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A study of the self-recording raingauge charts of Bangalore

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ABSTRACT. The paper gives the results of an analysis of rainfall recorded at Bangalore with the Casella siphon raingauge during the years 1935 to 1950, on lines more or less similar to previous studies of Poona (Krishnaswamy 1951) and Madras (Krishnaswamy 1952).

1. Introduction

The paper describes the results of an analysis of the charts obtained on the Casella siphon raingauge at the Central Observatory at Bangalore during the sixteen years 1935 to 1950. The instrument was installed on 6 January 1935. The distance between successive horizontal lines of the daily chart corresponds to a fall of two cents and the distance between successive vertical lines corresponds to a time interval of fifteen minutes. It is thus possible to get from the chart the amounts of rain recorded in successive periods of 15 minutes correct to one cent. However, it is also possible to estimate by sight the times of beginning and ending of a spell and for purposes of Tables 1 to 5 which deal with lengths of spells of rain etc, this course has been followed. For the remaining tables dealing with intensities of rainfall the fifteen-minute period has been taken as a unit, and the rain recorded in the unit, as a whole, has been taken into account.

2. Spells of rain

A rainy day has been taken as an interval of 24 hours beginning at each midnight, during which rain was recorded, however small the amount. A spell of rain has been taken as one during which rain fell uninterruptedly. The duration of spells of rain lasting for less than five minutes has been taken as five minutes.

Table 1 gives the numbers of rainy days, the numbers of spells of rain, the duration and amount of rainfall during the various calendar months. Rain falls on about 100 days during a year. The average number of spells is two, the average amount of rainfall is about a third of an inch and the average duration of rain is about two hours on each rainy day. Rain falls on so few occasions during January, February, March and December, that, though the figures for these months are given in all the tables for what they are worth, they are not being commented upon. Pre-monsoon showers occur in April and May. The numbers of rainy days and spells increase to a maximum in July and decrease thereafter. However, the average duration and average amount of fall in May are greater than those in June. These are maximum in August. The average number of spells is two and the average duration of a spell is about an hour practically throughout the year. The average duration of rainfall on a rainy day increases more or less regularly from $1\frac{1}{4}$ hours in June to $2\frac{3}{4}$ hours in November and December. It also appears that in October, on an average, a greater amount of rain falls in each spell and on each rainy day, than during any other month of the rainy season. The average numbers of rainy days, numbers of spells of rain and duration of rain are shown diagrammatically in Fig. 1.

In Tables 2 to 5 an attempt has been made to analyse further the figures in Table 1. Table 2 gives the numbers of rainy days with different numbers of spells of rain in each of the calendar months. In April and May, rain occurred only once on nearly half the number of rainy days. Rain occurred more than three times only on about 8 per cent of the days. In June, there are proportionately more days on which rain

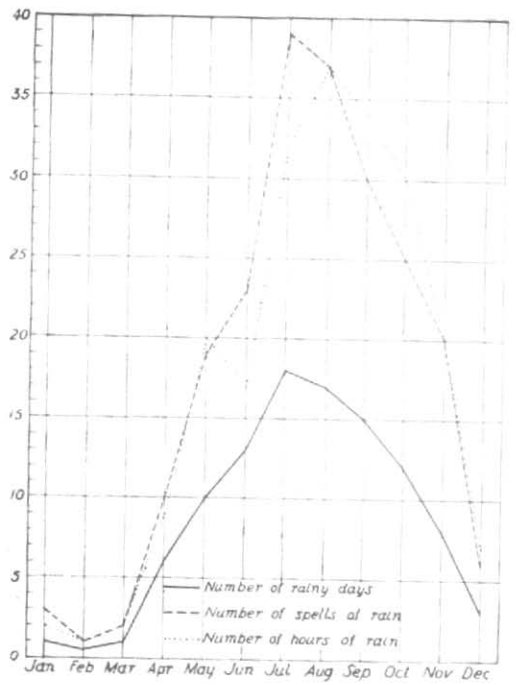

Fig. 1. Average numbers of rainy days, numbers of spells of rain and duration of rain, 1935-1950—Bangalore

occurred more than three times. The proportion was even more in July and August and in these months the number of single spell days was only about 40 per cent. This trend is slightly reversed in September which is rather similar to May in this respect. In the northeast monsoon months October and November, rain falls on a number of occasions on each rainy day, the number of days on which it fell only once varying from 30 to 40 per cent.

Table 3 shows the distribution of rainy days according to duration of rainfall and gives the numbers of rainy days on which rain occurred for less than 1 hour, between 1 and 2 hours and so on up to 11 and 12 hours and above 12 hours. It is seen from this table that the days when rain occurs for more than six hours were very rare. On an average there were only about six such days in a year and of these five occurred one in each of the months July to November. On about 70 per cent of the rainy days during January to March, rain falls for less than two hours. On the average, only on one day during these months did rain fall for more than two hours. April is also a month during which rain falls for short periods. On more than 60 per cent of the days rain fell for less than an hour and rain occurred for more than two hours only on one day on the average. In May rain fell for a longer period on each rainy day. It fell for more than an hour on more than half the number of rainy days. Also, there were some days during May when rain fell for more than ten hours. In June, the first month of the southwest monsoon, the duration of rain was less than two hours every four days out of five and during the entire period of 16 years to which the analysis relates, there was only one day on which rain fell for more than six hours. In July, longer durations were more common and rain fell for more than an hour on half the number of rainy days. This feature is accentuated in August and September which are very similar to each other. On about a third of the days the duration of rainfall exceeded two hours and occasionally it exceeded six hours. During the entire period of the southwest monsoon, *viz.*, June to September, there was only one day on which rain fell for more than twelve hours during the sixteen years 1935 to 1950.

The northeast monsoon commences in October and ends by December. These months are fairly similar to one another so far as duration of rain on rainy days is concerned. As compared with the period of the southwest monsoon, rain falls longer on each rainy day, the number of days on which the duration was less than an hour varying between 30 per cent and 40 per cent. On more than 10 per cent of the rainy days rain fell for more than six hours and on about 2 per cent of the days it fell for more than 12 hours.

Table 4 gives the distribution of spells of rain according to their duration. It is seen from this table that more than half the number of spells are of less than half an hour's duration and only about a quarter of the spells extend for over an hour. Spells exceeding six hours in duration are only

about one in a hundred. During the pre-monsoon months of April and May, the spells in the former are divided almost according to the average for the whole year. In May the spells are of a slightly longer duration. In June and July, 60 per cent of the spells are of less than half an hour's duration and only about a fifth of the spells exceed one hour. Relatively, the spells are longer in August and the distribution is similar to that for the whole year. September is very similar to May. During the north-east monsoon months the spells are of longer duration, particularly in October. About a third of the spells exceed an hour during this month.

Table 5 gives the interval between successive spells of rain during the various calendar months. It is seen from this table that about a fifth of the spells are followed by another spell within an hour and about half the spells are followed by another within six hours. Also, it appears that the chance of a spell being followed by another progressively decreases with time during all the months of the year. In April, May and June too, it rained again within six hours only in the case of about 45 per cent of the spells. In July, August and September, this percentage is between fortyfive and fifty. It increases to between fifty and sixty in the months October, November and December.

3. Intensity of Rainfall

Table 6 gives the numbers of fifteen-minute periods in which different intensities of rain were recorded. It appears from this table that the rainfall at Bangalore is generally of low intensity. For about 70 per cent of the period of rainfall, it is less than ten cents per hour. It exceeds one inch per hour only in about 3 per cent of the number of fifteen-minute periods in which there was rain. Heavy rains appear to be more common in the pre-monsoon months of April and May. The rains during the months June, July, August and September fall mostly in the form of a drizzle, though, very occasionally, falls of as great an intensity as 4 inches per hour have been recorded. Drizzle is slightly less common in October and in about a fifth of the number of intervals rain falls at an intensity exceeding 25 cents per hour. November and December are months of drizzle.

Table 7 shows the distribution of spells of rain according to the maximum intensity attained in each spell. Taking the year as a whole, in more than half the number of spells, the intensity never exceeded 10 cents per hour and in nearly three-quarter of the number of spells the maximum intensity was less than 25 cents per hour. In only about one in fourteen of the spells, rain fell at an intensity exceeding one inch per hour. It is interesting to note that in the thunderstorm months of April and May, the proportion of spells in which the intensity exceeded one inch per hour in May was very nearly twice that in April. In June there is a larger proportion of spells of low intensity than in the months of April and May. The proportion of spells of low intensity increases in July, in which month, in nearly 60 per cent of the spells the intensity never exceeded 10 cents per hour. The trend is reversed in August. In September and October, in more than half the number of spells rain fell at a rate of more than 10 cents per hour. It fell at a rate greater than one inch per hour in one spell out of every seven. In November and December the spells are mostly of low intensity and the maximum intensity exceeds 25 cents per hour in less than a fifth of the spells. There were very few spells during which rain fell at an intensity exceeding one inch per hour.

Table 8 shows the times of occurrence of the maximum intensity of rain on rainy days. On about half the rainy days the heaviest rainfall for the day occurred between 3 P.M. and 9 P.M. and in three-quarter of the days it occurred after noon and before midnight. There were very few days when it occurred in the early hours of the morning and in the forenoon. This feature is noticed practically during all the months of the year. In April, on 30 per cent of the days, the heaviest rain occurred between 6 and 9 P.M. and it fell in the afternoons and before midnight on about four days

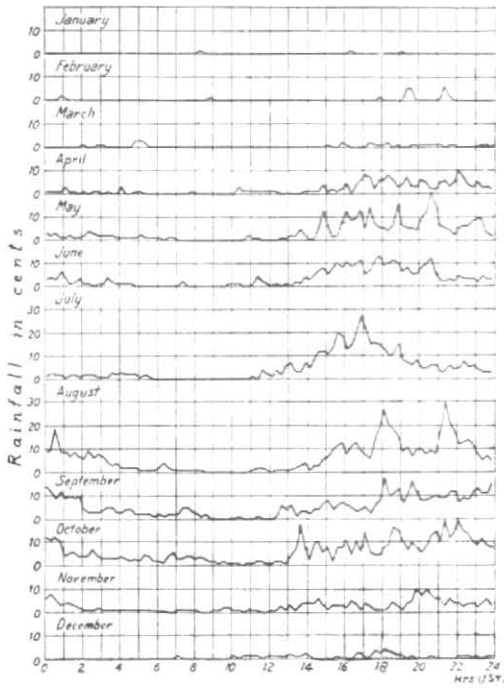

Fig. 2. Mean amounts of rainfall during various 15-minute intervals of the day, 1935-1950, Bangalore

out of five during this month. The same feature is noticeable in May, June and July also. The proportion of days on which the heaviest rain of the day occurred before 12 noon increases from August to about 30 per cent in October and about 40 per cent in November and December. This increase is due to a fairly large increase in the proportion of days on which the heaviest rain occurred after midnight and before 3 A.M.

On a number of days the maximum intensity of rainfall may be only a few cents per hour and Table 8 does not, therefore, show the times of occurrence of heavy rainfall. Table 9 shows the hours of occurrence of heavy rains and gives the numbers of fifteen-minute periods during which rain fell at an intensity of more than one inch per hour during the different parts of the day in three-hourly periods. It is seen from this table that heavy rains occur mostly in the afternoons and before midnight. Only about 5 per cent of the intervals in which heavy rains occurred are distributed over the period 3 A.M. to 12 noon. In May, June and July, about 90 per cent of the heavy rains occurred in the afternoons and about 65 per cent between 3 P.M. and 9 P.M. There appears to be a slight shift in August, during which month most of the heavy rainfall occurred after 3 P.M. and before 3 A.M. Heavy rains are rather more frequent in the early mornings in September and October.

Fig. 2 shows the mean amounts of rainfall during the various fifteen-minute intervals in the different months, as obtained from the records for the years 1935 to 1950. During all the months the largest part of the rain fell during the later half of the day, that is to say, after 12 noon and before midnight. Very little rain fell between 0600 and 1200 hours. The hours 0000 to 0600 were comparatively more wet during August to November than during the other months.

4. Acknowledgement

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REFERENCES

Krishnaswamy, K. R. (1951). *Ind. J. Met. Geophys.*, 2, 1, pp. 51-56.

Krishnaswamy, K. R. (1952). *Ind. J. Met. Geophys.*, 3, 2, pp. 115-120.

TABLE 1

Average numbers of rainy days, spells of rain, duration of rain and amounts of rain at Bangalore during 1935 to 1950

Month	Number of rainy days	Number of spells	Duration of rainfall (hr)	Amount of rainfall (cents)	Number of spells on a rainy day	Duration of spell (hr)	Amount of rainfall in a spell (cents)	Duration of rainfall on a rainy day (hr)	Amount of rainfall on a rainy day (cents)
Jan	1	3	2	12	3	$\frac{3}{4}$	4	$2\frac{1}{2}$	13
Feb	$\frac{1}{2}$	1	1	27	2	1	39	2	72
Mar	1	2	2	34	2	1	16	$1\frac{3}{4}$	26
Apr	6	10	9	182	2	1	18	$1\frac{1}{2}$	31
May	10	19	20	365	2	1	20	2	36
Jun	13	23	17	307	2	$\frac{3}{4}$	13	$1\frac{1}{4}$	24
Jul	18	39	32	462	2	$\frac{3}{4}$	12	$1\frac{3}{4}$	26
Aug	17	37	37	611	2	1	17	2	35
Sep	15	30	34	503	2	$1\frac{1}{4}$	17	$2\frac{1}{4}$	33
Oct	12	25	30	595	2	$1\frac{1}{2}$	24	$2\frac{1}{2}$	50
Nov	8	20	20	236	3	1	12	$2\frac{3}{4}$	32
Dec	3	6	7	58	3	1	9	$2\frac{3}{4}$	23
Year	104	215	211	3392	2	1	16	2	33

TABLE 2

Number of rainy days with different numbers of spells of rain, 1935 to 1950

Month	Number of spells										
	1	2	3	4	5	6	7	8	9	10	>10
Jan	4(27)	2(13)	3(20)	3(20)	1 (7)	1 (7)	—	—	1 (7)	—	—
Feb	4(67)	1(16)	—	—	1(16)	—	—	—	—	—	—
Mar	14(67)	4(19)	1 (5)	1 (5)	—	1 (5)	—	—	—	—	—
Apr	55(59)	23(24)	9(10)	5 (5)	—	—	1 (1)	1 (1)	—	—	—
May	84(52)	44(27)	20(12)	5 (3)	4 (2)	3 (2)	1 (1)	—	—	—	—
Jun	106(52)	59(29)	13 (6)	17 (8)	6 (3)	1(—)	1(—)	—	—	—	—
Jul	112(40)	83(30)	37(13)	25 (9)	16 (6)	6 (2)	1(—)	1(—)	—	—	—
Aug	118(43)	71(26)	48(17)	20 (7)	13 (5)	3 (1)	—	2 (1)	—	—	—
Sep	127(52)	57(23)	31(13)	17 (7)	6 (2)	4 (2)	1(—)	—	—	—	1(—)
Oct	75(39)	54(28)	36(19)	19(10)	4 (2)	1 (1)	1 (1)	—	—	—	—
Nov	39(32)	28(23)	25(21)	11 (9)	8 (7)	4 (3)	3 (2)	1 (1)	1 (1)	—	—
Dec	12(29)	12(29)	7(17)	6(15)	3 (7)	—	1 (2)	—	—	—	—
Year	750(45)	438(27)	230(14)	129 (8)	63 (4)	24 (1)	10 (1)	5(—)	2(—)	—	1(—)

The maximum number of spells observed was eleven on 20 September 1949

TABLE 3

Numbers of rainy days with different durations of rainfall, 1935 to 1950

Month	Duration of rainfall in hours												
	<1	1—2	2—3	3—4	4—5	5—6	6—7	7—8	8—9	9—10	10—11	11—12	>12
Jan	7(41)	5(29)	—	2(12)	1 (6)	—	1 (6)	—	1 (6)	—	—	—	—
Feb	3(50)	1(16)	—	1 (6)	—	1(6)	—	—	—	—	—	—	—
Mar	12(57)	3(14)	2(10)	1 (5)	2(10)	—	—	—	1 (5)	—	—	—	—
Apr	61(63)	19(20)	7 (7)	5 (5)	2 (2)	—	1 (1)	—	—	—	—	—	2 (2)
May	80(47)	38(22)	18(11)	11 (7)	12 (7)	4(2)	2 (1)	—	—	—	1 (1)	1 (1)	2 (1)
Jun	115(57)	46(23)	16 (8)	14 (7)	5 (2)	6(3)	1(—)	—	—	—	—	—	—
Jul	142(50)	56(20)	32(11)	24 (8)	8 (3)	11(4)	1(—)	3 (1)	1(—)	5 (2)	—	1(—)	—
Aug	121(43)	59(21)	41(14)	21 (7)	11 (4)	11(4)	10 (4)	1(—)	6 (2)	1(—)	1(—)	—	—
Sep	114(45)	46(18)	27(11)	23 (9)	16 (6)	14(5)	4 (2)	8 (3)	—	1(—)	1(—)	1(—)	1(—)
Oct	76(39)	48(24)	18 (9)	17 (9)	10 (5)	8(4)	7 (4)	4 (2)	3 (2)	3 (2)	—	—	3 (2)
Nov	41(33)	32(26)	18(15)	8 (6)	6 (5)	6(5)	4 (3)	3 (2)	2 (2)	1 (1)	1 (1)	—	2 (2)
Dec	15(37)	8(20)	5(12)	4(10)	3 (7)	1(2)	4(10)	—	—	—	—	—	1 (2)
Year	787(46)	361(21)	184(11)	131(8)	76(4)	62(4)	35(2)	19(1)	14(1)	11(1)	4(—)	3(—)	11(1)

The maximum duration of rainfall on a rainy day was for 23 hours on 19 May 1943

The figures within the brackets in Tables 2 and 3 are percentage frequencies

TABLE 4

Numbers of spells of rain of different durations, 1935 to 1950

Month	Duration in hours									
	<½	½ to 1	1—2	2—3	3—4	4—5	5—6	6—7	7—8	>8
Jan	32(65)	6(12)	7(14)	1(2)	2(4)	1(2)	—	—	—	—
Feb	4(36)	1 (9)	5(46)	1(9)	—	—	—	—	—	—
Mar	15(44)	11(32)	3 (9)	3(9)	2(6)	—	—	—	—	—
Apr	93(57)	33(20)	18(11)	7(4)	3(2)	1 (1)	—	—	—	1 (1)
May	157(52)	57(19)	41(14)	16(5)	12(4)	8(3)	2 (1)	1(—)	1(—)	2 (1)
Jun	234(63)	67(18)	42(11)	14(4)	10(3)	4(1)	1(—)	—	—	1(—)
Jul	380(61)	113(18)	68(11)	35(6)	9(1)	3(—)	4 (1)	4 (1)	3(—)	2(—)
Aug	319(54)	113(19)	80(14)	43(7)	16(3)	7(1)	5 (1)	1(—)	4(—)	3(—)
Sep	245(52)	77(16)	75(16)	21(4)	26(5)	15(3)	9 (2)	1(—)	2(—)	3(—)
Oct	201(51)	82(20)	55(14)	27(6)	14(4)	5(1)	2 (1)	3 (1)	2 (1)	9 (2)
Nov	163(52)	72(23)	40(13)	19(6)	10(3)	2(1)	4 (1)	2 (1)	2 (1)	2 (1)
Dec	55(53)	26(25)	11(11)	3(3)	1(1)	1(1)	4 (4)	1 (1)	—	1 (1)
Year	1898(55)	668(19)	445(13)	188(5)	109(3)	49(1)	32 (1)	13(—)	14(—)	24(—)

The maximum duration of spell observed was 23 hours and 20 minutes from 0625 hours on 18 October to 0545 hours on 19 October 1935

TABLE 5

Interval between successive spells of rain during various months, 1935 to 1950

Month	Interval in hours												
	<1	1—2	2—3	3—4	4—5	5—6	6—7	7—8	8—9	9—10	10—11	11—12	12—24	>24
Jan	15(31)	8(16)	6(12)	3 (6)	2(4)	1(2)	—	2(4)	1(2)	1(2)	—	1 (2)	—	2 (4)
Feb	4(36)	—	1 (9)	—	—	—	—	—	—	—	—	—	1 (9)	1 (9)
Mar	4(12)	2 (6)	2 (6)	2 (6)	2(6)	1(3)	2(6)	—	—	—	1(3)	—	3 (9)	8(24)
Apr	30(18)	18(11)	13 (8)	8 (5)	3(2)	2(1)	—	1(1)	2(1)	—	—	1 (1)	20(12)	51(31)
May	62(21)	25 (8)	23 (8)	13 (4)	9(3)	5(2)	2(1)	2(1)	3(1)	2(1)	—	4 (1)	37(12)	94(31)
Jun	77(21)	42(11)	22 (6)	13 (3)	8(2)	4(1)	3(1)	2(1)	3(1)	2(1)	3(1)	4 (1)	64(17)	110(30)
Jul	154(24)	75(12)	44 (7)	21 (3)	10(2)	14(2)	12(2)	15(2)	6(1)	5(1)	4(1)	9 (1)	126(20)	109(17)
Aug	132(22)	73(12)	35 (6)	29 (5)	18(3)	8(1)	7(1)	7(1)	6(1)	6(1)	11(2)	4 (1)	129(22)	110(19)
Sep	111(23)	43 (9)	32 (7)	15 (3)	9(2)	16(3)	10(2)	10(2)	7(1)	6(1)	6(1)	6 (1)	90(19)	109(23)
Oct	67(17)	53(13)	36 (9)	14 (4)	17(4)	10(3)	5(1)	6(2)	7(2)	7(2)	7(2)	5 (1)	69(17)	81(20)
Nov	66(21)	49(16)	25 (8)	21 (7)	14(4)	10(3)	11(3)	6(2)	3(1)	7(2)	5(2)	1(—)	41(13)	40(13)
Dec	24(23)	15(15)	5 (5)	7 (7)	6(6)	3(3)	4(4)	1(1)	1(1)	2(2)	1(1)	2 (2)	10(10)	12(12)
Year	746(22)	403(12)	244 (7)	146 (4)	98(3)	74(2)	56(2)	52(2)	39(1)	38(1)	38(1)	37(1)	590(17)	727(21)

TABLE 6

Numbers of 15-minute periods in which different intensities of rain were recorded, 1935 to 1950

Month	Intensity in cents per hour								
	<10	10—25	25—50	50—75	75—100	100—200	200—300	300—400	>400
Jan	151(90)	13 (8)	2(1)	1(1)	—	—	—	—	—
Feb	30(56)	15(28)	3(6)	1(2)	—	2(4)	1 (2)	2 (4)	—
Mar	109(71)	25(16)	9(6)	4(3)	2(1)	4(3)	—	—	—
Apr	417(65)	125(20)	47(7)	22(3)	9(1)	13(2)	7 (1)	2(—)	—
May	943(68)	238(17)	80(6)	45(3)	20(1)	49(4)	4(—)	2(—)	—
Jun	856(68)	223(18)	85(7)	33(3)	25(2)	33(3)	3(—)	1(—)	1(—)
Jul	1691(74)	321(14)	150(7)	58(3)	24(1)	45(2)	6(—)	1(—)	1(—)
Aug	1794(70)	404(16)	155(6)	71(3)	48(2)	63(2)	11(—)	5(—)	—
Sep	1647(70)	413(18)	142(6)	71(3)	26(1)	44(2)	8(—)	2(—)	—
Oct	1349(64)	375(17)	171(8)	68(3)	34(2)	72(3)	11(—)	5(—)	—
Nov	1073(77)	180(13)	75(5)	28(2)	20(1)	17(1)	3(—)	—	—
Dec	397(81)	63(13)	12(2)	8(2)	4(1)	3(1)	—	—	—
Year	10457(71)	2395(16)	831(6)	410(3)	212(1)	345(2)	54(—)	20(—)	2(—)

Greatest intensity of 440 cents per hour occurred between 2030 and 2045 hours on 4 June 1935

The figures within the brackets in Tables 4—6 are percentage frequencies

TABLE 7

Numbers of spells of rain with different maximum intensities, 1935 to 1950

Month	Maximum intensity in cents per hour								
	<10	10—25	25—50	50—75	75—100	100—200	200—300	300—400	>400
Jan	38(*78*)	8(*16*)	2 (*4*)	1(*2*)	—	—	—	—	—
Feb	2(*18*)	3(*27*)	3(*27*)	—	—	1 (*9*)	2(*18*)	—	—
Mar	15(*44*)	9(*27*)	4(*12*)	3(*9*)	—	3 (*9*)	—	—	—
Apr	73(*45*)	36(*22*)	25(*15*)	8(*5*)	7(*4*)	8 (*5*)	4 (*2*)	2 (*1*)	—
May	132(*45*)	60(*20*)	34(*11*)	18(*6*)	12(*4*)	35(*12*)	4 (*1*)	2 (*1*)	—
Jun	196(*53*)	84(*23*)	35 (*9*)	14(*4*)	17(*5*)	21 (*6*)	2 (*1*)	1(—)	1(—)
Jul	366(*59*)	111(*18*)	63(*10*)	31(*5*)	15(*2*)	28 (*5*)	5 (*1*)	1(—)	1(—)
Aug	327(*55*)	106(*18*)	55 (*9*)	33(*6*)	26(*4*)	34 (*6*)	7 (*1*)	3 (*1*)	—
Sep	250(*53*)	103(*22*)	43 (*9*)	30(*6*)	15(*3*)	24 (*5*)	7 (*1*)	2(—)	—
Oct	193(*48*)	73(*18*)	39(*10*)	23(*6*)	16(*4*)	42(*11*)	7 (*2*)	5 (*1*)	—
Nov	215(*68*)	41(*13*)	26 (*8*)	12(*4*)	9(*3*)	11 (*3*)	2 (*1*)	—	—
Dec	69(*67*)	23(*22*)	6 (*6*)	2(*2*)	1(*1*)	2 (*2*)	—	—	—
Year	1876(*54*)	657(*19*)	335(*10*)	175(*5*)	118(*3*)	209(*6*)	38(*1*)	18(—)	2(—)

TABLE 8

Numbers of rainy days distributed according to the hours of occurrence of maximum intensity of rainfall, 1935 to 1950

Month	Hours of occurrence of maximum intensity of rainfall (IST)							
	0—3	3—6	6—9	9—12	12—15	15—18	18—21	21—24
Jan	4(*20*)	3(*15*)	3(*15*)	2(*10*)	—	6(*30*)	1 (*5*)	1 (*5*)
Feb	2(*33*)	—	1(*17*)	—	—	1(*17*)	1(*17*)	1(*17*)
Mar	3(*13*)	3(*13*)	1 (*4*)	—	2 (*8*)	4(*17*)	8(*33*)	3(*13*)
Apr	12(*12*)	2 (*2*)	2 (*2*)	2 (*2*)	9 (*9*)	21(*21*)	31(*30*)	23(*23*)
May	18(*10*)	10 (*6*)	6 (*3*)	4 (*2*)	11 (*6*)	49(*28*)	45(*26*)	30(*17*)
Jun	15 (*7*)	5 (*2*)	2 (*1*)	13 (*6*)	34(*16*)	85(*40*)	43(*20*)	16 (*7*)
Jul	22 (*7*)	12 (*4*)	4 (*1*)	15 (*5*)	62(*20*)	118(*38*)	54(*18*)	21 (*7*)
Aug	31(*10*)	20 (*6*)	7 (*2*)	9 (*3*)	28 (*9*)	88(*29*)	83(*27*)	42(*14*)
Sep	45(*17*)	20 (*7*)	15 (*5*)	5 (*2*)	26(*10*)	51(*19*)	62(*23*)	48(*18*)
Oct	34(*16*)	15 (*7*)	9 (*4*)	5 (*2*)	31(*14*)	42(*19*)	41(*19*)	41(*19*)
Nov	21(*15*)	17(*12*)	9 (*7*)	8 (*6*)	27(*20*)	21(*15*)	18(*13*)	17(*12*)
Dec	6(*14*)	3 (*7*)	5(*11*)	2 (*5*)	4 (*9*)	9(*21*)	10(*23*)	5(*11*)
Year	213(*12*)	110 (*6*)	64 (*4*)	65 (*4*)	234(*13*)	495(*27*)	397(*22*)	248(*14*)

TABLE 9

Numbers of fifteen-minute periods, in which rain of intensity greater than one inch per hour was recorded, distributed according to the time of the day—1935 to 1950

Month	Hours (IST)							
	0—3	3—6	6—9	9—12	12—15	15—18	18—21	21—24
Jan	—	—	—	—	—	—	—	—
Feb	1(*20*)	—	—	—	—	—	2(*40*)	2(*40*)
Mar	—	2(*50*)	—	—	—	2(*50*)	—	—
Apr	1 (*5*)	1 (*5*)	—	1(*5*)	1 (*5*)	6(*27*)	7(*32*)	5(*23*)
May	2 (*4*)	—	—	1(*2*)	8(*15*)	16(*29*)	20(*36*)	8(*15*)
Jun	3 (*9*)	1 (*3*)	1(*3*)	1(*3*)	5(*14*)	9(*26*)	13(*37*)	2 (*6*)
Jul	—	1 (*2*)	—	1(*2*)	10(*19*)	28(*52*)	9(*17*)	5 (*9*)
Aug	15(*19*)	1 (*1*)	2(*3*)	—	2 (*3*)	15(*19*)	18(*23*)	26(*33*)
Sep	6(*11*)	—	3(*6*)	—	6(*11*)	7(*13*)	16(*30*)	15(*28*)
Oct	7 (*8*)	3 (*3*)	8(*9*)	—	15(*17*)	14(*16*)	20(*23*)	20(*23*)
Nov	2(*10*)	—	—	—	6(*30*)	1 (*5*)	8(*40*)	3(*15*)
Dec	—	—	—	—	—	1(*33*)	2(*67*)	—
Year	37(*9*)	9 (*2*)	14(*3*)	4(*1*)	53(*13*)	99(*24*)	115(*27*)	86(*21*)

The figures within the brackets in Tables 7—9 are percentage frequencies