

Letters to the Editor

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VISIBILITY OBSERVATIONS AT BOMBAY AIRPORT DURING THE WINTERS OF 1974-75 AND 1975-76 WHEN A SKOPOGRAPH WAS IN OPERATION

1. Rangarajan (1952) studied the fog over Bombay Airport utilising the data for the period 1944 to 1951 and Viswanathan and Faria (1963) using the data for 1952-59. Mukherjee, *et al.* (1975), however, showed that the statistics given by the above studies are gross over estimates of the percent conditions, the visibility values having considerably decreased during the last decade or so, mainly due to pollution caused by the industrialisation of surrounding areas.

The above studies have utilised only the visual estimates made from the Control Tower of the Airport. A skopograph was installed near the touch down point of the 27 Runway in July 1974. The visibility values, indicated by this instrument on many occasions, particularly of low visibilities, were found to be very much lower than the eye estimates of the observer on the Tower. On quite a number of such occasions it was noticed that there was a shallow layer 5 to 10 m deep of smoke or mist engulfing the airstrip and the values indicated by the skopograph were genuine while the visual observations on the Tower were over-estimated.

This note gives the results of an analysis of the visibility observations for the winters (November to March) of 1974-75 and 1975-76, when the skopograph was in operation. This analysis would be of some use to the airliners for planning their schedules and to the meteorologists in the issuing of forecasts. For the sake of comparison, the statistics for previous winter, *viz.*, November 1973 to March 1974 are also presented.

2. Fig. 1 shows the median values of the visibilities over Bombay Airport at different times of the day, during the winters (November to March) of 1973-74, 1974-75 and 1975-76, the lower and upper quartiles are also shown.

It may be seen that there is very little difference between the median values of the three winters between 03 and 13 GMT. While the median value decreased gradually from about 5700 m at 14 GMT to about 5000 m at 00 GMT during the winter 1973-74 (when the visibilities were estimated visually), the median values during the winters of 1974-75 and 1975-76 (based on skopograph) decreased rapidly from about 4700 m at 18 GMT and were between 2500 and 2800 m between 18 and 24 GMT. In 1973-74, the median values of the visibility decreased from 5000 m at 00 GMT to the lowest value of 2000 m at about 0230 GMT, it fell from about 2800 m at 00 GMT to the lowest value of about 1500 m at about 0230 GMT in the other two winters.

The curves for the individual months for the three winters showed the same trends. While the day time values at different hours did not vary much from one winter to another, the night time values, particularly from mid-night to daybreak were much less in the winters of 1974-75 and 1975-76 as compared to the corresponding values in the winter of 1973-74. The visibility values during the second half of the night in March 1976 were higher by about 1200 m than the corresponding values for March 1975, they were still smaller by about 1200 m than the values in March 1974. Probably the winter conditions persisted in March 1975 but not in March 1976. In all the years, November had higher values of visibilities than the months, January to March. The median values of the visibility during the later part of the night (18 to 24 GMT) were 5700 m in November, 4500 m in January and 5200 m in the remaining months in the winter of 1973-74. 3500 m in November 1974 and 2300 m to 2700 m from December 1974 to March 1975 and 3300 m in November, 3900 m in March and about 2300 to 2500 m in the remaining months of the winter of 1975-76. It may be seen that the median values given by the skopograph in both the winters of 1974-75 and 1975-76 agree well except during March and the values from mid-night to dawn in all the months are less than the corresponding values in the winter of 1973-74 by 2000 to 3000 m.

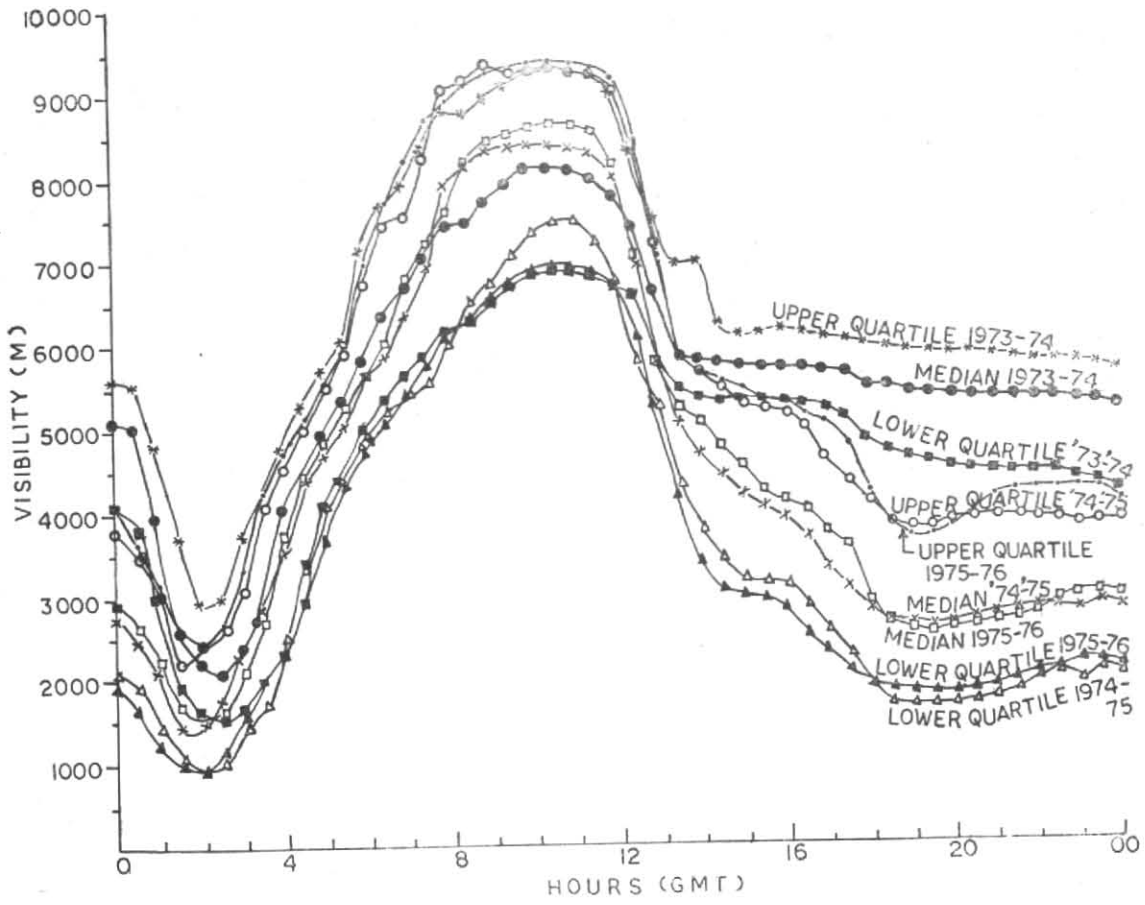


Fig. 1

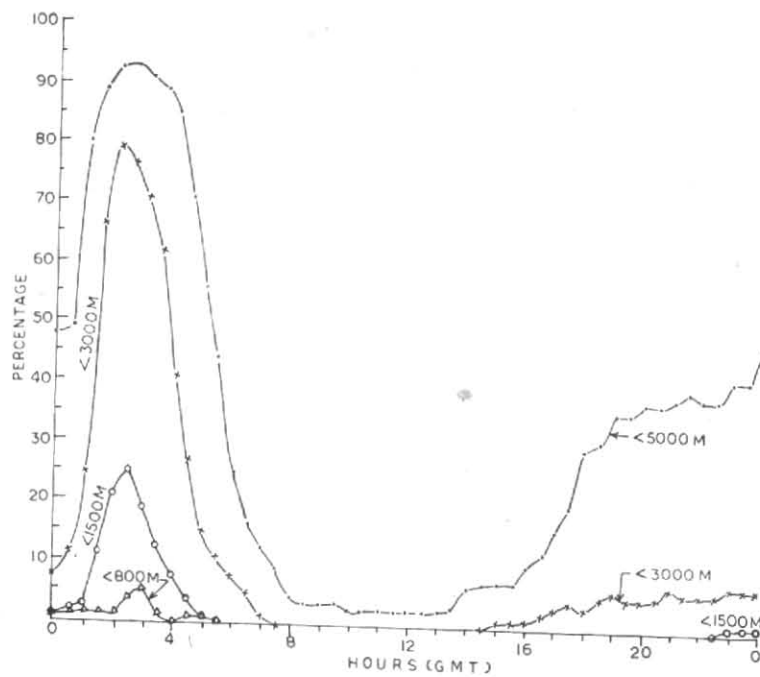


Fig. 2. Winter of 1973-74

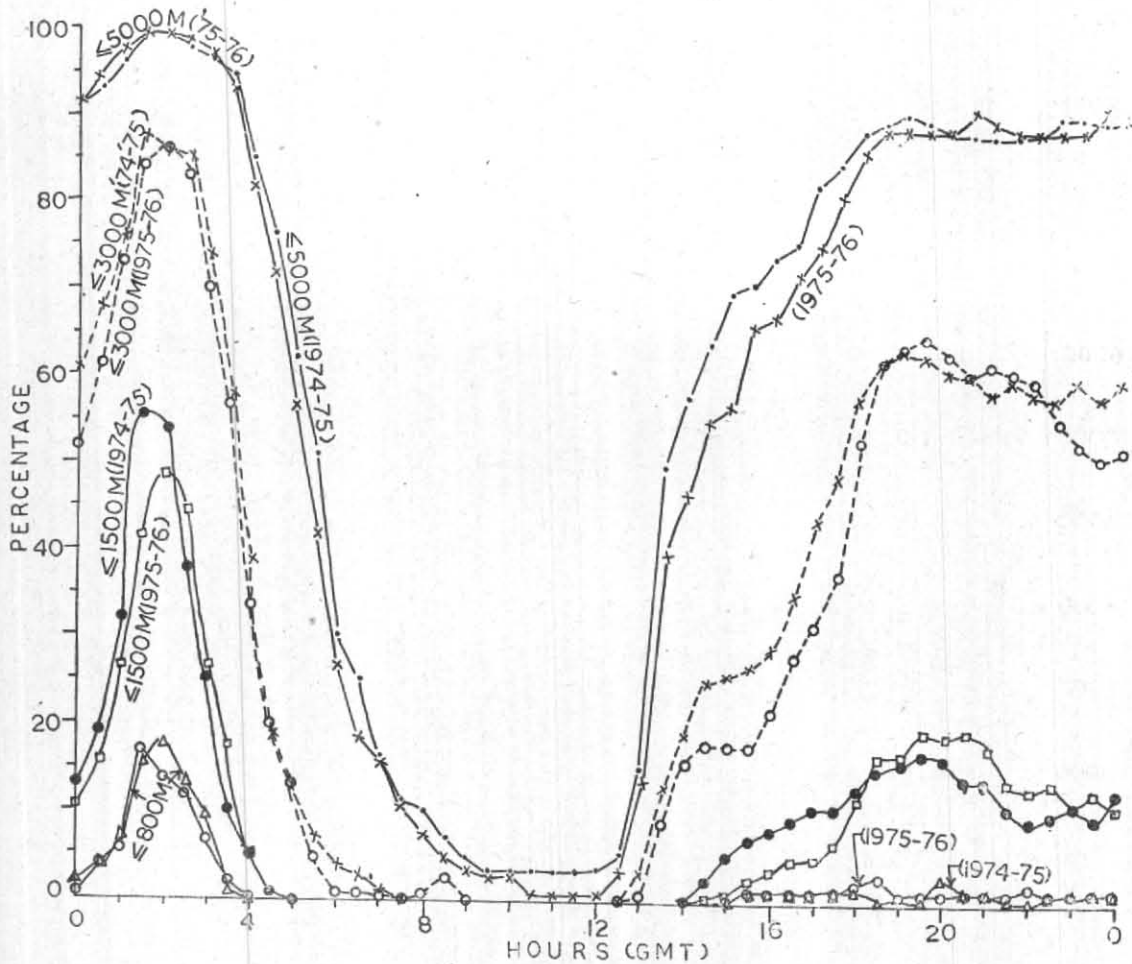


Fig. 3. Winters of 1974-75 and 1975-76

Fig. 1 also shows the lower and upper quartiles for the three winter seasons, *i.e.*, the visibility limit corresponding to the lowest and highest 25 per cent values. It will be seen that the corresponding curves for the 3 years run close to one another during the daylight hours; however, during the night hours, particularly the later half, the curves for the winters of 1974-75 and 1975-76 are close to each other, but widely separated from the corresponding curves for the winter of 1973-74. Between 16 and 01 GMT, the lower quartile for the winter of 1973-74 is higher than the upper quartiles for the winters of 1974-75 and 1975-76. Between mid-night and dawn, in the winter of 1973-74, visibility was less than 4000 m on less than 25 per cent of the days, while in 1974-75 and 1975-76 on more than 75 per cent of the days, visibility was less than about 4000 m.

2.2. Fig. 2 gives the percentage number of occasions when visibility was less than 5000 m, 3000 m, 1500 m and 800 m at various hours in the winter of 1973-74 and Fig. 3 the corresponding curves

for the winters of 1974-75 and 1975-76. There is very little difference between the corresponding curves for the three winters between 05 and 12 GMT. During the remaining hours, the corresponding curves for 1974-75 and 1975-76 run close to each other, but quite different from the corresponding curve for 1973-74. Between 18 and 24 GMT, visibility values were less than 5000 m on about 35 to 45 per cent of the days and less than 3000 m on about 5 per cent of the days in 1973-74, whereas they were less than 5000 m on about 90 per cent of the days and less than 3000 m on 50 to 60 per cent of the days and less than 1500 m on 10 to 20 per cent of the days in 1974-75 and 1975-76. The lowest visibilities occurring an hour or so after sunrise were less than 1500 m on about 20 to 30 per cent of the days in 1973-74 while they were so on nearly 50 per cent of the days in 1974-75 and 1975-76.

Thus it will be seen that the statistics given by the skopograph during the two winters 1974-75 and 1975-76 agree very well but are quite different

from the data for 1973-74 based on eye-estimates during the period 15 GMT to dawn.

3. A skopograph installed near the touch down point of the 27 Runway at Bombay Airport indicates that during winter :

(i) A shallow layer 5 to 10 m deep, of smoke or mist engulfs the Airport during night hours.

(ii) The visual estimates of visibility made by the observer from the Control Tower during night

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hours are over-estimates by about 2500 m.

(iii) The median values of the visibility during the later half of the night hours are about 3300 m in November and March and about 2500 m from December to February.

4. Our thanks are due to Dr. A. K. Mukherjee, Director, Regional Meteorological Centre, Bombay and to Shri C.E.J. Daniel, Meteorologist-in-charge of the Meteorological Office, Bombay Airport for the facilities afforded.

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