551.578.42(541.4 : 541.2)

DIURNAL VARIATION OF RAINFALL OVER BHAGIRATHI CATCHMENT

Bhagirathi catchment is situated in the border areas of Bihar plateau and Gangetic West Bengal and has a total catchment area of 25,000 sq. km. The annual rainfall over the catchment as a whole is of the order of 136 cm, about 85 per cent of which is received during the monsoon season, *i.e.,* from June to September. Rainfall in the Bhagirathi catchment is generally associated with the monsoon depressions and cyclones which move inland from the Bay of Bengal. Heavy rainfall is also caused in the catchment due to land depressions which form over Gangetic West Bengal, adjoining parts of Madhya Pradesh and eastern Uttar Pradesh. There are 38 stations in the catchment out of which 11 are equipped with self-recording raingauges. In addition to this, the State Government authorities also maintain 15 raingauges. Areal rainfall for 1-hour, 3-hour and 6-hour durations for the catchment area were computed by utilizing the self recording raingauge data of 9 stations and have been shown in Figs. 1 (a-c).

2. 3-hourly percentage contribution of rainfall to 24-hours rainfall is represented in Fig. 1 (b). From the graphs, it is seen that the contribution of 3-hourly rainfall in the month of May is 13, 33 and 25 per cent during the periods of 1200-1500, 1500-1800 & 1800-2100 IST respectively. Thereafter, the percentage contribution is much less. May, being the pre-monsoon period the maximum

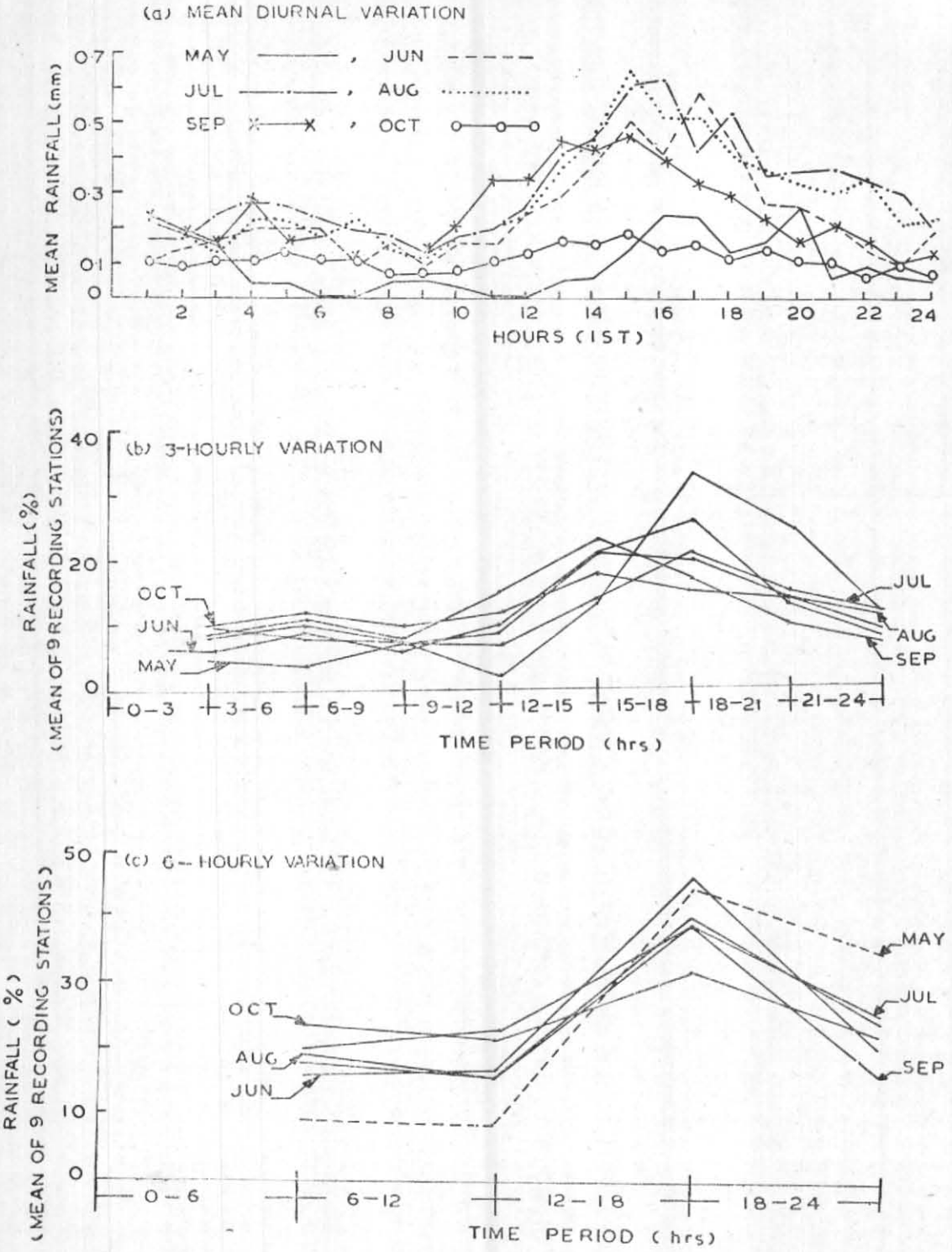

Fig. 1. Rainfall and its percentage contribution to 24-hr rainfall in Bhagirathi catchment (1961-70) : (a) Mean diurnal variation, (b) 3-hourly variation and (c) 6-hourly variation

amount of rainfall, is usually realised between 1200 & 2100 IST due to thunderstorm activities according to the analysis. In the month of June, 21 per cent of the 24-hr rainfall is realised between 1200 & 1500 IST followed by 26 per cent in 1500-1800 IST period, and only 13 per cent during period 1800-2100 IST. Rainfall further decreases thereafter. Percentage contribution of rainfall is much less in the forenoon than in the afternoon/evening hours. In the month of July, rainfall is more evenly distributed. The percentage contribution of rainfall in the 3-hourly periods of 1200-1500, 1500-1800 and 1800-2100 IST are 19, 21 and 15 per cent respectively. The maximum contribution of rainfall is, thus, between 1500 and 1800 IST. Percentage contribution of rainfall towards late night and early morning gradually increases in July when compared to that in the months of May and June. Similar features are noticed in the months of August and September. In the post monsoon month of October, the 3-hourly distribution of rainfall between 1200 and 2100 IST are 18, 15 and 14 per cent respectively. The percentage contribution of rainfall decreases towards mid-night. In the early morning and forenoon it is between 10 and 12 per cent which is quite significant keeping in view the fact that rainfall in the catchment is due to recurvature of monsoon depressions that may be moving near or through the catchment.

3. 6-hourly contribution of rainfall to 24-hour rainfall is represented in Fig. 1(c). In the month of May, taking the catchment as a whole, it is seen from the graphs that about 9 per cent of the total rainfall in 24-hr is realised in the first 0-6 IST, though taking individual stations a maximum of even 20 per cent of the rainfall may be realised in the period. Similarly, in the period 6-12 IST about 9 per cent on an average of the total rainfall in the catchment as a whole is realised. For individual stations the contribution may be as high as 20 per cent. In the period 1200-1800 IST about 46 per cent of the total rainfall in 24-hours is realised. In the period 1800-2400 IST another 36 per cent of the rainfall is realised. In the month of June, percentage contribution of rainfall in the forenoon increases. It is 16 and 17% respectively for the period 0-6 & 6-12 IST. In the period 12-18 IST, 47% of rainfall is realised followed by another 21% in the 18-24 IST period. In the month of July, 18 and 16 per cent respectively of the 24-hr rainfall occurs in the forenoon. In the period 12-18 IST 40 per cent of rainfall is realised followed by another 26 per cent in the subsequent 6-hour period. Almost similar features were observed in the month of August.

In the month of September, 20 and 23 per cent respectively, of 24-hour rainfall are realised in the 0-6 and 6-12 IST periods. 35% of rainfall occurs during the period 12-18 IST. There is slight decrease in the percentage of rainfall when compared to the month of August in the 18-24 IST period. Similarly, the percentage contribution of rainfall has increased in the forenoon as compared to that in the month of August. In the month of October, percentage contribution of rainfall in the forenoon, as well as in 18-24 IST period increases to 24, 22 and 23 per cent respectively. In the period 12-18 IST the percentage contribution is 33 per cent of the 24-hour rainfall. Taking 6-hourly period, it may be said that 40-46 per cent of the total rainfall of 24 hours is realised during 12-18 IST period in the monsoon months (June to September).

In the month of May, more than 40 per cent of 24 hour rainfall in the afternoon and about another 40 per cent during night is due to thundershowers which are very frequent in the pre-monsoon months. 6-hourly percentage contribution of rainfall in the month of October is subject to large variations depending upon the passage of recurving monsoon depressions through or near the catchment and their times of movement.

4. There are two periods in which peak rainfall generally occurs in the catchment, one in the early hours of the morning generally at 0200, 0300, 0500 and 0700 hour and the other in the afternoon/evening generally between 1500 and 1700 IST with secondary evening maxima between 1900 and 2100 IST. The amplitude of the peak rainfall in the afternoon/evening hour is on the whole higher than that of early morning hour. During the period May-October peak 3-hourly percentage contribution of rainfall generally is between 1500 and 1800 IST being on an average of 22 per cent of the 24-hour rainfall. Similarly peak 6-hourly percentage contribution of rainfall is generally high between 1200 and 1800 IST, when on an average more than 45 per cent of total rainfall in 24 hours can be realised in the catchment.

In general, it is seen that with the progress of rainy season lasting from May to October, the 3-hourly and 6-hourly percentage contributions in relation to total 24-hour rainfall keeps on gradually increasing during the morning hours.

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