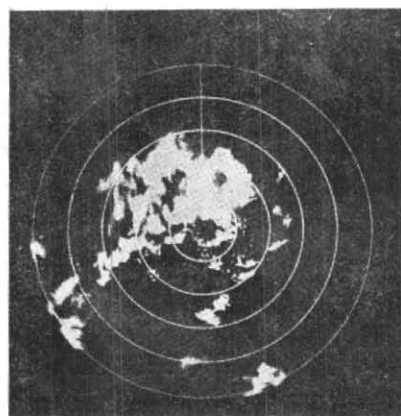


DRY HOLE IN A THUNDERSTORM

The "dry hole" activity in a thunderstorm was noticed on radarscope on 24 March 1964 after 1200 GMT routine observation. The radar used was Decca type 41 having a PPI, beam width of 0·75 degree in horizontal and 4 degrees in vertical plane and range of elevation angle from -2 degrees to +12 degrees. One of the dry holes in a thunderstorm was photographed at 0·4 of receiver gain at 1827 IST, when echoes were moving from west to east, on 25 nautical miles range. The hole was situated at near about 015 degrees azimuth and 7 nautical miles range. The diameter of the hole was about 2·5 nautical miles. This is shown in Fig. 1. Fig. 2 shows the same hole at 1833 IST at 0·1 of receiver gain. This shows the most intense part of the echoes surrounding the hole and small protuberances at 030 degrees azimuth and 7 nautical miles range.

Browning and Ludlam (1962) and Browning and Donaldson (1963) have suggested that this echo-free hole (dry hole) or the vault is associated with an intense updraft, and lies beneath the highest part of the storm. It appears as an echo-free area due to the

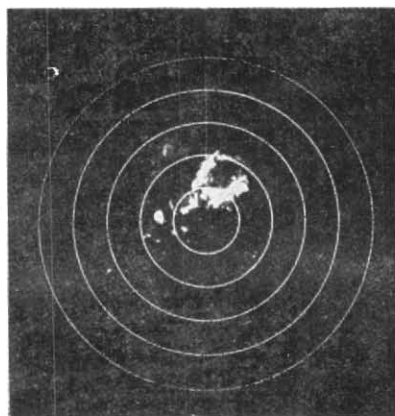


25

1827

4

Fig. 1



25

1833

4

Fig. 2

Dry Hole in a thunderstorm on 24 March 1964

Figures below the photographs indicate (from left to right) range in nautical miles, time in IST and elevation in degrees

presence of small cloud droplets, which owing to the high velocity within the core of the updraft, have insufficient time to attain radar detectable sizes. It serves as a reliable warning of severe weather.

The curvature of the protuberances around the vault or the dry hole might be due to the strong updraft ascending cyclonically towards the highest part of the echo (Fig. 2).

The station had experienced a northwesterly squall at 1829 IST for 2 minutes with a speed of 69 km/hr, and 1.15 mm of rainfall was recorded. Since the system of echoes was moving from west to east, this squall might have occurred from a portion in the rear of vault (*i.e.*, due west) due to an outflow from an intense downdraft, associated with the region of most intense precipitation in the immediate vicinity of intense updraft (Browning and Donaldson 1963). This region is probably the one due northwest of the station with intense echoes, shown in Fig. 2, at reduced gain of the receiver.

Such "dry holes" have been observed by other workers also (Hoecker 1957, Kulshrestha 1963) and have also been discussed by Battan (1959). In U.S.A., these "dry holes" are known to be associated with tornadic activity and sometimes with hail. In

India, so far no evidence is available of such associations. The only conclusive point about their occurrence is that these are always associated with severe storms where precipitation rate is high and surface wind strong. The occurrence of such "dry holes" or "vaults" in extensive precipitation echoes should be taken as a definite indication that the storm is a severe one.

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REFERENCES

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|---|------|--|
| Battan, L. J. | 1959 | <i>Radar Meteorology</i> , p. 115, University of Chicago Press. |
| Browning, K. A. and Ludlam, F. H. | 1962 | <i>Quart. J. R. met. Soc.</i> , 88 , pp. 117-135. |
| Browning, K. A. and Donaldson, Jr., R. J. | 1963 | <i>J. Atmos. Sci.</i> , Amer. met. Soc., 20 , pp. 533-545. |
| Hoecker Jr., W. H. | 1957 | Proc. 6th Weath. Radar Conf. (Boston), p. 143. |
| Kulshrestha, S. M. | 1963 | Studies of precipitation and non-precipitation radar echoes over north India. Doctoral Thesis (unpublished), Part II, Chap. 7. |