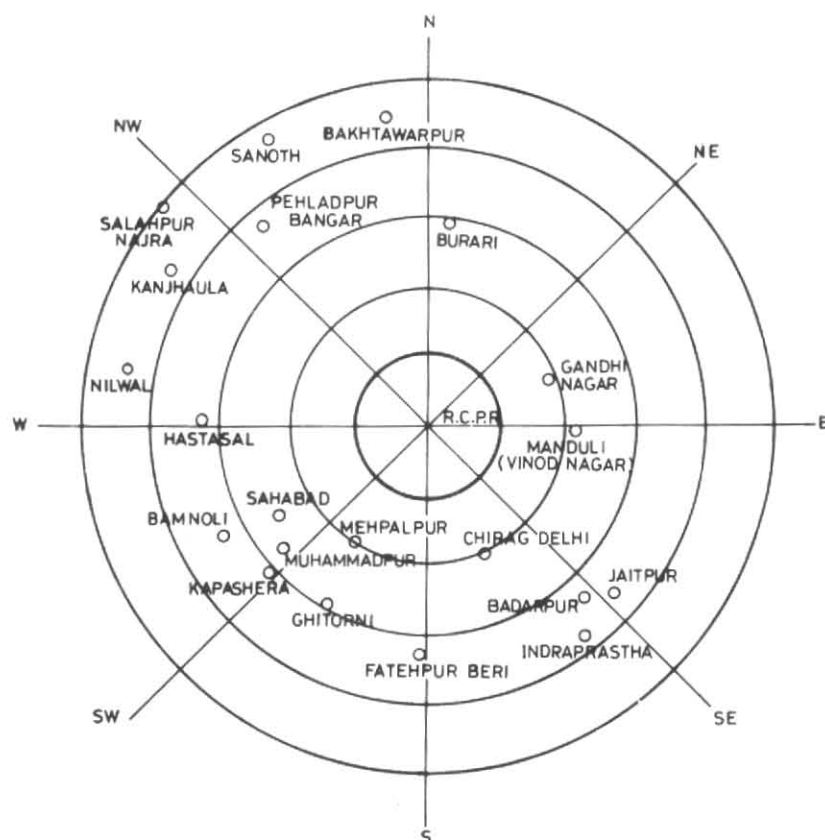


Fig. 1. Locations of the rain gauge stations around Rain and Cloud Physics Research Centre (R. C. P. R. C.), New Delhi

TABLE 2

Gradation of rainfall distribution

Gradation	Criteria for grading
Widespread (W)	Rainfall at all stations in the area
Fairly Widespread (FW)	Rainfall at 2/3 or more but not at all the stations
Local (L)	Rainfall at 1/3 or more but less than 2/3 of the stations
Scattered (SC)	Rainfall at less than 1/3 of the stations
No Rain (NR)	No rain at any station

TABLE 3

Distribution of days (%) among different rainfall gradation — seasonwise

Season	Rainfall gradation					Total number of days
	W	FW	L	SC	NR	
Winter (Dec-Feb)	—	1.8	5.6	22.7	69.9	903
Pre-monsoon (Mar-Jun)	—	3.8	8.1	34.2	53.9	1220
Monsoon (July-Sep)	1.5	19.7	22.6	31.6	24.6	920
Post-monsoon (Oct-Nov)	—	0.3	2.0	11.1	86.6	610

Fig. 1, has been evaluated. On application of Chi-square test on the data so obtained, it has been found that the distribution is non-uniform (significant at 5 per cent level) during winter, pre-monsoon and post-monsoon seasons, whereas, it is

extremely non-uniform (significant at better than 0.1 per cent level) during monsoon season. The analysis reveals that the region NW-NE receives the maximum rain and that NE-SE, minimum rain.

3.4. The region intercepts major rain with the passage of southwest monsoon and western disturbances. It seems likely that irrespective of the influence of these systems rainfall in this region is activated and geared mainly by local convective processes.

4. The main limitation of our study is that the raingauge stations are not uniformly distributed in the area under study. This limitation has been fully appreciated and kept in mind in the analysis and only broad conclusions have been drawn.

References

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