

Letters to the Editor

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CLIMATOLOGICAL STUDIES OF SQUALLS AT SANTACRUZ AND COLABA IN BOMBAY

Alvi and Punjabi (1966) and Dekate and Bajaj (1966) have studied the diurnal and seasonal variations of the squalls in India for 22 stations in India and climatological study of the squalls at Bombay Airport (Santacruz) respectively. From the climatological point of view, a detailed and comparative study of the squalls occurring at Santacruz and Colaba stations in Bombay has not been carried out so far. Here in this note, the significant differences have been brought out by making comparative climatological studies of squalls at Santacruz and Colaba stations in Bombay.

2. From the available self recording charts of the Dines P.T. anemographs and Monthly Meteorological Registers, the data for the 11 years period (1968-78) have been extracted and used for both of the stations.

3. From self recording wind chart, the average monthly as well as yearly incidences of squalls have been determined. If there are 2 occurrences of squalls on a day, the occurrences are taken as two. It is observed that the number of squalls occurring at Santacruz (149) and Colaba (152) over a period of 11 years are nearly same at both the stations. The correlation coefficient between the annual frequencies at the two stations is 0.66 and it accounts for about 45 per cent of the variation. The highest number of 51 and 32 squalls were recorded during 1971 at Santacruz and Colaba respectively. A significant fact which is noticed, is that the scattering is much greater at Santacruz than at Colaba. The coefficient of variation is about 100 per cent at Santacruz but only about 60 per cent at Colaba.

4. The monthly seasonal and annual number of squalls are shown in Table 1 (a). The annual number of squalls occurring at both of the stations are nearly the same, 13 to 14 squalls a year. In the annual variation, the peak is more pronounced at Santacruz than at Colaba. During monsoon months, Santacruz and Colaba record about 92 and 87 per cent of the annual number of squalls respectively.

A comparison of average monthly incidence of squalls and thunderstorms (Prasad and Pawar 1985) indicate that though there are 2 maxima of thunder storms frequency (June and September) in a year at both of the stations, there is only one maximum of squall frequency which occurs during July at these two stations.

5. The monthly, seasonal and annual number of days with squalls are given in Table 1(b). The annual number of days with squalls are about 10 and 12 at Santacruz and Colaba respectively. The highest annual of 34 days of squalls at Santacruz and 25 days at Colaba were reported in 1971 out of 105 at Santacruz and of 128 squally days at Colaba over a period of 11 years.

A comparison of annual number of days with squalls with the climatological values indicate a fall of about 20 per cent at Colaba and about 10 per cent at Santacruz.

6. The occurrences of squalls have been considered for the 16 points of compass for both of the stations. The cumulative distribution over a period of 11 years as well as percentage directionwise frequency of squalls along with seasonal distribution are shown in Table 2. The main features of the table are given below:

(a) Most (about 85 per cent) of the squalls at Santacruz are from the sector, SSW to W, with SW to WSW accounting for nearly two-thirds of the squalls.

(b) Most (about 75 per cent) of the squalls at Colaba are in sector, SW to NW, with W to WNW accounting for over 45 per cent of the squalls.

(c) The scattering in the direction of squalls is much greater at Colaba than at Santacruz.

(d) There is a definite shift of about 60° from SW at Santacruz to WNW at Colaba in the modal direction of squalls.

(e) The number of squalls from SW quadrant is quite high (118) at Santacruz, compared to (43) at Colaba. The frequency of squalls in the W-N quadrant is more at Colaba (78) than at Santacruz (11). The frequency of squalls from the other two quadrants are also comparatively more at Colaba than at Santacruz

TABLE 1 (a)
Average monthly incidence of squalls*
(No. of occasions)

Stations	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Santacruz	0 (0)	0 (6.1)	0 (0.1)	0.1 (0.3)	0.1 (1.1)	3.7 (6.1)	6.4 (2.5)	1.5 (1.0)	0.7 (4.4)	0.7 (3.5)	0.1 (1.9)	0 (0)	13.3 (21.0)
Colaba	0 (0)	0 (0.2)	0 (0.2)	0.1 (0.2)	0.5 (1.2)	3.7 (4.5)	5.4 (1.9)	2.0 (1.5)	0.9 (3.7)	0.9 (3.2)	0.3 (1.5)	0 (0)	13.8 (18.1)

*The figures in bracket indicate average monthly incidence of thunderstorms (after Prasad and Pawar 1985)

TABLE 1 (b)
Average monthly, seasonal and annual number of days with squalls*

Stations	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Santacruz	0 (0)	0 (0)	0 (0)	0.1 (0.1)	0.1 (0.3)	2.5 (2.0)	4.2 (4.0)	1.2 (3.0)	0.7 (0.8)	0.7 (0.5)	0.1 (0)	0 (0)	9.6 (11.0)
Colaba	0 (0)	0 (0)	0 (0)	0.1 (0)	0.5 (0.1)	3.1 (4.0)	4.4 (5.0)	1.8 (4.0)	0.6 (1.2)	0.9 (0.5)	0.3 (0)	0 (0)	11.7 (15.0)

*The figures in bracket indicate climatological number of days with squalls, (1931-1960)

TABLE 2
Directionwise frequency of squalls
(16 points of compass)

Station	Direction																Total
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
Santacruz																	
Winter season	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pre-monsoon	1	2	0	0	1	0	0	0	0	0	3	0	0	0	0	0	7
Monsoon	0	1	1	2	1	0	2	1	1	10	64	31	16	1	2	0	133
Post monsoon	0	0	2	0	2	1	2	0	0	0	2	0	0	0	0	0	9
Cumulative	1	3	3	2	4	1	4	1	1	10	69	31	16	1	2	0	149
Percentage	0.7	2.0	2.0	1.3	2.7	0.7	2.7	0.7	0.7	6.7	46.3	20.8	10.7	0.7	1.3	0	100
Colaba																	
Winter season	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pre-monsoon	0	0	0	1	0	1	1	0	0	0	1	0	0	1	1	0	6
Monsoon	2	1	1	5	5	1	1	1	2	3	9	12	31	38	19	2	133
Post monsoon	1	0	1	1	0	3	3	2	0	1	1	0	0	0	0	0	13
Cumulative	3	1	2	7	5	5	5	3	2	4	11	12	31	39	20	2	152
Percentage	2.0	0.7	1.3	4.6	3.3	3.3	3.3	1.9	1.3	2.6	7.2	7.9	20.4	25.7	13.2	1.3	100

TABLE 3
Frequency of squalls (per cent) of different speed

Windspeed (kmph)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
(a) Santacruz													
40-49	0	0	0	0	0	7.5	10.2	4.8	0.7	0.7	0.7	0	24.6
50-59	0	0	0	0	0.7	8.8	27.2	4.7	2.7	1.4	0	0	46.2
60-69	0	0	0	0	0	5.4	8.8	2.0	2.0	2.7	0	0	20.9
70-79	0	0	0	0	0	4.8	1.4	0	0	0	0	0	6.2
80-89	0	0	0	0	0	0.7	0	0	0	0.7	0	0	1.4
90-99	0	0	0	0	0	0.7	0	0	0	0	0	0	0.7
Total	0	0	0	0.7	0.7	27.9	47.6	11.5	5.4	5.5	0.7	0	100.0
(b) Colaba													
40-49	0	0	0	0	0.7	6.6	3.9	5.2	0.7	2.0	1.3	0	20.4
50-59	0	0	0	0.7	1.3	10.5	15.1	3.9	0.7	1.3	0.6	0	34.1
60-69	0	0	0	0	0.7	6.6	12.5	4.6	2.6	2.6	0	0	29.6
70-79	0	0	0	0	0.7	1.3	7.2	0.7	0.7	0.6	0	0	11.2
80-89	0	0	0	0	0	1.3	0.7	0	0.7	0	0	0	2.7
90-99	0	0	0	0	0	0.7	0	0	1.3	0	0	0	2.0
Total	0	0	0	0.7	3.4	27.0	39.4	14.4	6.7	6.5	1.9	0	100.0

(f) It is worthwhile to mention here that the significant differences in the modal directions of the squalls at Colaba and Santacruz — only about 20 km apart raises doubts about the universal applicability of the findings of Dekate and Bajaj (1966) about correlation between direction of squalls with 700 mb level wind.

7. The average monthly frequency of squalls (per cent) of different windspeeds are shown in Table 3(a) for Santacruz and Table 3(b) for Colaba. The main features of these tables are given below:

- (i) Even though the median windspeed has nearly the same value of 55 to 60 kmph at both the stations, frequency of squalls of higher windspeeds is greater at Colaba than at Santacruz. Frequencies of squalls with windspeeds exceeding 70, 80 and 90 kmph are nearly twice at Colaba than at Santacruz and of windspeeds exceeding 60 kmph, 1.5 times at Colaba than at Santacruz.
- (ii) The scattering of windspeeds is comparatively more at Colaba than at Santacruz.
- (iii) During the 11-year period under study, the windspeed in the squall never exceeded 100 kmph at either of the two stations.

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