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ON THE RECURVATURE AND INTENSIFICATION OF A PERTURBATION FROM THE EAST UNDER THE INFLUENCE OF A WESTERLY TROUGH

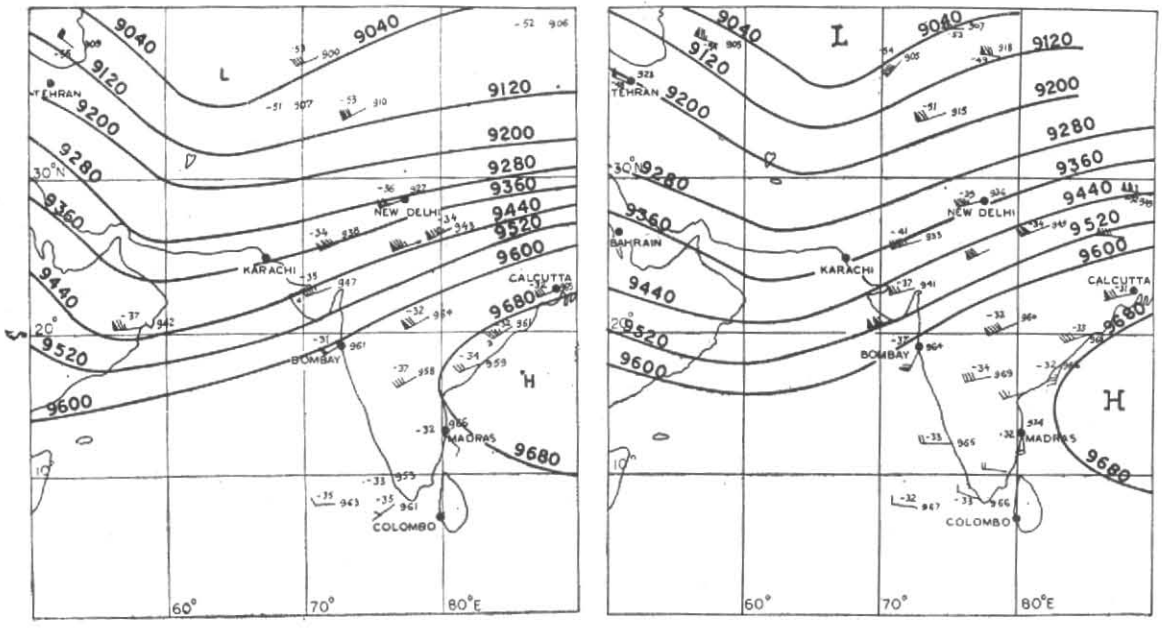
1. In February 1975, a perturbation from the east was found to move northwestwards across the Peninsula. At the same time in the northern latitudes, a deep trough in westerlies was appproaching towards India. As this trough had extended from central Afghanisatan to the east central Arabian Sea and the perturbation had appeared over north Maharashtra coast and adjoining south Gujarat region, it recurved and intensified under the influence of the former.

2. During 17 to 19 February 1975 a deep trough in westerlies between 700 and 200 mb was approaching northern India. At 300 mb level the NNE/SSW-oriented axis extending from Karakumi areas of U.S.S.R. to the southeastern parts of Saudi Arabia through the Gulf of Oman in the evening of 17th, lay in the evening of 19th, extending from central Afghanistan to the east central Arabian Sea through Baluchistan. Across Lat. 25°N the movement of the trough axis was about 9 degrees in the course of 48 hours. The positions of the trough at 300 mb at 00 and 12 GMT of 18 Febuary 1975 are shown in Fig. 1 (a, b). The positions at 900 m a.s.l. are shown in Fig. 2 (a-f).

At 0·9 km a.s.l. winds over northwest India, Gujarat, north Maharashtra and west Madhya Pradesh were initially anticyclonic. Clear skies, appreciably below normal minimum temperatures with moderate to severe cold wave conditions at places prevailed there during 17th and 18th. On 19th, however, clouds appeared over parts of Rajasthan and Madhya Pradesh with abatement of cold wave conditions over east Rajasthan and adjoining Madhya Pradesh.

In the south a perturbation extending upto 1500 m a.s.l. with the trough line oriented NNE/SW was moving northwestwards towards higher latitudes. This perturbation had closed circulations at 900 m above sea level but had no closed isobar initially at the sea level. The centres of cyclonic circulations at 900 m and the centres of the low at sea level are shown in Fig. 3.

3. A sea level low had developed in the evening of 18th. It will be seen from Fig. 3 that the perturbation was set to recurve between 0000 and 1200 GMT of 18th and after its intensification into a sea level low at 1200 GMT of 18th, it had taken a northeasterly track and subsequently moved with greater speed. It is of interest to record that the cyclonic circulation associated with the low extended upto 2100 m above sea level



(a) 00 GMT (b) 1200 GMT

Fig. 1. 300 mb contour on 18 February, 1975

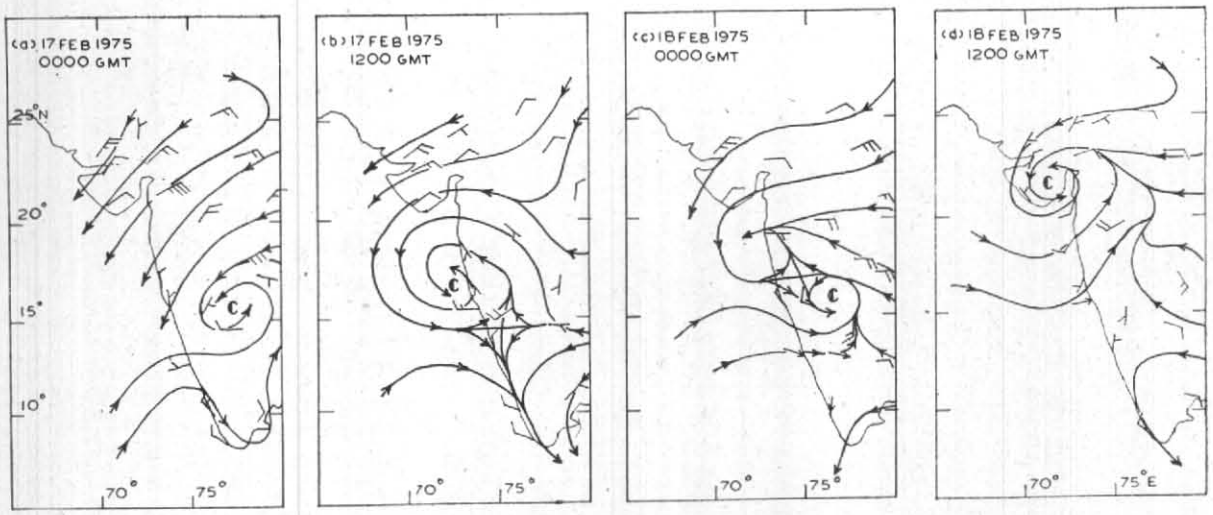


Fig. 2 (a—d). Streamlines at 900 m a.s.l. on 17 and 18 February, 1975

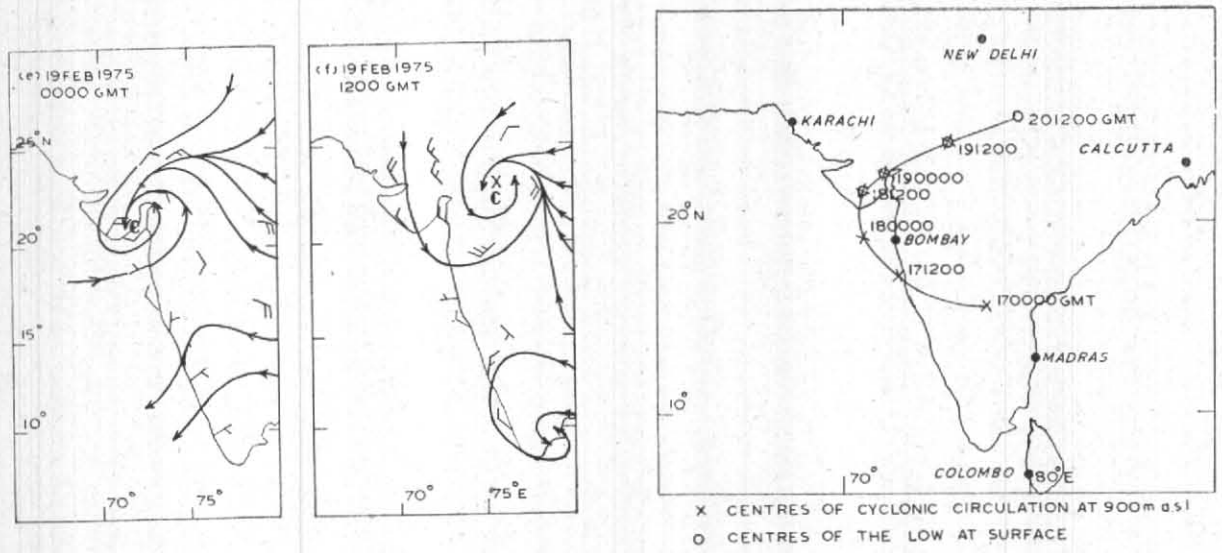


Fig. 2 (e—f). Streamlines at 900 m a.s.l. on 19 February, 1975

at 0000 and 1200 GMT of 19th indicating its further intensification. Moving through southeast Rajasthan and northwest Madhya Pradesh, it appeared over southwest Uttar Pradesh in the evening of 20th, weakening, it moved further to the northeast and was close to the hills of eastern Nepal in the evening of 21st. This low along with a western disturbance moving through north Pakistan and adjoining Jammu & Kashmir was responsible for well-distributed precipitation over east Rajasthan, north Madhya Pradesh, plains and hills of west Uttar Pradesh, Punjab, Haryana, Himachal Pradesh and Jammu & Kashmir between 18th and 20th.

4. The salient features of this perturbation are its intensification and subsequent recurvature.

For intensification, we recognise the probable effects of its emergence into and passage through the shallow warm waters off the north Maharashtra—south Gujarat coasts. But the intensification also appears attributable to the effects of the approaching westerly trough. The same was undoubtedly responsible for the recurvature. Research workers both in India and abroad working on similar problems have also noted recurvature and intensification of such perturbations when influenced by westerly trough (Yeh 1950, Hosler 1956, Desai 1970, Ananthakrishanan and Bhatia 1958).

The successive positions of the trough at 300 mb at 00 and 12 GMT of 18 Febuary 1975 are shown in Fig. 1(a, b). It is well known that the vorti-

city advection is least along the axis of such troughs. To the east of the trough the positive vorticity advection gradually increases becoming maximum at the inflection points. Therefore, it seems acceptable to assume that when the perturbation had appeared over south Gujarat in the evening of 18th, the positive vorticity advection in the middle and upper troposphere due to the advancing trough become super imposed upon it leading to the sea level development. Further, embedded now in the prevailing southwesterlies, it moved in the northeasterly direction and subsequently attained greater speed. Presumably because of lesser magnitude of positive vorticity advection, usual at this position of the trough, the sea level low remained feeble and did not intensify into a depression.

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11 May 1976

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