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Radar Echoes from a winter thunderstorm at Bombay

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Thunderstorms at Bombay during winter months are rather an unusual phenomenon. The city and its suburbs experienced two spells of thunderstorms on 5 February 1961. The first spell lasted from 2120 GMT (0250 IST) to 0119 GMT while the second spell lasted from 0500 to 0600 GMT. During the past 15 years, Bombay had thunderstorms only on one more occasion in this month, *viz.*, February 1954. The weather on 5 February 1961 occurred in association with a western disturbance which was located over southwest Rajasthan, Kutch and Saurashtra on the morning of 4th. The disturbance moved away eastwards, causing fairly widespread thunderstorms in the northern and central parts of the country. Arrangements were made to take radar photographs of the thunderstorm cells over Bombay at short intervals and these photographs are discussed in this note.

The first radar picture (Fig. 1) was taken at 2345 GMT when the thunderstorm was over the station. It is seen from the synoptic charts that no station within 150 miles from Bombay reported any thunderstorm on the 4th night prior to the occurrence at this station. This would suggest that the large thunder cell over Bombay as noticed in Fig. 1, developed locally over the area. There were small cells around it, particularly to the east and west; within half an hour most of the cells oriented themselves in a WSW-ENE line (Fig. 2). This line of thunder cells then began to move away in a southeasterly direction at the rate of 10 to 15 miles per hour (Figs. 3, 4 and 5). Fig. 6 shows the picture at 0405 GMT, *i.e.*, one hour prior to the occurrence of the second spell of thunderstorm. It is seen that a number of cells were present to the south; they roughly lay in straight lines, pointing to some east-west direction. At 0500 GMT, the cells positioned themselves along a NE-SW line which moved southeastwards. There was one isolated cell over the station (Fig. 7). This developed and dissipated locally, giving temporary thunderstorm over the station. This thunderstorm was not associated with any change in the wind speed and direction while the first spell which was of a frontal type caused a squall of 32 km/hr with a sudden change in the wind direction. It would appear from the pictures taken on the day in question that the cells had a general tendency to lie in lines in a particular preferred direction. Fig. 8 at 0646 GMT is a good illustration. The cells were located along four distinct lines in the east-west or northeast-southwest direction.

An examination of the upper air charts would suggest that the cells oriented themselves in the direction of the cold front associated with the western disturbance. Figs. 9 and 10 show the weather distribution reported at 1200 GMT of 4th and 5th respectively. It is seen that the cold front ran from Veraval to Jhansi on the 4th evening and lay in a WSW-ENE direction. Figs. 11, 12, 13 and 14 represent the 850 and 500-mb charts of 1200 GMT of the 4th and 5th. It is seen that on the 4th evening, the 15°C isotherm ran from near Porbander to Sagar at 850-mb level and was quite close to the cold front. The above isotherm moved in a southeasterly direction and passed through Dahanu and Jabalpur at 1200

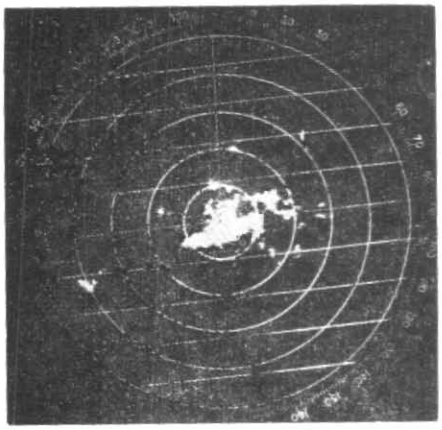

Fig. 1. 2345 GMT

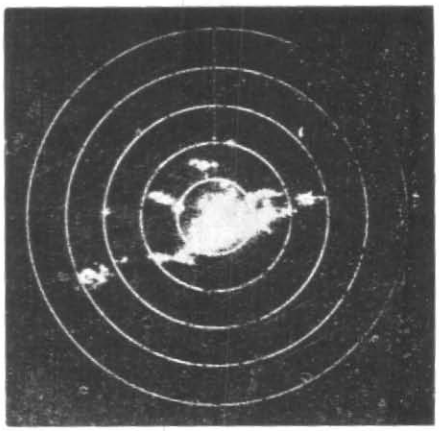

Fig. 2. 0005 GMT

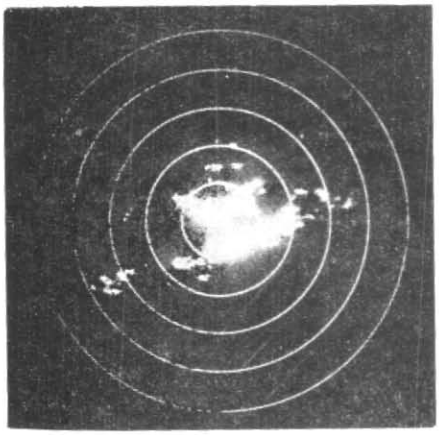

Fig. 3. 0020 GMT

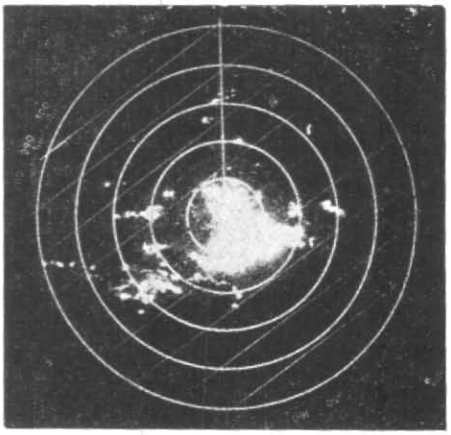

Fig. 4. 0050 GMT

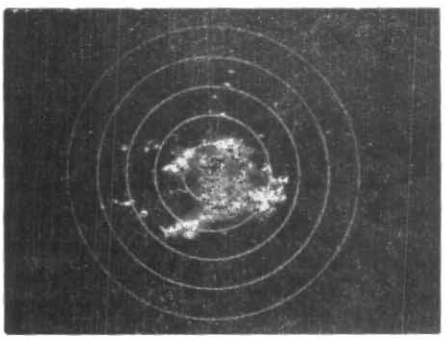

Fig. 5. 0120 GMT

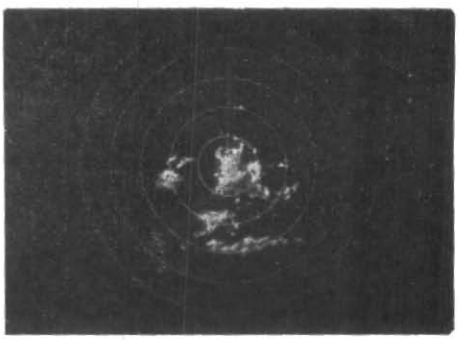

Fig. 6. 0405 GMT

(Range rings at 10 nautical miles)

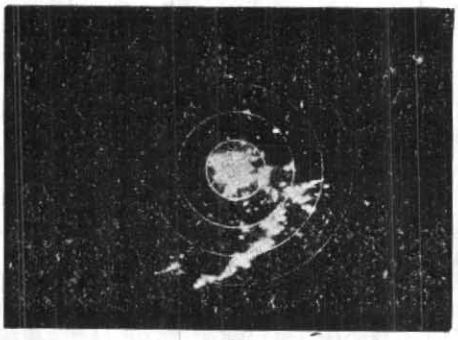

Fig. 7. 0500 GMT

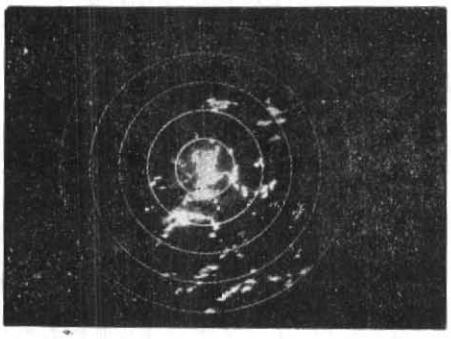

Fig. 8. 0646 GMT

(Range rngs at 10 nautical miles)

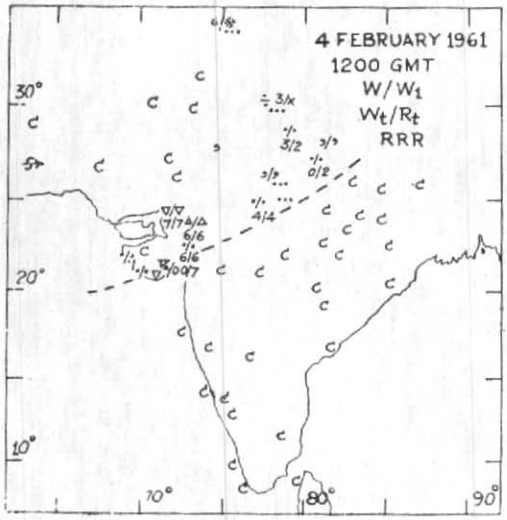

Fig. 9

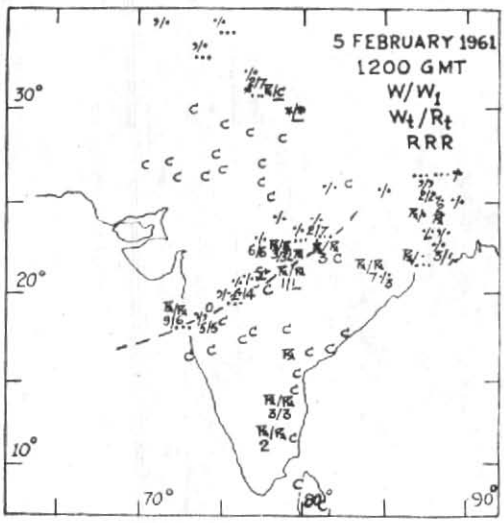

Fig. 10

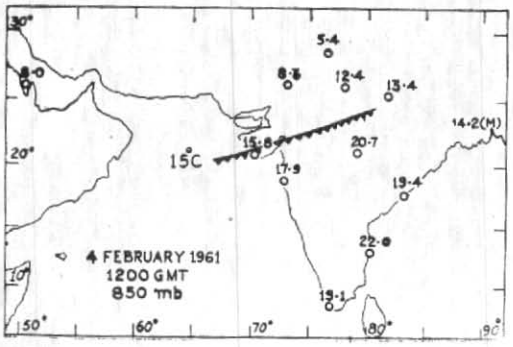

Fig. 11

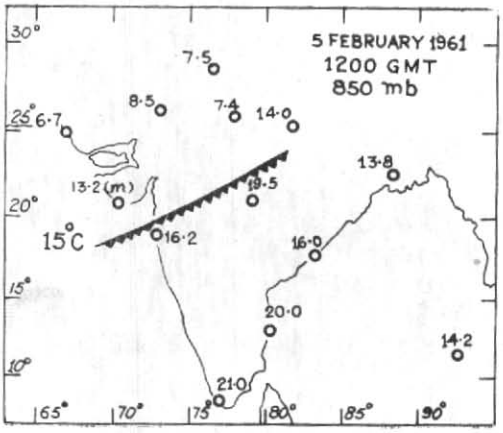

Fig. 12

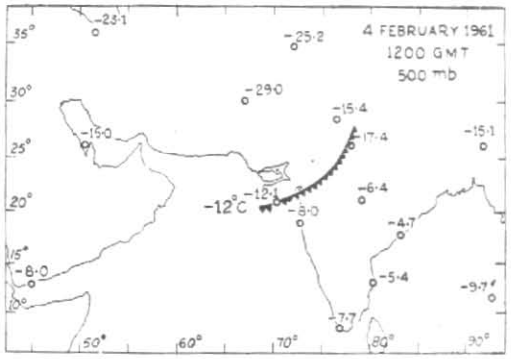

Fig. 13

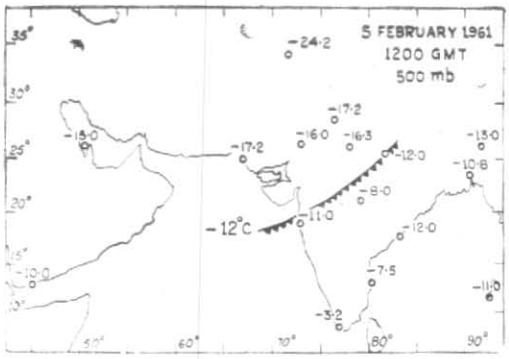

Fig. 14

GMT of the next day. The —12°C isotherm at 500-mb level which too was located near the cold front on the 4th evening, showed the similar movement as the 15°C isotherm at the 850-mb level. On the evening of 5th, the cold front passed through Bombay and Umaria as is evident from the weather plotted in Fig. 10. Due to the inadequate network of radiosonde stations, it is often found very difficult to locate a cold front accurately in the upper air charts, and to determine its movement. A study of the position and movement of a neighbouring isotherm may, however, give useful information about the distribution and movement of thunder cells of the frontal type over an area.