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Letters to the Editor

551.576.4 : 551.58

A CLIMATOLOGICAL STUDY OF LOW CLOUD AMOUNTS OVER BANGLADESH

1. The low clouds are observed within 2.5 km height from the surface (Matveev 1976). These are one of the hazards to road, railway, river and air communications. By using climatological data of 16 stations for 27 years (1951 - 77), a study of low cloud amounts has been done over Bangladesh. Annual variation pattern and spatial distribution of the mean monthly values are investigated. An attempt has also been made to explain temporal and spatial variation from synoptic point of view.

2. From monthly mean values of each station the annual variation curves of the low cloud amounts for all stations are classified into 3 different categories according to the maximum and minimum values. These are as follows:

Category 1 : Maximum - June; minimum - January or December.

Category 2 : Maximum - July; minimum - December or January or February.

Category 3: Main peak - June; main minimum - December;

Secondary peak - August; secondary minimum - December or February.

3. A pictorial distribution of the above categories is shown in Fig.1. Mean low cloud amounts over Bangladesh are obtained in Table 1. Analysis shows that category 1 is seen mostly over the north-western part of Bangladesh. Almost the whole part of the country is covered by category 2. And category 3 is observed over the isolated zones, *viz.*, Comilla and Rangamati. Some analysis of spatial distribution is described here for the months January, April, July and October.

(a) *January* — During this period the mean low cloud amounts vary from 0.3 to 1.7 tenths. The amount of low cloud is almost uniformly distributed in the western half of the country. It increases from the north-west towards the centre and again decreases towards the south. The highest amount (1.7 tenths) is seen in the Hill Tracts.

(b) *April* — In the northern side, the low cloud amount gradually increases towards the central part (1.5 - 3.0 tenths) in Fig.2. A ridge-like form is found in the rest of the country. It originates from Sylhet hilly areas and extends towards the south- west part.

(c) *July* — In this month, the low cloud amounts gradually increase from the north towards the central part (3.8 - 6.5 tenths). This is the zone with the lowest value. This zone is found to originate from Rangpur. A trough-like form extends from here and covers the north-western part of Bangladesh. Some isolated pockets are also found in different parts of the country.

(d) *October* — The maximum cloud amount is found in the Sylhet hilly areas (5.7 tenths). A trough-like form originates in the northern side of Bangladesh and extends from here. Cloud amount is uniformly distributed in the Chittagong hilly areas.

3.1. For the months January, April, July and October the diurnal variation curves for different stations are classified according to the following categories:

Category 1: Maximum - 0000 UTC, minimum - 0300 or 1200 UTC.

Category 2 : Maximum - 0300 UTC, minimum - 1200 or 0000 UTC.

Category 3 : Maximum - 1200 UTC, minimum - 0000 or 0300 UTC.

3.2. The above categories vary from month-to-month with respect to stations. The distributions of the stations under the above category are shown in Table 2. From Table 2 it has been found that the categories are not uniformly distributed spatially throughout the year. Category 2 is observed almost over the same stations in January and October. In July this category is observed althrough Bangladesh except only eastern part of the country.

3.3. From Table 3 analysis of the variability of the low cloud amounts has shown that the annual variation curves of the low cloud amounts over Bangladesh are unipeaked ones and the maximum of it is observed in January and the minimum in July. The cause of such variations may be explained from the synoptic point of view discussed later.

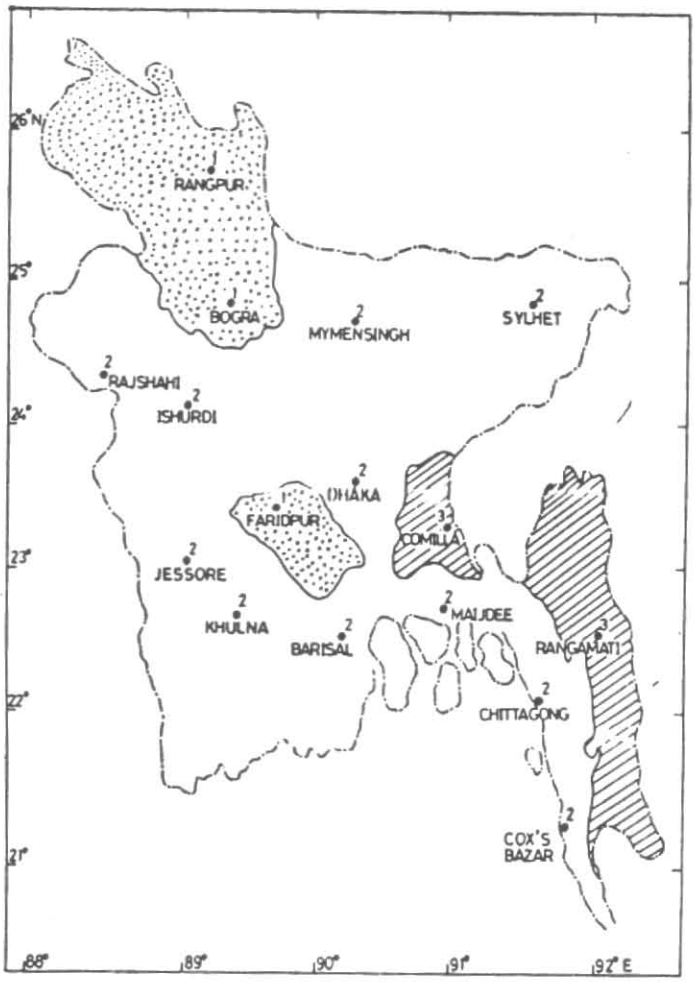

Fig.1. Distribution of annual variation pattern of different categories (1,2 and 3) of flowcloud amounts over Bangladesh

TABLE 1

Mean low cloud amounts (in tenths) over Bangladesh

Stations	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Comilla	0.90	1.61	2.51	3.95	4.85	6.38	6.33	6.38	5.30	3.08	1.31	0.61
Khulna	0.67	1.31	2.00	2.95	3.71	5.66	6.00	5.61	4.74	2.72	1.15	0.46
Ishurdi	0.86	0.87	1.71	2.95	4.38	5.82	6.19	6.22	5.44	3.08	1.31	0.87
Rajshahi	1.08	0.72	1.52	2.03	3.47	5.86	6.68	6.42	5.28	3.05	1.44	1.00
Rangpur	0.42	0.36	0.66	1.45	2.78	3.85	3.75	3.27	2.69	1.69	0.43	0.17
Faridpur	1.00	1.31	2.29	3.36	4.52	5.94	5.93	5.82	5.17	3.45	1.48	0.71
Chittagong	0.41	0.91	1.82	3.32	4.06	5.50	5.86	5.68	4.91	3.36	1.45	0.66
Rangamati	1.73	1.37	1.62	2.57	3.34	4.83	4.60	4.64	4.28	3.61	2.33	2.31
Dhaka	0.47	1.00	1.84	3.19	4.17	5.30	5.58	5.39	4.44	2.47	0.83	0.32
Maijdee	0.26	0.78	1.45	2.39	3.19	4.64	4.77	4.73	3.43	2.03	0.55	0.12
Bogra	0.53	0.67	1.24	2.24	3.75	4.96	4.92	4.70	3.89	2.31	0.79	0.58
Sylhet	1.04	1.38	2.04	4.31	5.03	6.20	6.35	6.07	5.36	3.66	1.61	0.86
Barisal	0.87	1.26	2.37	3.48	4.24	5.74	5.84	5.70	5.12	3.35	1.64	0.84
Cox's-Bazar	0.50	0.72	1.61	3.21	3.96	5.49	5.82	5.41	4.93	3.40	1.46	0.74
Jessore	0.79	1.11	2.04	2.88	4.05	5.72	6.32	6.07	5.35	3.20	1.26	0.41
Mymensingh	0.83	1.30	1.96	3.76	4.51	6.89	7.01	6.64	5.68	3.36	1.12	0.60

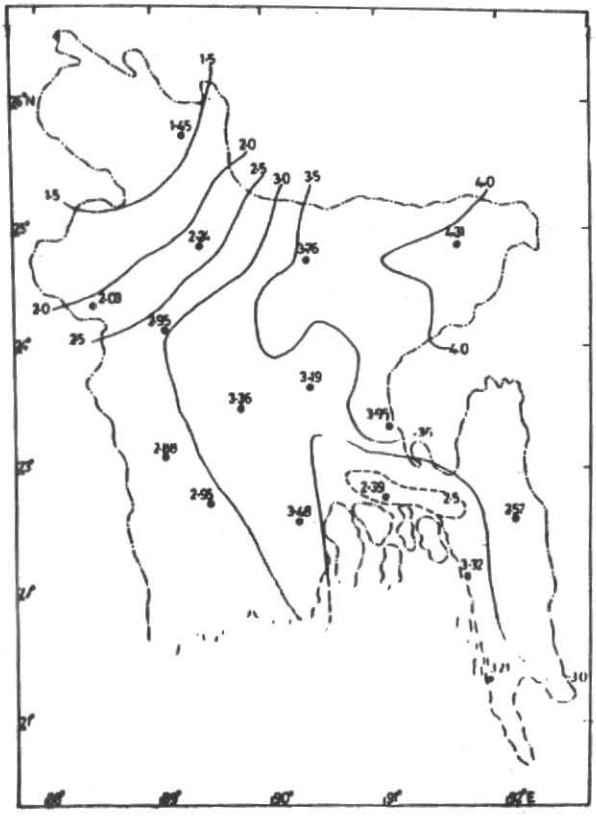

Fig.2. Distribution of low cloud amounts (in tenths) over Bangladesh in April

Study of spatial distribution of the variability of low cloud amounts concluded that the maximum coefficient of variation is observed in the north-western part of Bangladesh throughout the year and that of the minimum is seen either in the central region of the country or in the north- eastern part of Bangladesh. The cause of such variation probably due to the orography of the region plays the dominant role in the formation of low cloud amounts. From the study of the temporal variation of standard deviation of low cloud amounts it has been found that the unipeaked variations are dominant in Bangladesh.

3.4. The cause of temporal and spatial variations of the low cloud amounts over Bangladesh may be explained from the point of view of synoptic meteorology. It has been observed that the temporal variation of the low cloud amounts is in good agreement with the annual variation of synoptic processes in Bangladesh and its surrounding areas. The low cloud amounts in Bangladesh are minimum in December or January when the periphery of Asiatic anticyclone is dominant over the region (Mobassher, 1991). It is due to the fact that clear weather prevails during the occurrence of this type of synoptic process. From February, the low cloud amounts grow up due to the occurrence of the low pressure related synoptic processes (*viz.* Complex low pressure area, pressure trough from the south-western disturbance etc.). Due to the increase of these types of processes, the low cloud amount rises up in April and May. In June, southwest monsoon sets in Bangladesh, which is related mainly with monsoon depressions and the frequency of this process is significant in this month. So, due to monsoon depressions the low cloud amount in Bangladesh is maximum or near maximum in June or July. The southwest monsoon continues upto September in Bangladesh. Hence, the low cloud amounts are significant in these months also. With the introduction of the 'periphery of Asiatic anticyclone' in Bangladesh from October, the low cloud amount decreases sharply. In the spatial distribution of the monthly values, the overall increase of the low cloud amounts takes place from the west to the east. It is due to the fact that hills are situated in northeastern parts of Bangladesh. Synoptic processes mainly moving from the west to the east, intensify in these hills due to special orography which may be the cause of the maximum of the low cloud amounts in these regions.

TABLE 2

Distribution of the stations under different category of diurnal variations

Stations	January	April	July	October
Chittagong	2	2	3	1
Rangamati	1	2	3	1
Cox's Bazar	1	2	3	3
Comilla	1	3	1	3
Sylhet	2	1	1	2
Dhaka	2	2	2	2
Faridpur	1	3	2	3
Mymensingh	2	2	2	2
Bogra	2	2	2	2
Rangpur	2	1	2	2
Rajshahi	1	1	2	3
Ishurdi	3	3	2	3
Jessore	1	3	2	3
Khulna	2	2	2	2
Barisal	2	2	2	2
Maijdee	1	3	2	2

Note — Figures indicate categories 1,2 and 3.

TABLE 3

Standard deviation (S.D.) values of the low cloud amounts and % coefficient of variations (C.V.) for the months January, April, July and October

Stations	January		April		July		October	
	S.D.	C.V.	S.D.	C.V.	S.D.	C.V.	S.D.	C.V.
Chittagong	0.41	100	0.85	26	0.83	14	0.76	23
Rangamati	0.84	49	0.70	27	0.85	18	0.72	20
Cox's Bazar	0.46	92	0.94	29	0.92	16	0.77	23
Comilla	0.65	72	1.45	37	1.99	31	1.68	55
Sylhet	1.61	155	0.94	22	0.71	11	1.08	30
Dhaka	0.37	79	0.93	29	0.74	13	0.98	40
Faridpur	0.58	58	1.01	30	1.00	17	0.99	29
Mymensingh	0.54	65	1.58	42	0.68	10	1.12	33
Bogra	0.35	94	1.02	46	1.25	25	0.85	37
Rangpur	0.84	200	1.37	94	2.81	75	1.52	90
Rajshahi	0.81	75	0.99	49	1.29	34	1.31	43
Ishurdi	0.51	59	0.89	30	1.13	18	1.21	39
Jessore	0.65	82	1.26	44	1.15	18	1.30	41
Khulna	0.63	94	1.75	59	2.27	40	1.29	47
Barisal	1.03	118	1.79	51	2.16	37	1.66	50
Maijdee	0.31	119	0.93	39	1.03	22	0.81	40

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