551.577.3 (547)

INTENSITY OF RAINFALL AT BOMBAY AIRPORT

It has been shown by Rai Sircar and Sikdar (1963) that the visibility at Bombay Airport is directly connected with intensity of rainfall during the monsoon months. In recognition of the hazardous nature of heavy falls to aircraft operations, warnings are being issued whenever rainfall of intensity of 50 mm/hr or more with a minimum duration of 10 minutes is expected over the airfield.

Intensity of rainfall can be estimated from the records of the natural syphon raingauge. But it is more accurate to analyse directly the record of intensity raingauge. A tipping bucket intensity raingauge with a Billy impulse recorder averaging intensity of rainfall in 3 minutes slabs, has been in operations at Santacruz Airport, Bombay since 18 July 1953. The intensity of records of showers has been mainly examined in the present study for the 5-year period 1963–67.

2. Bombay has two seasons, dry and wet seasons. The wet season is the season of southwest monsoon. The monsoon sets in Bombay on 10 June and withdraws during early October. Table 1 gives the climatological data for Bombay (Colaba) as published by the India Meteorological Depart-

TABLE 1

Analysis of climatological data for Bombay (Colaba)

	Monthly total rainfall (mm)	No. of rainy days	Heaviest fall per day (mm)	Amount of rainfall per rainy day (mm)
Jun	520·3	15·4	408·9	33·8
Jul	709·5	23·5	304·8	30·2
Aug	439·3	19·1	287·0	23·0
Sep	297·0	12·8	548·1	23·2

TABLE 2

Frequency of showers of intensity of 50 mm/hr and more

	Jun	Jul	Aug	Sep	Oct
1963	2 (1)	3 (1)	6 (1)	2 (0)	1 (1)
1964	5 (0)	2 (1)	3 (0)	1 (1)	1 (1)
1965	10 (3)	15 (6)	6 (0)	3 (0)	—
1966	2 (0)	14 (5)	2 (0)	6 (0)	—
1967	11 (4)	5 (2)	1 (0)	—	—
Total	30 (8)	39 (15)	18 (1)	12 (1)	2 (2)

Figures in brackets indicate those lasting for 9 min or more

TABLE 3

Maximum duration (in minutes) of heavy rainfall intensity 50 mm/hr and more

	Jun	Jul	Aug	Sep	Oct
1963	12	12	9	6	12
1964	3	12	3	9	9
1965	15	30	6	6	—
1966	3	54	6	6	—
1967	27	15	6	—	—

TABLE 4

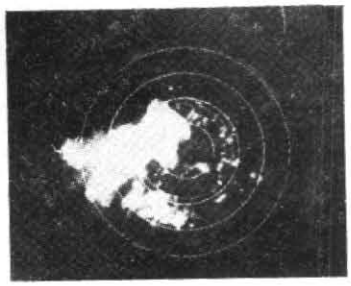
Maximum intensity of shower (mm/hr)

	Jun	Jul	Aug	Sep	Oct
1963	52	68	80	68	63
1964	65	67	62	55	55
1965	91	115	87	57	—
1966	66	107	53	87	—
1967	110	132	54	30	—

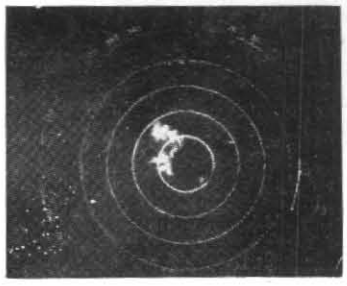
TABLE 5

Evaluation of the ratio x/y

	<1	$\geqslant 1$	Intermediate	Total
		1963		
Jun	10	5	—	15
Jul	18	7	7	32
Aug	25	12	5	42
Sep	3	2	—	5
		1964		
Jun	21	9	2	32
Jul	30	30	4	64
Aug	11	13	—	24
Sep	3	3	—	6
		1965		
Jun	22	12	1	35
Jul	20	7	1	28
Aug	8	12	3	23
Sep	5	7	—	12
		1966		
Jun	5	2	1	8
Jul	30	15	2	47
Aug	4	6	3	13
Sep	10	6	2	18
		1967		
Jun	31	6	3	40
Jul	13	11	—	24
Aug	47	13	3	63
Sep	4	—	—	4



7 Oct 1968, 1450 IST, Range :5 n. miles, Elevation : 12°, Gain : 6.0



7 Oct 1968, 1452 IST, Range : 5 n. miles, Elevation : 12°, Gain : 4·0

Fig. 1

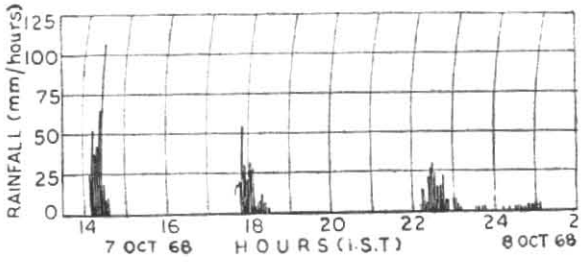


Fig. 2

ment in their *Climatological Tables* (1931-1960). This shows that the average intensity on a rainy day is greatest in June and gradually decreases with progress of the season.

3. For aviation purpose it is necessary to anticipate whether heavy rain of intensity 50 mm/hr or more is expected and if so, whether such intensity of fall would last for at least 10 minutes. For this purpose Tables 2 to 3 have been prepared.

4. For the purpose of getting an approximate idea of the core of the cloud, an analysis of intensity records was made by the method followed by Fujiwara (1958) by taking the time interval between start of shower to its maximum intensity (x) and the time interval between the maximum intensity to the end of the shower (y).

In the present study shower was supposed to have ended when the intensity fell to a value of 5 mm/hr. Considering the nature of rain at Bombay such a criterion was chosen.

The results of the analysis have been given in Table 5. It will be seen that $x/y<1$ is in majority cases. According to Fujiwara $x/y<1$ suggests that the core of the cloud is displaced towards the forward edge of the cloud. Similarly $x/y>1$ suggests that the core of the convective cloud is displaced towards the rear edge.

It was difficult to verify these conclusions from the radar observations at Bombay. It was, however, possible to do so on 7 October 1968. On this day there was a heavy downpour for 33 minutes and the maximum intensity attained was 110 mm/hr. For this shower x/y was greater than unity and a radar photograph at low gain showed that the core was displaced towards the rear edge. The radar photograph and intensity records of this day are shown in Figs. 1 and 2 respectively.

A. K. MUKHERJEE

Meteorological Office,
Alipore, Calcutta

G. KRISHNAMURTHY

Meteorological Office,
Bombay Airport, Bombay

March 25, 1969

REFERENCES

Fujiwara, M. 1958 *Pap. Met. Geophys.*, 9, pp. 141-151.

Rai Sircar, N. C. and Sikdar, D. N. 1963 *Indian J. Met. Geophys.*, 14, p. 480.