

Letters to the Editor

551.591 (547.1)

POOR VISIBILITY AT BOMBAY AIRPORT DUE TO AIR POLLUTION DURING MONSOON SEASON

1. The suburbs of Andheri, Kurla and Chembur cover the NE and SE sectors of Bombay Airport. These suburbs are highly industrialised and are sources of air pollutants. The effect of industrial pollution on visibility during the winter season has been studied by a number of workers. Chandiramani *et al.* (1975) in their case study have shown that stagnation of pollutants is the main cause of poor visibility. Pradhan *et al.* (1976) have studied the diurnal and seasonal variations of visibility over Bombay Airport during non-monsoon months. It has been shown that for reduction of visibility due to stagnation of air pollutants' presence of inversion is not necessary, but it suffices to have a stable atmosphere. It is further shown that the surface wind plays a major role in lowering the visibility by causing stagnation of pollutants over the airfield.

The deterioration of visibility due to spells of heavy precipitation during monsoon season is well known. It is generally believed that after a shower or long spell of precipitation, visibility improves considerably because the dust and other suspended particles are dissolved or are washed off. It is observed that over Bombay Airport, during monsoon season, the visibility deteriorates even when there is no precipitation. In the present study, such cases of poor visibility have been analysed and discussed.

2. A skopograph was installed at Bombay Airport in June 1974. Half hourly visibility values, recorded in the current weather register for monsoon months for the years 1974 and 1975 have been analysed. Corresponding surface wind data have also been taken from the Current Weather Registers. The mean percentage frequency of wind direction for the monsoon months has been taken from the paper of Narasimham *et al.* (1975).

3. There are in all 295 cases of visibility 2.0 km or less, which are not associated with precipitation, during the monsoon seasons of 1974 and 1975. These cases have been analysed month-wise and are presented in Table 1. The three hourly variation is presented in Table 3. Table 2 and Fig. 1 give the variation of visibility with respect to speed and direction.

4. It is seen from Table 2 that, 265 cases out of 295 cases (90 per cent cases) occur whenever the wind is calm/light variable or speed less than or equal to 5 kt. Fig. 1 suggests that 95 per cent cases of poor visibility occur whenever the wind is calm/light variable or from NNE to S'ly direction, and only 5 per cent cases occur when the wind is from S to NNE'ly direction.

5. It is seen from Table 1 that number of cases of visibility 2.0 km or less associated with industrial smoke are maximum in September followed by July and August and least in June. Table 3 gives that 267 cases out of 295 cases (90 per cent cases) occur between 18 and 06 GMT, highest number of cases occur between 00 and 03 GMT followed by 03-06 GMT, 21-24 GMT and 18 to 21 GMT.

The mean percentage frequency of wind direction for the monsoon months given by Narasimham *et al.* (1975) clearly suggests that (i) maximum frequencies of calm/light variable/NNE'ly to S'ly winds occur in September followed by June, July and August respectively. The percentage frequency of the wind is higher in June but the number of cases of poor visibility is less in June (Table 1). This may lead one to believe that the wind direction is favourable to bring in the pollutants over the airport in the month of June and cause deterioration in visibility. But the fact is not so. The atmosphere mostly remains unstable before the onset of monsoon due to strong insolation, with the result that the pollutants are quickly dispersed. Therefore, the cases of poor visibility due to pollution or smoke are less in June. Maximum frequencies of calm/light NNE'ly to S'ly and wind in the monsoon months are between the period 18 and 06 GMT,

TABLE 1

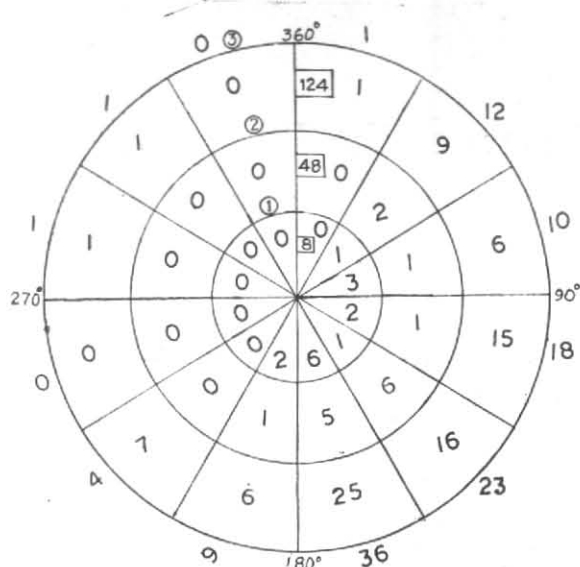
Monthly frequency of visibility 2.0 km or less during monsoon months not associated with precipitation

Visibility (km)	Jun	Jul	Aug	Sep	Total
2.0-1.5	22	52	31	103	208
1.5-1.0	6	17	3	38	64
<1.0	1	4	5	13	23
Total	29	73	39	154	295

TABLE 2

Frequency of visibility 2.0 km or less during monsoon months (not associated with precipitation with respect to wind speed)

Visibility (km)	Calm/light variable	wind speed (kt)			Total
		≤5	5-10	>10	
2.0-1.5	124	59	24	1	208
1.5-1.0	48	13	3	0	64
<1.0	8	13	2	0	23
Total	180	85	29	1	295



① VISIBILITY < 1 km, ② VISIBILITY < 1.5-1.0, ③ VISIBILITY 2.0-1.5 km, □ No. OF CASES OF VISIBILITY ASSOCIATED WITH CALM/LIGHT VARIABLE WIND

Fig. 1. Number of cases of visibility 2.0 km and less during monsoon months (not associated with precipitation with respect to direction of wind for 1974-75

TABLE 3

The hourly frequency of visibility 2.0 km or less during months not associated with precipitation

Visibility (km)	Time (GMT)								Total
	00-03	03-06	06-09	09-12	12-15	15-18	18-21	21-24	
2.0-1.5	95	38	7	0	2	15	12	39	208
1.5-1.0	41	9	4	0	0	0	5	5	64
<1.0	9	7	0	0	0	0	2	5	23
Total	145	54	11	0	2	15	19	49	295

being highest during the period 0030 to 0330 GMT followed by 0330 to 0630 GMT and 2130 to 0030 GMT. This corresponds to the cases of poor visibility as given in Table 3.

6. The authors are indebted to Dr. A. K.

Meteorological Office, Bombay Airport, Bombay
23 February 1976

Mukherjee, Director, Regional Meteorological Centre, Bombay for suggesting the problem and Shri C. E. J. Daniel, Meteorologist I/C for all possible help and Mrs. Asha Ningoo for neat typing.

S. K. PRADHAN
DAYAKISHAN
N. S. MANRAL

REFERENCES

Chandiramani, W. G., Pradhan, S. K., Gurunadhan, G., Dayakishan and Manral, N. S.
Narasimham, A. L., Ganesan, G. S. and Pillai, E. S.

1975 *Indian J. Met. Hydrol. Geophys.*, 26, 2, pp. 208-210.

1975 Diurnal and seasonal variation of various meteorological parameters at Bombay Airport Pre-Published Sci. Rep. 210.

Pradhan, S. K., Dayakishan and Manral, N. S.

1976 *Indian J. Met. Hydrol. Geophys.*, 27, 3, pp. 330-331.