

## **SOME CLIMATOLOGICAL CHARACTERISTICS OF FOG OVER BHUBANESWAR AIRPORT**

1. Fog is one of the important hazards to aviation activity. Bhubaneswar being the capital city of Orissa; is growing rapidly and has become one of the important Airports of India. According to climatology (IMD, 1999) based on the data of 1951-80, about 92% of the total fogs in a year occur during the period from October to March.

Hence some climatological characteristics of fog during October to March are analysed. Fog at Bhubaneswar Airport is generally of radiation type. According to Rao and Srinivasan (1969), the noteworthy synoptic features associated with the fog over northeast India including Orissa, ahead of the western disturbance are (i) south/southwesterly wind over Orissa, Gangetic West Bengal and Bangladesh in lower levels, (ii) an anticyclone over north Bay on the surface chart and (iii) considerable rise in dew point and minimum temperatures over the land areas indicating the advection of warm moist air.

TABLE 1

**The mean frequency of fog**

Month	Frequency
October	0.9
November	0.3
December	1.2
January	5.1
February	3.4
March	2.4
Total	13.3

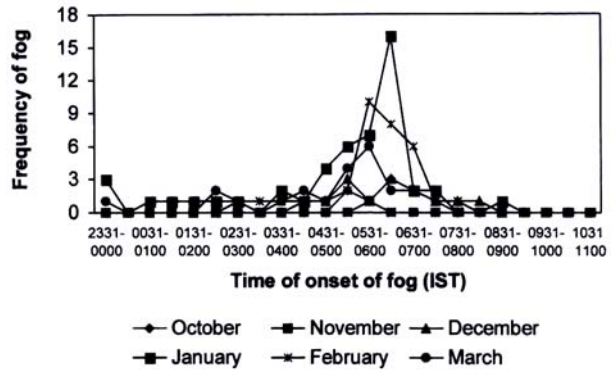


Fig. 1. The onset of fog over Bhubaneswar airport

TABLE 2

**The interannual variation in the monthly frequency of fog**

Parameter	January	February	March	Total (Oct-Mar)
Maximum frequency	13	8	9	27
Minimum frequency	1	1	0	4
Range	12	7	9	23

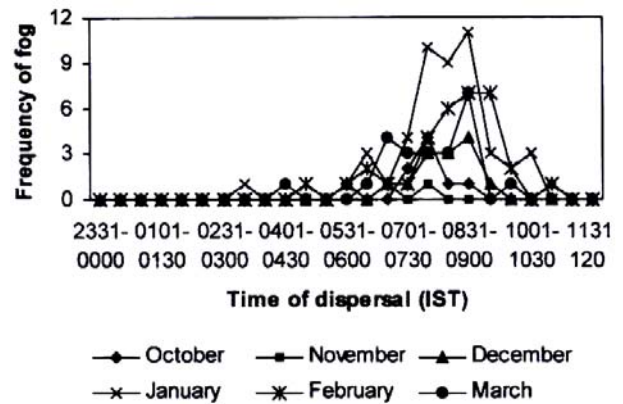


Fig. 2. Dispersal of fog over Bhubaneswar airport

TABLE 3

Percentage of frequency of fog days with visibility of < 4000m at 0830 UTC out of total fog days

Month	Percentage frequency
October	44
November	33
December	75
January	82
February	71
March	75
Total	74

There have been many studies on fog over different airports. To mention a few are the studies by Roy (1951), Rangarajan (1952), Basu (1954), Basu (1957), Kundu (1957), Chandiramani (1958), Swaminathan (1961) and Mohapatra and Thulsidas (1998) etc.

2. This study has been carried out on the data of six months viz. October, November, December, January, February and March over a period of 10 years from 1989 to 1998. The frequency of occurrence, day of occurrence, time of onset, time of dispersal, intensity in terms of visibility and the duration of fog are given.

3. The analysis shows that fog occurs for about 13 days during October to March (Table 1). The mean monthly frequency of fog is maximum during January followed by February and March.

4. The range in frequency of fog is maximum in January followed by March and February (Table 2). Considering the period as a whole, the annual frequency ranges from 4 to 27.

5. The frequency of onset of fog is maximum between 0601 to 0630 UTC for the months of October, December and January and between 0531 to 0600 UTC for the months of November, February and March (Fig. 1). However, the maximum number of fogs occurs around the sunrise time, which is well in agreement with physical principle. There is no onset of fog after 0730 UTC during the months of October, November and March, after 0800 UTC during February, after 0830 UTC during December and after 0900 UTC during January. The percentage frequency of onset of fog after 0730 UTC is only about 3 % during the whole period. However, during

TABLE 4

The percentage frequency of fog dispersed by 0800, 0830 and 0900 UTC

Month	B 0800 Hours (UTC)	B 0830 Hours (UTC)	B 0900 Hours (UTC)
January	42%	60%	82%
February	49%	70%	91%
March	50%	63%	92%
Total (Oct-Mar)	47%	65%	87%

TABLE 5

The highest duration of fog during 1989-98

Month	Date	Year	Duration	
			Hours	Minutes
October	12	1992	02	55
November	19	1989	05	00
December	02	1991	03	40
January	05	1997	10	20
February	10	1997	07	30
March	05	1997	10	35

TABLE 6

Comparison of the mean frequency of fog

Mean frequency	Oct	Nov	Dec	Jan	Feb	Mar	Total
1989-98	0.6	0.3	0.8	2.6	1.4	0.5	6.2
1951-80	1.1	0.4	0.8	2.6	3.2	2.3	10.4

January and March, the onset of fog even takes place as early as 2330 UTC. Only 5% of the total onset takes place before 0200 UTC and most of them occur during January.

6. Intensity of fog can be measured in terms of minimum visibility associated with it. The horizontal visibility is less than 4000 m at 0830 UTC on 74 % cases of total fog days. The percentage frequency of fog days with visibility less than 4000 m at 0830 UTC is maximum in January followed by March and December (Table 3).

7. Maximum number of fogs disappears during 0831 to 0900 UTC followed by 0731 to 0800 UTC (20% of total) and 0801 to 0830 UTC. About 60% of total fogs disperse between 0731 to 0900 UTC (Fig. 2). The percentage frequencies of fog dispersed by 0800, 0830 and 0900 UTC for different months are given in Table 4. There is late dispersal of fog during January and November compared to other months. As the frequency

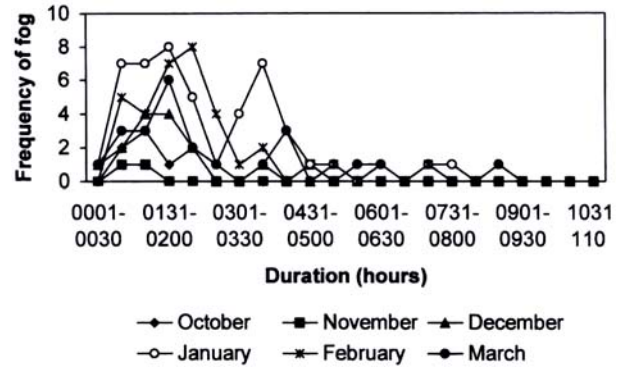


Fig. 3. Duration of fog over Bhubaneswar airport

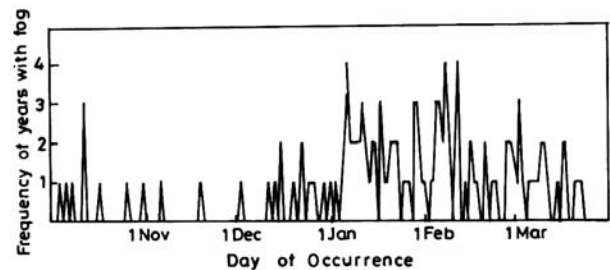


Fig. 4. The frequency of years with fog over Bhubaneswar airport during 10 years period of 1989-98

of fog in November is very less and also scattered, the above conclusion cannot be drawn regarding dispersal of fog in November.

8. The frequency of fog is maximum with duration of 1 hour to 1 hour 30 minutes during October, 1 hour 30 minutes to 2 hours during December, January, March and 2 hours to 2 hours 30 minutes during February (Fig. 3). The frequency of fog with duration of more than 3 hours is maximum in January followed by March and February. Considering highest duration of fog, more durable fogs have occurred during January, February and March in recent years (Table 5). The fog with highest duration of 10 hours 35 minutes has occurred on 5<sup>th</sup> March, 1997 during March, with duration of 10 hours 20 minutes on 5<sup>th</sup> January, 1997 during January and with duration of 7 hours 30 minutes on 10<sup>th</sup> February, 1997 during February.

9. The frequency of years with occurrence of fog is depicted in Fig. 4. The frequency has been very less from 1<sup>st</sup> October to 5<sup>th</sup> January. From 5<sup>th</sup> January, the frequency has sharply increased to reach peak on

7<sup>th</sup> January. It has decreased slowly afterwards till the end of January and increased then to reach another peak around 10<sup>th</sup> February. From 10<sup>th</sup> February, it has decreased slowly with embedded minor oscillations towards end of March.

10. Comparing the mean frequency of fog days during 1989-98 with that during 1951-80, the mean frequency of fog during the period under study is appreciably less than that during 1951-80 (Table 6). The mean frequency during 1989-98 is less than that during 1951-80 for October, November, February and March. It remains same during December and January.

11. The following broad conclusions can be drawn from the above results and discussion. Maximum number of fogs occurs in January followed by February and March. The frequency of years with occurrence of fog is appreciably higher from 5<sup>th</sup> January to mid-March with peaks around 7<sup>th</sup> January and 10<sup>th</sup> February. The frequency of onset after 0730 UTC is only 3% of total frequency of fog. Early onset, late dispersal and hence higher duration of fog mostly occur in January. Also the fogs are most intense in terms of minimum visibility during January. About 60% of the total fogs disperse between 0731 and 0900 UTC. Most of the fogs have duration of 1 hour to 2 hours 30 minutes.

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