

Fog over Upper Assam

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1. Introduction

A large number of aircraft (passenger and freighter services) now ply between Calcutta (Dum Dum) and the Upper Assam stations. Many of these aircraft commence flying even during winter months early in the morning when the occurrence of fog at the Upper Assam stations is very common. As fog constitutes one of the greatest weather hazards both for landing and taking off, it was considered important to study the fog frequencies at Gauhati, Mohanbari and Tezpur which have been taken to be representative stations of the Upper Assam valley. Tables showing (1) frequency of occurrence of fog in different winter months, (2) frequency of occurrence of fog at different hours, (3) simultaneous occurrence of fog at different hours of day and night and (4) time of onset of fog have been worked out and the meteorological conditions which favour the development of fog at these stations have been studied and summarised.

2. Data used

For the purpose of the present investigation, the observational data of Gauhati and Mohanbari airfields, and Tezpur and Dibrugarh pilot balloon observatories, for the years 1950-52 were utilised. A short description of the localities together with geographical positions in respect of the above stations is given in Table 1.

3. Monthly frequency of fog

Table 2 shows the average frequency of occurrence of fog during November to February at Gauhati, Mohanbari or Dibrugarh and Tezpur. In other months there was no occasion of fog in these localities. It will be seen from the table that the monthly frequency is highest at Gauhati in all the winter months (November to February), the maximum being in January. The frequency is lowest at Tezpur.

4. Hourly distribution of fog

The number of occasions when there was fog at different hours at these stations during the winter months November to February of 1950 to 1952 is shown in Table 3(a). It will be seen from the table that there was no occasion of fog between the hours 0500 and 1600 GMT at any station. The number of occasions was generally maximum at Gauhati as compared to other stations at all other hours of November to January, the highest being in January between the hours 0001 to 0200 GMT.

5. Simultaneous occurrence of fog

Table 3(b) shows the number of occasions when there was fog simultaneously (a) at all the stations (Gauhati, Mohanbari or Dibrugarh and Tezpur), (b) at Gauhati and Mohanbari or Dibrugarh, (c) at Gauhati and Tezpur, (d) at Tezpur and Mohanbari or Dibrugarh at different hours during the winter months of

TABLE 1

Station	Position	Period of data used	Short description of the locality
Gauhati airfield	26°5' N 91°43' E	Nov 1950 to Feb 1951 and Nov 1951 to Feb 1952	Eastern Himalayan ranges to the north. Hill ranges about 1000 ft high to the south and east. River Brahmaputra runs from northeast to southwest to the north of the station
Dibrugarh or Mo- hanbari airfield	27°28' N 94°55' E	Do.	Eastern Himalayan ranges to the north and Naga hills to the east of the station. Brahmaputra runs from northeast to southwest to the north of the station
Tezpur	26°37' N 92°47' E	Do.	Eastern Himalayan ranges to the north. River Brahmaputra runs from northeast to southwest to the south of the station.

Note: D-type centres at Gauhati and Mohanbari airfields started functioning from 1950 and 1951 respectively. Data for November 1950 to February 1951 of Dibrugarh pilot balloon observatory (which was close to Mohanbari) were used. There is no observatory at Tezpur airfield

TABLE 2

Frequencies of occurrence of fog per month

	Gauhati	Mohanbari or Dibrugarh	Tezpur
November	15	5	5
December	20	15	5
January	23	14	4
February	4	3	1
Other months	nil	nil	nil
Year	62	37	15

1950 to 1952. It will be seen from the table that there was simultaneous occurrence of fog at all the stations on 3 to 4 occasions only during 2201 to 0200 GMT of November and on rare occasions during other hours and other winter months. It is, however, striking that occasions of simultaneous occurrence of fog at Gauhati and Mohanbari are highest during 2201 to 0200 GMT in all winter months, the maximum being in December and January. The occasions of simultaneous occurrence of fog at Gauhati and Tezpur and at Tezpur and Mohanbari vary between 2 and 6 particularly during 2101 to 0300 GMT of November to January.

6. Time of onset of fog

Table 4 shows the occasions of onset of fog at different hours during November to February of the years 1950 to 1952. It will be seen that occasions of onset of fog were maximum between the hours 2200 and 2259 GMT at all these stations. As the sunrise time at all these stations was later than 0000 GMT during the above months it can be inferred that the maximum occasions of onset were before sunrise.

7. Type of fog and the meteorological conditions favourable for its formation

It is well known that during the winter months Western Disturbances frequently pass eastwards across Upper Assam and cause low and medium clouds with occasional rain there. From a study of the synoptic charts for November to January of the years 1950 to 1952, percentage frequency of occurrence of fog in association with western disturbances and the percentage frequency of occurrence of fog on the remaining days during the period at Gauhati and Mohanbari, have been prepared. The occurrence of fog at Tezpur, which is situated to the north of the Brahmaputra river, is invariably in association with western disturbance. The incidence of fog on other days is rare at Tezpur. It will be seen from the table that during the period under

TABLE 4

Stations	1600 to 1859	1900 to 1959	2000 to 2059	2100 to 2159	2200 to 2259	2300 to 2359	0000 to 0059	0100 to 0200	Sunrise time (GMT)
Gauhati	11	5	10	14	40	31	7	2	0011—0041
Mohanbari or Dibrugarh	7	..	1	7	32	10	13	1	0002—0030
Tezpur	2	2	3	3	7	6	4	1	0008—0038

TABLE 5

Station	November				December				January			
	1950		1951		1950		1951		1951		1952	
	12 disturbed nights due to 4 W. D. 18 undisturb- ed nights		13 disturbed nights due to 4 W. D. 17 undisturb- ed nights		12 disturbed nights due to 4 W. D. 19 undisturb- ed nights		7 disturbed nights due to 4 W. D. 24 undisturb- ed nights		5 disturbed nights due to 3 W. D. 26 undisturb- ed nights		4 disturbed nights due to 3 W. D. 27 undisturb- ed nights	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Gauhati	100	77	100	59	100	60	100	67	100	54	100	85
Mohanbari	75	17	75	12	75	53	100	63	67	31	100	50

(1) Percentage occasions of fog in association with western disturbances

(2) Percentage occasions of fog when the area was not affected by any disturbance

consideration, the area was affected by 3 to 4 western disturbances per month, followed by incidence of fog almost on all occasions. During the remaining period when the area was not affected by the passage of any western disturbances, fog developed on about 70 per cent occasions at Gauhati during November to January and on about 15 per cent occasions in November and about 50 per cent occasions during December and January at

Mohanbari. The small number of occurrence of fog at Mohanbari in comparison to Gauhati on undisturbed nights is apparently due to topographical difference. The occasions of fog over Upper Assam can, therefore, be classified as (a) radiation fog on days just following the passage of western disturbances and (b) advection-radiation fog on the remaining days including those when western disturbances approach the area but are not too near. Two

examples in support of the above views are given below—

- (1) During the period 6 to 14 January 1952, two successive western disturbances passed eastwards across Eastern Himalayas. On the early mornings of 7th and 8th, both Gauhati and Mohanbari experienced advection-radiation fog when the disturbance was approaching the area but was not too near. The sky was clear during night hours and N/NE light winds prevailed upto 3000 ft. During 8th-10th when a feeble western disturbance was passing across Upper Assam, cloudy weather with scattered rain and SW/W winds prevailed over Upper Assam. The sky cleared by the evening of 10th when the disturbance passed away eastwards and N/NE light winds upto 3000 ft prevailed resulting in radiation fog over Gauhati and Mohanbari in the early morning of 11th. Tezpur did not, however, record any fog. On 12th and 13th when another western disturbance affected the area, cloudy weather with local rain and SW/W winds prevailed over the area. The sky cleared by the evening of 13th when the disturbance passed away eastwards and N/NE light winds upto 3000 ft prevailed over the area resulting in radiation fog over Gauhati, Tezpur and Mohanbari in the early morning of 14th.

- (2) During the period 23 to 29 December 1951, when Upper Assam was not affected by any western disturbance, Gauhati and Mohanbari, situated to the south of the Brahmaputra river, experienced advection-radiation fog daily in the early morning but Tezpur, situated to the north

of the river, did not experience any fog. During the period, clear skies and N/NE light winds upto 3000 ft prevailed during night and early morning hours.

Following the passage of western disturbance anticyclonic circulation sets in over north India and dry cold air associated with this anticyclonic circulation, sets in over the area and produces clear skies, although occasionally high clouds and scattered cumulus clouds in the afternoon are not unusual. After 1200 GMT these clouds begin to dissipate and by early part of night the sky clears and remains so until 0400 or 0500 GMT on the following morning. Such a clearing together with light surface winds inevitably produces favourable conditions for fog formation in the early morning hours. On other days, during the winter months (November to January) when light N/NE winds at the lower levels with clear skies prevail over the region during the night hours, advection of moisture from the broad expanses of the Brahmaputra river allows the surface layers of air to form aerial lakes which under the influence of radiative cooling produces favourable conditions necessary for fog formation.

8. Conclusions

1. Occasions of fog were maximum at Gauhati air field in all the winter months, the highest being in January between the hours 0001 to 0200 GMT. The occasions of fog at Tezpur, which is situated on the north of the Brahmaputra river, is minimum.

2. Occasions were rare when all airfields were closed for landings simultaneously due to fog.

3. Occasions of onset of fog were maximum between the hours 2200 and 2259 GMT at all the stations.