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KARAIKAL CYCLONIC STORM OF NOVEMBER 1991 : A CASE OF MARGINAL SEVERE CYCLONE

1. The remnant of the typhoon THELMA which caused great devastation in Phillipines emerged into the Andaman Sea on 10th. Moving westwards over the southeast Bay of Bengal, it intensified into a depression on 11th, continuing its westward movement it further concentrated into a cyclonic storm over the southwest (SW) Bay on 13 morning. Thereafter, it moved north-westwards. It lay centred about 70 km east-southeast of Karaikal on 14th evening. The system crossed the Tamil Nadu coast around mid- night of 14-15 November and weakened over north Tamil Nadu and neighbourhood by the night of 15th.

2. The system caused extensive rainfall activity over Thanjavur south Arcot districts of Tamil Nadu and over Karaikal in Pondicherry. In the Quaid-E-Milleta Nagapattinam district of Tamil Nadu, many stations received very heavy rainfall of the order of 20 cm and above during 24 hr

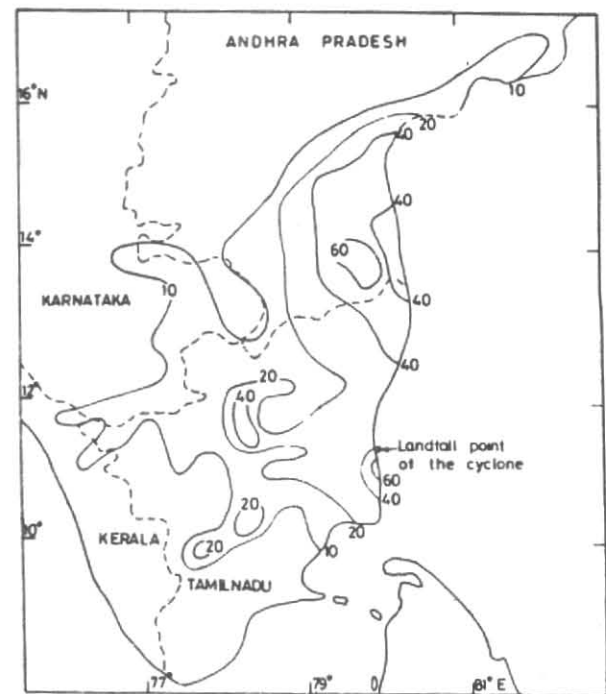


Fig.1. Cumulative rainfall (cm) over peninsular India during 14-17 November 1991



Fig. 2. Estimated/Observed surface winds in the area close to storm track as revealed by post cyclone-survey

period. Sirkali recorded a rainfall of 40 cm. An all time record of 48 cm rainfall was recorded at Karaikal on 15th. Widespread rainfall with heavy-to-very heavy falls occurred over Tamil Nadu, south coastal Andhra Pradesh, Rayalseema and south interior Karnataka during 14-17 November. Venkatagiri in Nellore district of coastal Andhra Pradesh reported 48 cm on 15th. Fig. 1 shows the isohyetal map of rainfall over Peninsular India for the period 14-17 November 1991.

2.1. The Indian National Satellite, INSAT-ID tracked the system right from its formation on 11th to its dissipation after 15 November. The peak intensity reported by INSAT-ID for the system was T 3.0 (~ 83 kmph) on 14th at 1200 UTC and on 15th at 00 UTC. CDRs Chennai and Karaikal tracked the system from 09 UTC of 13th till 06 UTC of 15th. Both the CDRs reported open eye in their hourly observations from 03 UTC to 16 UTC of 14th. At 1500 UTC of 14th a circular eye was reported by CDR, Karaikal.

2.2. The fact that both the CDRs reported distinct eye in the system continuously for about 13 hours, shows that the system was of higher intensity than that based on INSAT imageries.

3. The post cyclone survey conducted by the India Meteorological Department (IMD) soon after the cyclone had crossed the coast, revealed that maximum sustained surface winds associated with the system were of the order of 100 kmph with some isolated pockets of wind maxima reaching upto 120 kmph. Nagapattinam reported peak wind speed of 48 kt (~ 89 kmph) at 2200 UTC of 14th when the centre of the system was 65 km north of the station. Fig. 2 depicts the estimated/observed surface winds in the area which experienced wind speed of 50 kmph or above in Tamil Nadu as revealed by the post cyclone survey report of IMD. It is seen that the coastal stretch of about 165 km experienced wind speed in excess of 50 kmph, whereas about 50 km area along the coast south of landfall point reported wind speed over 100 kmph.

4. The value of outermost closed isobar at the time of landfall was 1008 hPa. Taking the pressure depth of 10.1 hPa corresponding to T 3.0 intensity, the central pressure in the storm is estimated to be 998 hPa (using Mishra and Gupta 1976) which is even higher than the reported surface

pressure of 995.1 hPa at Cuddlore, a station situated 60 km away from the landfall point around the sametime. It is, therefore, clearly evident that central pressure was much lower than 995.1 hPa. Considering a weak pressure gradient of 0.1 hPa/km between Cuddlore and the centre of the cyclone, the central pressure works out to be 989.1 hPa which is consistent with the estimated lowest central pressure of 990 hPa reported in Mausam (1992). This implies that the system had an estimated pressure depth of 18 hPa which corresponds to a maximum sustained wind of 60 kt (~ 110 kmph). The maximum sustained surface wind of 60 kt, in turn, corresponds to the intensity of severe cyclonic storm (48-63 kt) as per IMD's definition. These appear to be quite consistent with the observed surface pressure reported by many stations and also the observed/estimated wind speeds near the storm's landfall point as depicted in Fig. 2.

5. It is also reported that the sea water had entered 200 to 250 m inland near the landfall and in the outer sea area, sea waves rose 2 to 3. There was, however, no significant storm surge near the storm crossing. It is important to note that the storm had crossed the coastline where the shoaling factor was very low (~ 0.8) and therefore estimated peak storm surge corresponding to above intensity (60 kt) comes to only 0.35m.

6. Ship and surface observations around the cyclone field, radar observations and the damages associated with the cyclonic storm of 14-17 November 1991 clearly indicate that the system was a case of marginal severe cyclonic storm.

References

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