551.577.37

EXCEPTIONALLY HEAVY RAINFALL OVER HONAVAR ON 12-13 JUNE 1988

Honavar (14.17° N, 74.27° E) is located in Uttara Kannada district of coastal Karnataka at a height of 26 metres above mean sea level.

There was an exceptionally heavy rainfall over Honavar on 12-13 June 1988. Honavar observatory recorded 466.3 mm of rain in 24 hours ending 0830 IST on 13 June 1988. This is the highest ever recorded rainfall in 24 hours in Honavar. The previous recorded highest 24-hour rainfall of the place was 378.5 mm on 5 June 1919.

The hyetograph of 12-13 June (Fig. 2) shows that the bulk of rainfall occurred between 0900 IST and 1800 IST on 12 June during which nearly 30 cm rain was recorded. This 24-hour rainfall of 13th constituted 46 per cent of the normal value of 1018.5 mm of Honavar for the month of June.

Fig. 1 shows isohyetal map of coastal and neighbouring districts of Karnataka for 13 June 1988. Uttara Kannada district received very heavy rainfall at a number of stations with the highest amount recorded at Honavar, while Dakshina Kannada district and adjoining Shimoga district have experienced isolated heavy falls.

2. *Associated synoptic situation* — A well marked low pressure area formed over east central Arabian Sea off Maharashtra-Karnataka coasts on the morning of 8 June 1988. The associated upper air cyclonic circulation was extending up to 5.8 km a.s.l. The low pressure area intensified into a depression on 9th morning and into a deep depression on the same evening with its centre lying within half a degree of Lat. 17.5°N/ Long. 70.0° E. The system practically remained stationary for more than 48 hours. However, from 12th morning, the system accentuated and the lower tropospheric winds (Fig. 3) along Maharashtra-Karnataka coasts have strengthened resulting in heavy to very heavy rainfall over coastal Karnataka.

The orography of Honavar where the main hill slope commences within 10 km of the coast has further contributed to the associated synoptic situation for the occurrence of unprecedented heavy rainfall over the place.

3. The probability of recurrence of the unprecedented heavy rainfall has been examined by return period analysis. Highest daily rainfall values of Honavar for a 50-year period from 1939 to 1988 were utilised in the present study.

4. *Analysis and discussion* — According to Gumbel (1958), the cumulative probability that any extreme value will be less than the given quantity X approaches the expression given by :

$$\phi(X) = \exp[-\exp\{-\alpha(X-u)\}]$$
$$= \exp[-\exp(-Y)]$$

where, $Y = \alpha(X-u)$

or $X = u + \frac{1}{\alpha} Y$ (1)

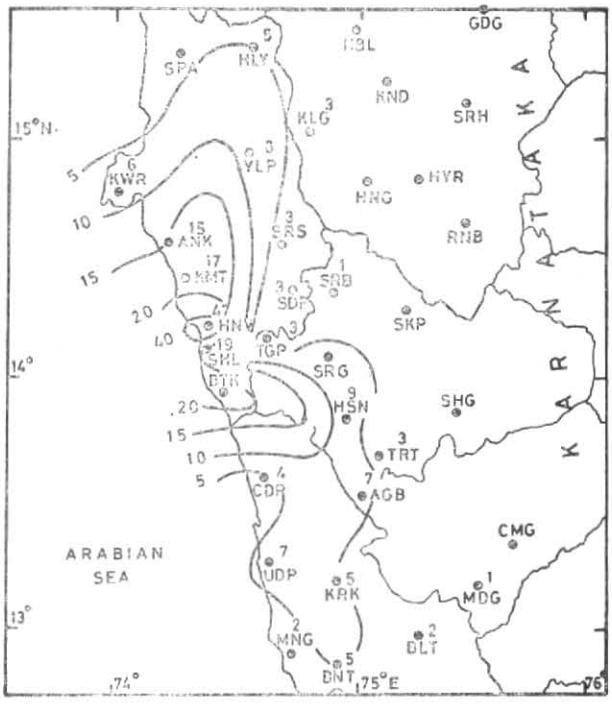

Fig. 1. Isohyetal map of the area on 13 June 1988

TABLE 1

Values of rainfall over Honavar for different return periods

Probability							
.9000	.9800	.9900	.9950	.9975	.9983	.9985	.9986
Return period (year)							
10	50	100	200	400	600	650	700
Rainfall (mm)							
283.2	354.8	385.0	415.2	445.3	462.9	466.4	469.6

in which Y is known as reduced variate, u is mode of the extremes and $1/\alpha$ is equal to 0.7796968 times the standard deviation of the extremes X.

Eqn. (1) can be written as :

$$X = A + BY \quad (2)$$

where, A and B are the parameters estimated by the method of least squares.

The return period T of an extreme value equal to or exceeding X is given by :

$$T = 1/[1-\phi(X)] \quad (3)$$

Based on above distribution, extreme values of rainfall for different return periods and for different probability values are computed and presented in Table 1.

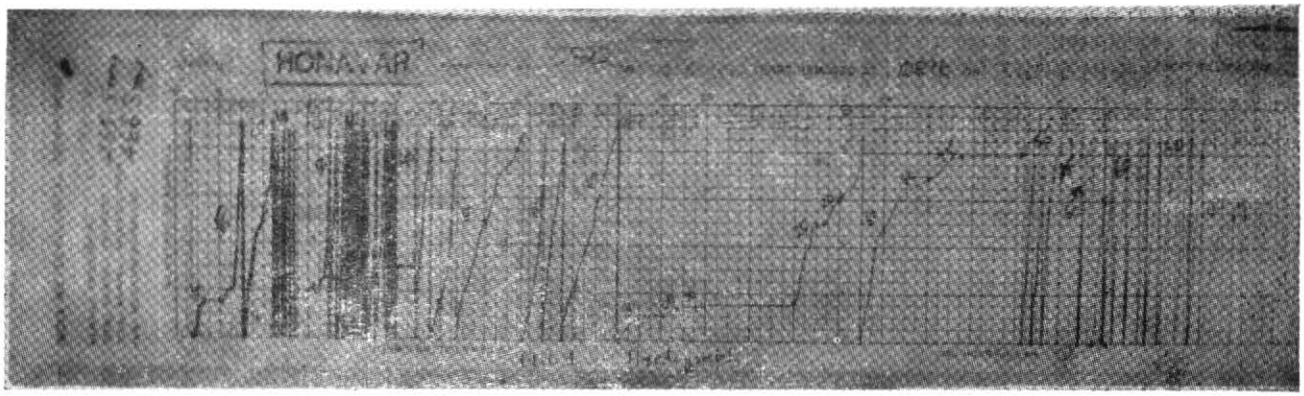

Fig. 2. Hyetogram of 12-13 June 1988 of Honavar observatory

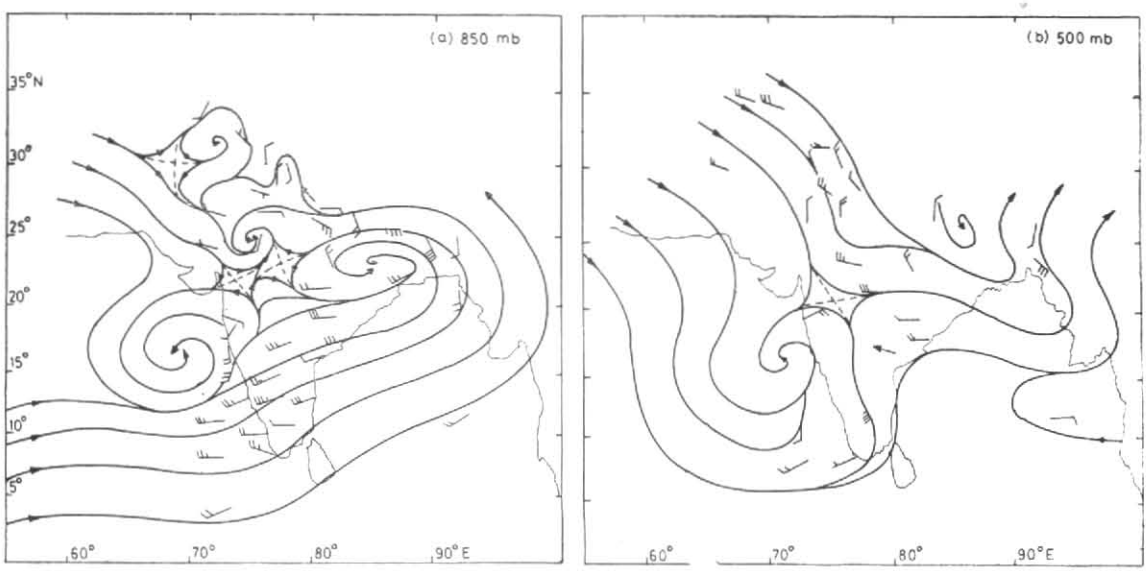

Fig. 3. Upper winds at 00 GMT on 12 June 1988

5. The study has revealed that the return period is to exceed 10 years to have more than 30 cm rain, and exceed 100 years for 40 cm rain. While the phenomenal one-day heavy rainfall of June 1988 which is of the order of 47 cm is a rare event and has a return period of 650 years.

6. The author is thankful to Shri P.J. Rajagopalachari, Director for taking keep interest in this study.

Reference

Gumbel, E.J., 1958, *Statistics of Extremes*, Columbia University Press, New York.

C. V. V. BHADRAM

Meteorological Centre, Airport,
Bangalore
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