

A STUDY OF THUNDERSTORMS AND HAILSTORMS OVER NEW DELHI

Thunderstorm is a meso-scale phenomenon and this goes generally undetected in the synoptic analysis. Hailstorms are not as frequent as thunderstorms and are more localised in occurrence. These are the products of violent thunderstorm activity when cumulonimbus clouds grow to very great heights. Considerable damage is caused by hailstorms to property, standing crops and occasionally to life. The thunderstorms and hailstorms are also very important phenomena for aviation. They constitute major aviation hazards and any aid to their forecasting is obviously of considerable interest to the meteorologist.

A study of various aspects of thunderstorm and hailstorm activity over Safdarjung airfield (New Delhi) based on data for the years 1952 to 1982 shows that there are on an average 44 days of thundery conditions per year when about 49 thunderstorms occur. These thunderstorms are associated, on a few occasions, with hail. The annual frequency of hailstorms over New Delhi is 1.4 days.

TABLE 1

Frequency of thunderstorms during the years (1952-Feb 1983)

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1952-60	19	7	35	27	33	61	74	80	41	12	6	2
1961-70	18	27	30	26	58	73	84	77	46	15	10	12
1971-80	10	24	42	43	55	72	118	85	44	12	1	9
1981-(Feb 1983)	20	8	14	10	20	13	12	16	3	8	4	0
Total	67	66	121	106	166	219	288	258	134	47	21	23
Mean	2.1	2.0	3.9	3.4	5.4	7.1	9.3	8.3	4.3	1.5	0.7	0.7

Yearly mean = 48.7

For this study a day of thunder is defined as one on which thunder is heard. It is well known that on some days more than one thunderstorm occurs during a day. These thunderstorms have been separately counted and

TABLE 2

Frequency of thunderstorms according to their duration

	Duration (hour) of thunderstorms between							Total
	1	1-2	2-3	3-4	4-5	5-6	6-7	
Jan	16	31	6	9	2	1	2	67
Feb	12	23	12	6	4	6	3	66
Mar	32	49	16	8	7	2	7	121
Apr	33	29	12	9	11	4	8	106
May	42	46	31	14	17	1	15	166
Jun	51	78	44	16	10	6	14	219
Jul	69	84	55	35	11	13	21	288
Aug	55	75	48	37	14	8	21	258
Sep	31	46	23	19	6	6	3	134
Oct	13	13	8	5	4	1	3	47
Nov	5	8	3	4	0	0	1	21
Dec	4	10	6	1	0	0	2	23
Total	363	492	264	163	86	48	100	1516
Average	11.7	15.7	8.5	5.2	2.8	1.6	3.2	48.7
Percentage	24.0	32.4	17.4	10.7	5.7	3.2	6.6	100

TABLE 3

Commencement of thunderstorms during different periods

Month	Period in hours (I.S.T.)								Total
	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	
Jan	10	10	4	5	9	13	4	12	67
Feb	12	4	7	3	5	15	9	11	66
Mar	15	11	6	8	15	33	22	13	121
Apr	8	13	8	2	8	33	22	12	106
May	16	7	14	9	17	38	32	33	166
Jun	30	21	9	14	33	57	31	24	219
Jul	33	24	16	21	73	69	31	21	288
Aug	26	21	18	25	60	53	40	15	258
Sep	7	8	9	7	39	42	17	5	134
Oct	4	5	4	3	11	9	7	4	47
Nov	2	3	4	1	3	4	3	1	21
Dec	2	2	2	3	4	3	4	3	23
Total	165	129	99	101	277	369	222	154	1516
Mean	5.3	4.2	3.1	3.3	8.8	11.9	7.2	4.9	48.7
Percentage	10.9	8.6	6.4	6.7	18.1	24.5	14.7	10.1	100

are given in Table 1 for the four periods, viz., 1952 to '60, 1961 to '70, 1971 to '80 and 1981 to Feb '83.

Table 2 gives the duration in hours for which the individual thunderstorms have lasted.

In Table 3 thunderstorms have been grouped according to three hourly intervals of a day in which the first peel of thunder was heard signifying the commencement of the thunderstorm.

The thunderstorms are associated with hail on a few occasions. The monthwise distribution of hailstorms (42) during the period January 1952 to February 1983 is given in Table 4. The total number of individual hailstorms are shown in bracket. The duration for which the hailstorms (44) have lasted is given in Table 5 in intervals of 5 minutes upto 15 minutes and then in 15 minutes interval.

2.1. Hailstorms are about 1 to 2 per year on an average. 3 distinct hailstorms have been recorded at New Delhi on a single day, viz., 1 March 1952.

2.2. Thunderstorms occur at New Delhi in all the months of the year although their frequency is minimum in November. Thunderstorm activity at New Delhi begins perceptibly in May. It is maximum during July and August when the monsoon is fully established and starts decreasing from September. The occurrence of thunderstorms during the monsoon months is generally associated with the axis of the monsoon trough passing through Delhi or in its close proximity.

2.3. A study of Table 2 shows that 56 per cent of thunderstorms over New Delhi last for less than 2 hours, 74 per cent last for less than 3 hours and 85 per cent

TABLE 4

Number of hailstorm days at New Delhi (number of individual hailstorms) (Jan 1952 to Feb 1983)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
No. of hailstorm days											
5	5	11	5	2	6	1	1	1	3	0	2
(13)											
Total No. of hailstorm = 42											

TABLE 5
Duration of hailstorms at New Delhi (in minutes)

	<5	5-10	10-15	15-30	30-45	>45
Number of hailstorms	29	3	3	7	2	0

for less than 4 hours. Only 15 percentage of the thunderstorms seem to persist for more than 4 hours.

2.4. From the study of synoptic situations it is seen that thunderstorms of longer duration occur in association with slow east moving western disturbances or induced upper air cyclonic circulations across Haryana and adjoining areas during the non-monsoon months, and the persistence or slow N/NW moving upper air cyclonic circulations from east over northeast Rajasthan and adjoining Haryana and the plains of Uttar Pradesh.

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