

Flood in Tripura in October 1958

A. K. CHAUDHURY

Meteorological Office, Dum Dum

(Received 26 November 1962)

ABSTRACT. The paper contains the analysis of the Hydro-meteorological aspects of flood in the State of Tripura caused by a recurving Bay storm in the month of October 1958 during the retreating phase of the southwest monsoon. From the isohyetal patterns of this storm, it is seen that northern sub-divisions of the State, which were subjected to more inundations received comparatively lesser amount of rainfall. This suggests the higher susceptibility to floodings of the northern groups of rivers, flowing from south to north through the narrow, elongated valleys intersticed between the denuded ranges. Further, from a comparative study, it is seen that under identical orientation of storm tracks, the march of precipitation and its general distribution in Tripura State follow more or less similar patterns.

1. Introduction

Destructive floods were reported in some subdivisions of Tripura State in the last week of October 1958. Except for the subdivisions of Belonia and Sabrum in the extreme south, other areas were more or less affected—worst hit being the northern and the western parts comprising of the subdivisions of Dharmanagar, Kailashahar, Kamalpur, Khowai and the Sadar. Newspapers reported inundations of vast areas of paddy fields rich with Aman crops and heavy loss of cattle and poultry. The Assam—Tripura highway and the feeder roads were submerged and washed away at a number of points, the surface communication between Agartala and Dharmanagar remaining suspended for three or four days. There was no aircraft movement to Khowai, Kamalpur and Kailashahar during 23 to 25 October due to adverse weather conditions and unserviceability of the landing strips. Pilots operating on Agartala-Gauhati and Agartala-Silchar-Imphal routes reported flood waters on both sides of their tracks, inundation being worst from Kumarghat (confluence of the rivers Manu and Deo) towards north and northwest. This flood, though shortlived, had hit hard the economy of the State. The meteorological and hydrological aspects of the flood and the susceptibility of certain areas of the

state to flooding with respect to the storm track, topography and the orientation of the river systems have been analysed in this paper.

2. Topography and river systems of Tripura State

The State of Tripura lying between 22°56'N/24°32'N and 91°10'E/92°22'E is bounded on the north by the district of Sylhet, on the south by Noakhali and Chittagong districts and Chittagong hill tracts of East Pakistan, on the west by Noakhali and Tiperra districts of East Pakistan and on the east by the Lusai hills (Assam) and the Chittagong hill tracts.

Five principal ranges of hills decreasing in elevation from east to west run north/south through the State. From east to west the ranges are—(i) the Jampai, (ii) the Sakhantlang, (iii) the Langtarai, (iv) the Atharamura and (v) the Baramura-Devatamura. Notable peaks are—(i) the Belting Sib (about 980 m) on the Jampai and (ii) the Sakhantlang (about 820 m) on the Sakhantlang. These ranges form the main watershed from which the river systems flow towards the north, the west and the southwest. The rivers Juri, the Deo-Manu system, the Dhalai and the Khowai all flow from south to north. Rivers Gumti, Haora—Kathakhal system and Rangapani—Burigong system flow from

east to west and empty themselves in the river Meghna (East Pakistan). River Muhuri-Laogong-Manunala system emerges out of the state near the subdivisional town of Belonia. This system along with the Manugong flowing from north to south joins the river Feni (East Pakistan). The physiography and the river system can be seen in any physical map of India of sufficient large scale.

3. Synoptic situation

Meteorological conditions responsible for widespread and heavy precipitations in the state that had ultimately caused flooding of the rivers are as follows. A well marked trough of low pressure had appeared over the east central and northeast Bay of Bengal on the morning of 22 October 1958, and in the same evening it had concentrated into a depression with its centre at about 400 km southsoutheast of Calcutta. Moving in a northnortheast direction, the depression intensified rapidly into a cyclonic storm of small extent by the morning of 23rd being centred at about 250 km (21.0°N , 90.5°E) southeast of Calcutta. The storm continued to move rapidly towards northnortheast and had crossed East Pakistan coast between Barisal and Noakhali by the same night and had weakened into a shallow depression centred between Agartala and Comilla by the midnight of 23rd/24th. Weakening further it moved away northeastwards as a low across upper Assam. With the dissipation of this disturbance monsoon had also withdrawn from Tripura and Assam.

4. Distribution of Rainfall

(a) Rainfall data used

Daily and monthly records of raingauge for Sadar, Kailashahar, Khowai, Sonamura, Belonia, Dharmanagar, Udaipur, Sabrum and Amarpur since 1948 and for Kamalpur since 1957 are available with the State Agriculture Department. Recent observations for Teliamura and Palangphabari are also available with them. Records of Agartala and Kailashahar aerodromes (I. met. Dep. observatories) are available from 1953 on-

wards. From sometime past C.W.P.C. are maintaining a number of raingauge stations of which the records of daily rainfall for Ompibazar, Ambasa, Khowai-Dam site, Bhattimuchpara, Mompairoy Para and Raimabazar being readily available, were obtained for the purpose of this study.

(b) Averages and actual of the month

From the records of the rainfall for the months of October during the years from 1948 to 1958, averages for the month have been worked out for a number of stations. The average for Agartala aerodrome is based on the records from 1953 to 1958. Columns 16 and 18 of Table 1 show these average as well as the actual totals of October 1958 for these stations. It will be seen that except for Sabrum, all other stations in October 1958 had recorded rainfall much heavier than their averages. In case of Sonamura and Khowai, October 1958 rainfall is more than the double of their respective monthly averages.

(c) From the table it will also be seen that—

(i) In most of the flood affected areas, 40 to 66 per cent of the total rainfall of the month occurred in course of two rainy days only

(ii) Prior to 23 October, during the formative stage of storm in the Bay, little or no rainfall occurred in the State

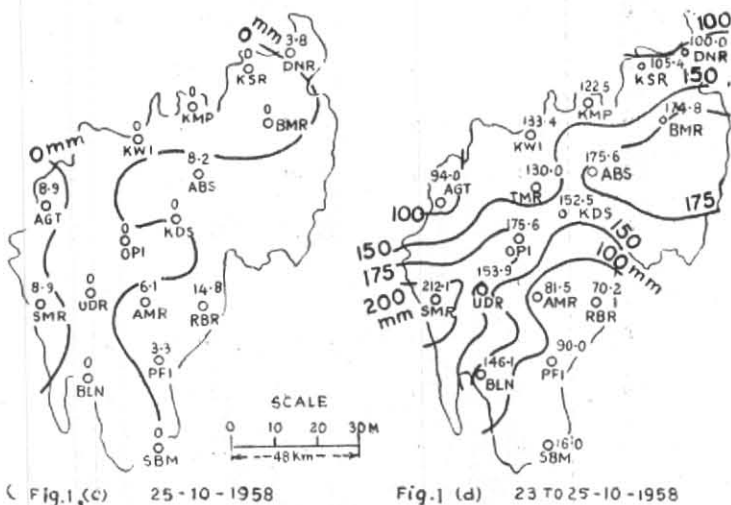
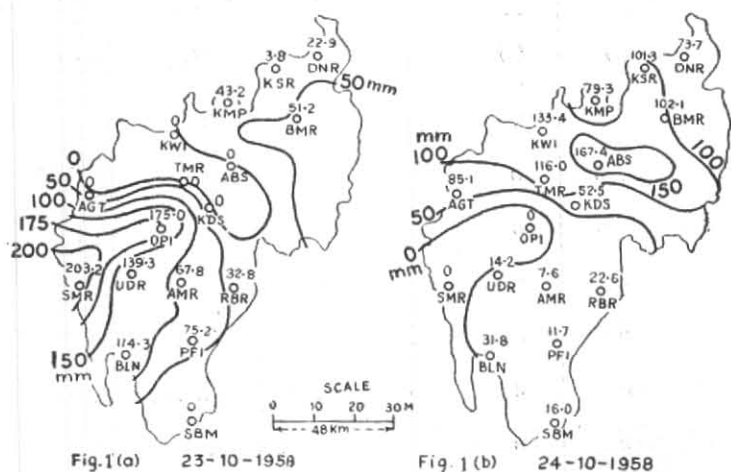
(iii) Dry spell prevailed in the State again from 26 October except in the east and in the southeast

5. Study of the isohyetal maps

Isohyetal maps for 23, 24 and 25 October and for the storm period 23–25 October are given in Figs. 1(a) to 1(d).

A study of these maps reveals the following characteristics—

(i) On 23rd, the precipitation zones are distinctly two—one, concentrated, in the south/southwest and the other, rather shallow, in the north—the two being separated from each other by a dry zone on the central part of the State.



Figs. 1(a)-1(d). Isohyets of rainfall

TABLE
Rainfall amounts (mm) in Tripura State and

Station (1)	Rainfall			Total rainfall from 1-22 Oct (5)	Rainfall during			
	20 (2)	21 (3)	22 Oct (4)		23 (6)	24 (7)	25 (8)	26 (9)
Agartala aerodrome	39.7	0	0	146.6	0	66.2	8.0	0
Sadar	2.5	0	0	128.3	0	85.1	8.9	0
Kailashahar aerodrome	0.5	0	0	186.9	1.3	45.7	101.6	0
Kailashahar	0	0	0	67.3	3.8	101.3	0	0
Silchar	0	0	0	132.8	6.2	6.2	52.2	1.0
Aijal	0	0	0	75.0	5.1	27.9	144.8	0
Dharmanagar	0	0	0	129.5	22.9	73.7	3.8	0
Kamalpur	0	0	0	166.0	43.2	79.3	0	0
Khowai	0	0	0	228.5	0	133.4	0	0
Sonamura	0	0	0	322.8	203.2	0	8.9	0
Udaipur	0	0	0	129.3	139.7	14.2	0	0
Amarpur	0	0	0	104.2	67.8	7.6	6.1	0
Palangphabari	0	0	0	110.5	75.2	11.7	3.3	0
Teliamura	0	0	0	141.5	0	116.0	14.0	0
Sabrum	0	0	0	128.5	0	16.0	0	0
Belonia	0	0	0	149.8	114.3	31.8	0	0
Ompibazar	0	0	0	239.1	175.0	0	0	0
Ambasa	0	0	0	124.4	0	167.4	8.2	0
Khowai-Dam site	0	0	0	90.0	0	52.5	0	0
Raimabazar	4.0	4.0	6.8	33.6	32.8	22.6	14.8	14.0
Bhattimuchpara	0	0	4.0	212.1	51.2	102.1	0	0

FLOOD IN TRIPURA IN OCTOBER 1958

243

1

neighbourhood during October 1958

the disturbance					Total rainfall during the passage of the disturbance (with dates)	Total rainfall of the month	Ratio of storm to monthly rainfall (%)	Average rainfall for October
27	28	29	30	31 Oct				
(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
0	0	0	0	0	74.2 (24, 25)	220.8	34	141.2
0	0	0	0	0	94.0 (24, 25)	222.3	42	144.0
0	0	0	0	0	148.6 (23-25)	335.5	44	—
0	0	0	0	0	105.1 (23, 24)	172.7	61	167.3
0	0	0	0	0	64.6 (23-25)	198.4	33	—
17.8	0	0	10.2	8.4	177.8 (23-25)	289.2	61	—
0	0	0	0	0	100.4 (23-25)	229.9	44	184.8
0	0	0	0	0	122.5 (23-24)	288.5	43	—
0	0	0	0	0	133.4 (23)	361.9	37	148.8
0	0	0	0	0	212.1 (23, 25)	534.9	49	231.5
0	0	0	0	0	153.9 (23-24)	283.2	54	165.5
0	0	0	0	0	81.5 (23-25)	185.7	44	151.0
0	0	0	0	0	90.2 (23-25)	200.7	45	—
0	0	0	0	0	130.0 (24-25)	271.5	49	—
0	0	0	0	0	16.0 (24)	144.5	11	211.0
0	0	0	0	0	146.1 (23-24)	295.9	49	203.2
0	0	0	0	0	175.0 (23)	414.1	42	—
0	0	0	0	0	175.6 (24-25)	300.0	57	—
0	0	0	0	0	52.5 (24)	142.5	37	—
10.0	10.0	8.6	6.8	4.0	70.2 (23-25)	157.2	45	—
0	0	0	1.8	5.6	153.3 (23-24)	372.8	41	—

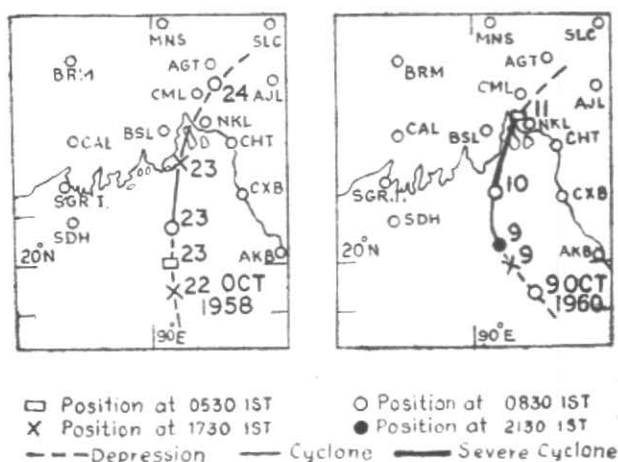


Fig. 2

(ii) On 24 October, the area of precipitation had shifted to the northeast, a dry zone appearing to the southwest.

(iii) On 25 October, the area had shifted further north-northeast, outside the state. Isolated falls, one around Teliamura and the other around Raimabazar still contributed to the runoff in the rivers Khowai and the Dholai and in the upper reaches of the river Gumti respectively.

(iv) Total amount of storm precipitation received in the northern subdivisions is less compared to the amount received in the south.

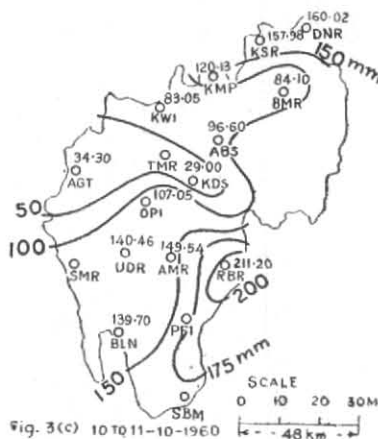
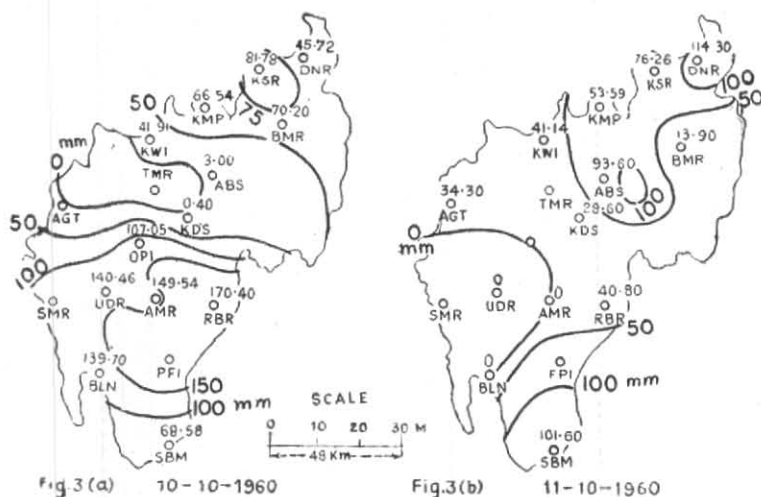
It will, therefore, be seen that only one day's (23rd) heavy rain in the southwestern part resulted in increased discharges in the Rangapani-Burigong, the Gumti-Noachara-Gangachara and in the Muhuri-Laogong-Manunala systems. During the subsequent days this region remained practically free from precipitation. These rivers, due to gradients, could easily throw the volume of flood in the rivers of East Pakistan, *viz.*, the rivers Meghna and the Feni. Similarly, in the west, heavy rainfall occurred increasing discharges in the river Haora only on one day, *v.e.*, on 24th. On the other hand, the upper catchment of the rivers like the Juri, the Deo-Manu, the Dholai and the Khowai which

traverse the northern region in south to north direction received precipitation on 23rd, 24th and 25th, heavy rain on 24th resulting in heavy flooding in the narrow elongated drainage basins of these systems. The path of the low pressure system and the associated storm precipitation is such that the lower catchment comes under the influence of the storm when the upstream flood is passing through it.

6. Patterns of distribution and the nature of concentration of precipitation as related to the orientation of storm tracks

To examine if the pattern of distribution and concentration of precipitation in Tripura State is identical under identical orientation of storms, isohyetal maps of the state for another storm, the storm of 9–11 October 1960 is discussed.

A low pressure wave moving across central Burma formed into a depression in the Bay of Bengal and later intensified into a cyclonic storm of small extent on the night of 9 October 1960 and became severe on the morning of 10th when it was centred near $21\frac{1}{2}^{\circ}\text{N}$, $90\frac{1}{2}^{\circ}\text{E}$ at about 130 km west-southwest of Cox's Bazar. Moving east-northeast, it struck East Pakistan coast near Noakhali on the night of 10th, weakened and was found to exist as a depression on the morning of 11th near $23\frac{1}{2}^{\circ}\text{N}$, 92°E — close to Agartala.



Figs. 3(a)-3(c). Isohyets of rainfall

Moving further in the northeast direction, it further weakened and became unimportant by the same evening. The tracks of the two storms are presented in Fig. 2. The isohyetal maps for the storm of 9-11 October 1960 are presented in Figs. 3(a) to 3(c).

It will be seen that the tracks of the two storms are nearly identical. Study of the isohyetal maps for 10 and 11 October 1960, on which days most of the storm precipitation occurred, reveals that —

(i) On 10 October 1960, the precipitation zones are distinctly two—one, concentrated, in the south/southeast and the other, rather shallow, in the north—the two being separated from each other by almost a dry zone lying on the central part of the state (comparable with the isohyetal map for 23 October 1958).

(ii) On 11 October 1960, the area of precipitation had shifted to the northeast and east, a dry zone appearing to the southwest

(comparable with the isohyetal map for 24 October 1958).

(iii) Rainfall received during the storm in the northern subdivisions is less compared to that received in south (Fig. 1d and Fig. 3c are comparable).

Thus it appears from the above comparative studies that with the storm tracks normally running from southwest to northeast, the march of precipitation and its general distribution (qualitative) in Tripura State are likely to follow, more or less, the patterns as due to the storm under review.

The groups of rivers flowing from south to north traversing through the narrow elongated valleys intersticed between the hill ranges, appear, under these meteorological conditions, to be more susceptible to flooding compared to those flowing through the plains in the southwest and in the south. This is borne out by the fact that inspite of recording comparatively lesser amount of rainfall, the northern subdivisions were subjected to more inundations, compared to those in the southwest, where rainfall was heavier. A greater flooding in the northern rivers in such circumstances may be naturally expected because the catchments of the rivers flowing south to north are under the influence

of the rain-storm for longer duration than those of the southern rivers of the state, such that the flood flow from upper reaches of the rivers Juri, the Deo-Manu, the Dholai, the Khowai etc arrive downstream at a time when that area is subsequently under the influence of the rain-storm.

Sinha (1959) and Dhar (1959) have discussed the meteorological conditions associated with the floods in different regions of India in different seasons. While cataloguing the floods of the rivers of Tripura State during the retreating phase of the southwest monsoon, those produced by Bay depressions that tend to recurve, should not be lost sight of. The disturbance of October 1958 was also responsible for causing flood conditions in Manipur and Sylhet. Damage was also reported from the districts of Comilla, Noakhali and Chittagong districts of East Pakistan.

7. Acknowledgement

The author expresses his grateful acknowledgements to Dr. S. N. Sen, Director, Regional Meteorological Centre, Calcutta and to Shri S. K. Ghose, Meteorologist, Damodar Valley Corporation Meteorological Unit for their encouragements and valuable suggestions.

REFERENCES

- | | | |
|--------------|------|---|
| Dhar, O. N. | 1959 | Proc. the Symp. met. hydrol. aspects of Floods and Droughts in India, pp. 57-62. (India met. Dep.). |
| Sinha, K. L. | 1959 | <i>Ibid.</i> , pp. 49-51. |