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A RADAR STUDY OF 2-6 OCTOBER 1983 BAY CYCLONE

1. The various features of 2-6 October 1983 Bay cyclone which crossed coast near Bhimunipatnam as seen by Cyclone Detection Radar, Visakhapatnam are presented and discussed. Certain difficulties experienced during observations are also discussed.

2. Since May 1982, a new 10 cm cyclone detection radar* imported from USA has been functioning at Visakhapatnam. Apart from normal A, RHI and PPI display, it also has a built-in digital video integrator processor for (i) integrating the return video, (ii) correcting for range attenuation and (iii) slicing of integrated video into six levels for display on PPI corresponding to rainfall rates of .1", .5", .1", 2" and 5" per hour based on Z-R relation :

$$Z = 200 R^{1.6}$$

This radar has tracked so far both the cyclones which developed in Bay and crossed within 250 km of Visakhapatnam. This communication describes the various features of Visakhapatnam cyclone (2-6 October 1983) as seen by the radar.

3. *History of storm*— A low pressure area developed over north Andaman Sea and adjoining central and southeast Bay on 28 September 1983. It moved northwest and concentrated into a depression and lay centred at 03 GMT on 1 October 1983 at 18°N, 87° E. It later intensified into a cyclonic storm and crossed the coast in the night of 3 October 1983 near Bhimunipatnam.

4. *Radar observation of the storm*— The radar observation of 1 October (0300 GMT) showed dis-organised patch of cloud cells extending upto 400 km in the NE to SE sector (Fig. 1). The same night the radarscope showed echo area to contract to within 250 km of the station. The next morning in the 0300 GMT observation some organisation of cloud cells in broken bands could be seen but these were short in length (Fig. 2). The bands were not stable and were changing their configuration. As the radar is located on a 550 ft high hill, excessive ground clutter is present in scope which is solely due to its location on the hill (Fig. 3) (Smith 1972). Since the system was close to coast, the bands of cells and ground clutter echoes were merging making determination of centre difficult.

At 0000 GMT of 3 October (Fig. 4) a faint eye could be seen with its centre at 17.9°N, 84.5° E. One prominent band could also be seen by this time though the inner part was merged with the ground clutter of the

radar. One and a half hours later the eye became indistinct and centre had to be estimated by spiral overlay. At 0500 GMT closed eye was again visible on scope for an hour (Fig. 5). By 0730 GMT the bands had again become disorganised (Fig. 6). By 0830 GMT the system had come within 60 km of the station and thereafter identification of cloud cells from ground clutter was no longer possible.

5. *Storm track*— The track of the cyclone based on estimated centres by radar may be seen at Fig. 7. The zig-zag path as seen is probably due to inaccuracies inherent in the estimation of centre by spiral overlay technique and not a real phenomena.

6. *Prediction of movement*— As may be seen from the photographs, the storm did not have very organised pattern of bands, eye etc. Therefore, it was not possible to predict the movement from the features of the cyclone as shown by radar.

7. *Intensity of the storm*— The system can be classified as marginal or immature storm on the basis of following radar features observed in the present system :

- Diffused eye was opening and closing frequently.
- The eye wall intensity was not uniform and its max. height all through was less than 8 km.
- Only two spiral bands could be observed and these were also constantly changing their configuration in the initial phase.
- The sea travel as cyclonic storm was over a small distance. The above features are normally associated with immature storms (Raghavan 1977).

8. *Distribution of precipitation*— Fig. 8 shows the isohyetal chart for rainfall over coastal Andhra Pradesh for 24-hr ending 03 GMT of 4 October 1983. The maxima of rainfall is to the left of track. Radar photographs also show a dense cloud mass south of Visakhapatnam as the system crossed coast in the night of 3 October.

9. *Conclusion*— The study shows :

- The storm which crossed coast near Visakhapatnam was a marginal storm or immature storm.
- The rainfall distribution shows a maxima to the left of the track of cyclone.

*Peak power : 500kw, Pulse width : 2.2μs, PRF : 250, Video display : LIN LOG C-LOG, Frequency : 2800 MHz.

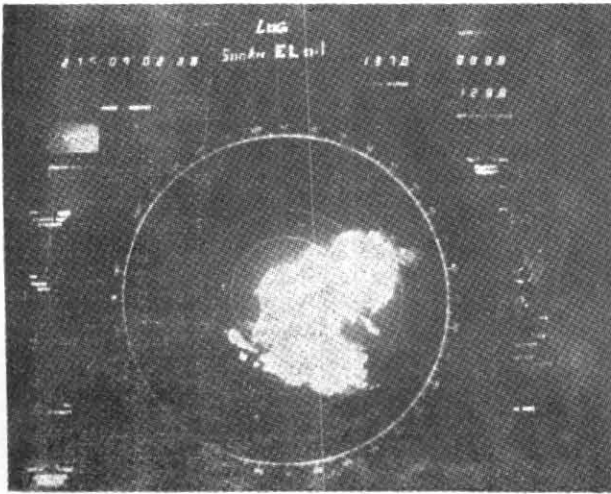


Fig. 1. Radar PPI photograph at 0332 GMT of 1 October, Range 500 km, Elevation 0.1°

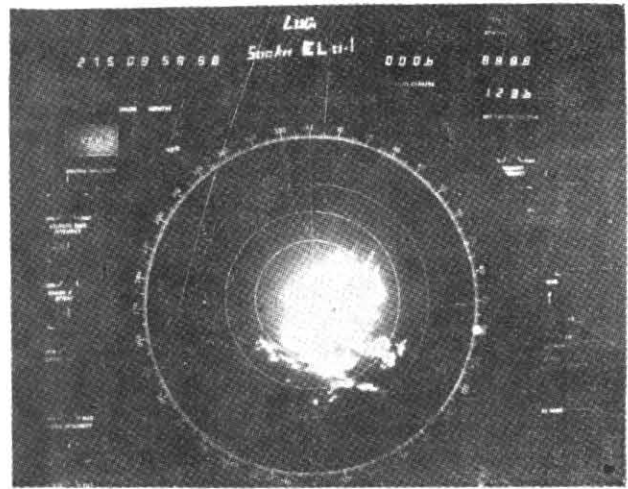


Fig. 2. Radar PPI photograph at 0328 GMT of 2 October

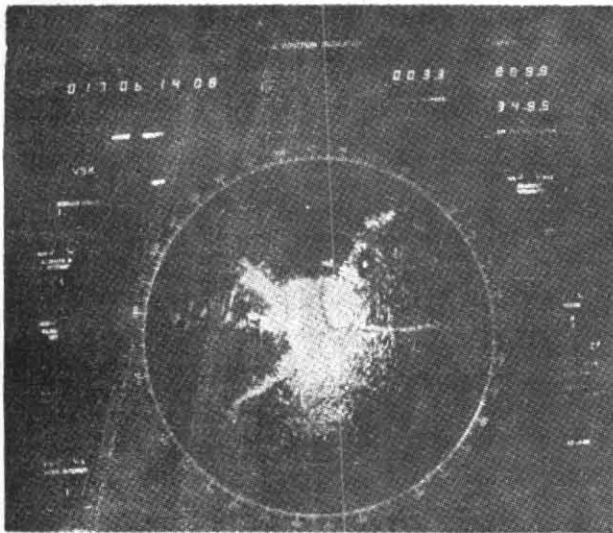


Fig. 3. Ground clutter echoes as seen in radar, Range 5 km, Elevation 0°

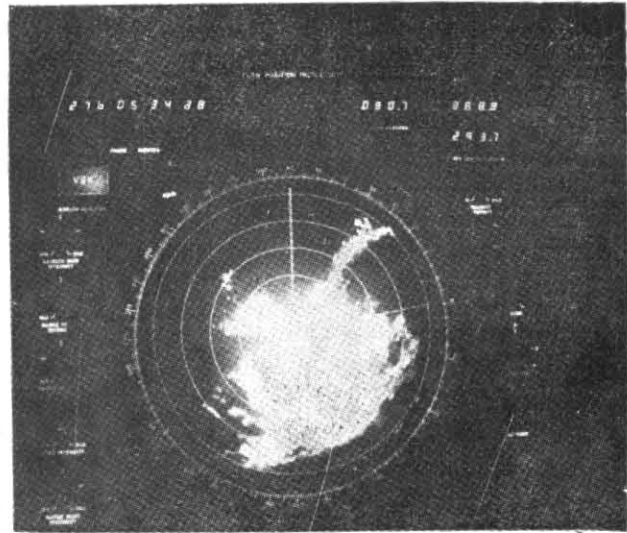


Fig. 4. Radar PPI photograph at 0004 GMT of 3 October, Range 200 km

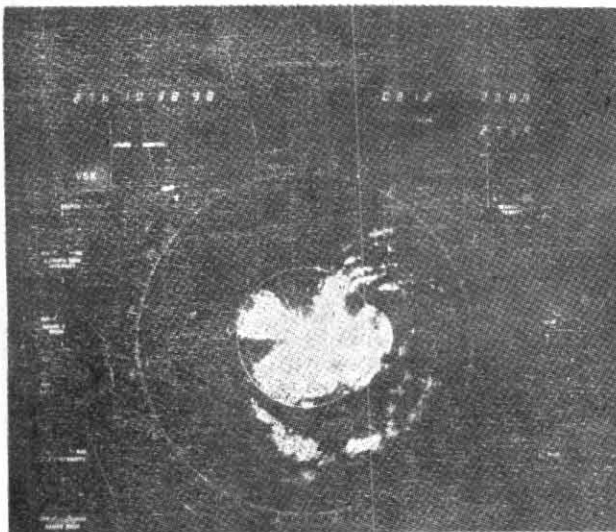


Fig. 5. Radar PPI photograph at 0508 GMT of 3 October, Range 200 km

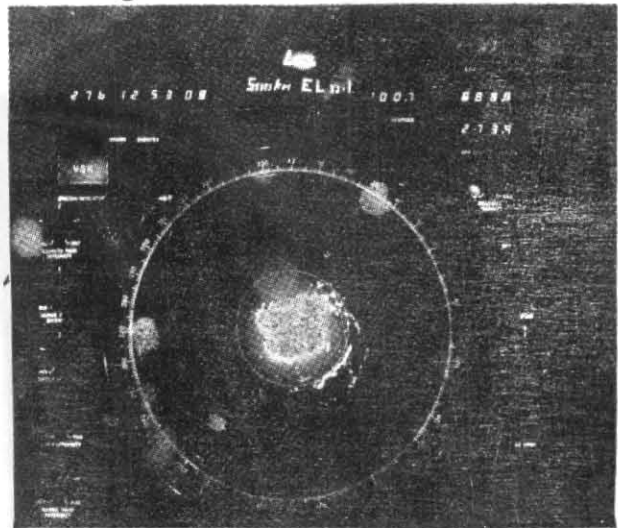


Fig. 6. Radar PPI photograph at 0723 GMT of 3 October

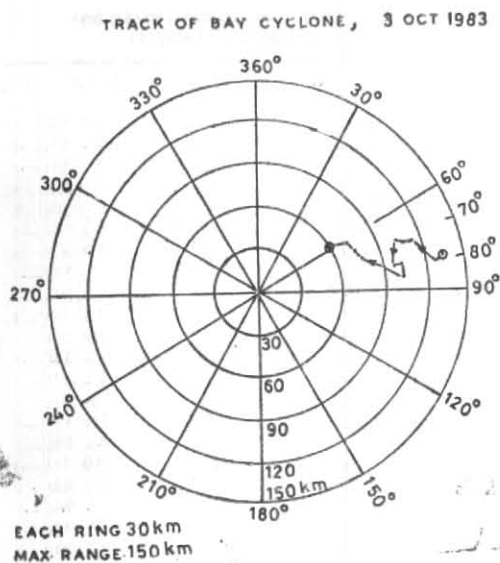


Fig. 7. Track of cyclone as determined by radar

(iii) The radar at Visakhapatnam should be provided with ground clutter canceller for removing excessive ground clutter echoes in PPI display.

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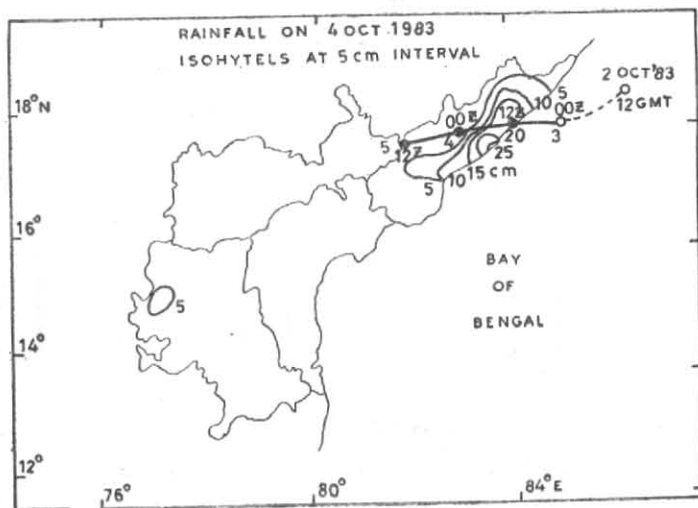


Fig. 8. Storm isohyetal chart, 4 October 1983

References

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