HORIZONTAL DISTRIBUTION OF TEMPERATURE OVER INDIA IN MAY DURING YEARS OF EARLY, NORMAL AND LATE SW MONSOON

The years 1955, 1956 and 1957 were distinctly different from one another in so far as the time of onset of the monsoon over the country in these years was concerned. The monsoon was nearly timely in 1955, having extended into most parts within a few days of the normal dates, while it was unusually early in 1956 and unusually late in 1957. The thermal patterns prevailing during the premonsoon months of the above three years have been examined and it is noticed that the patterns were appreciably different from one another in the higher levels. The results of the study may be of some interest to a forecaster who has to make a long-range prediction about the probable time of arrival of the monsoon in different years.

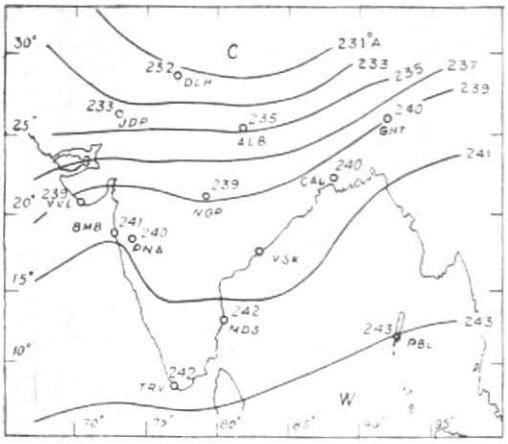

Fig. 1. (January)

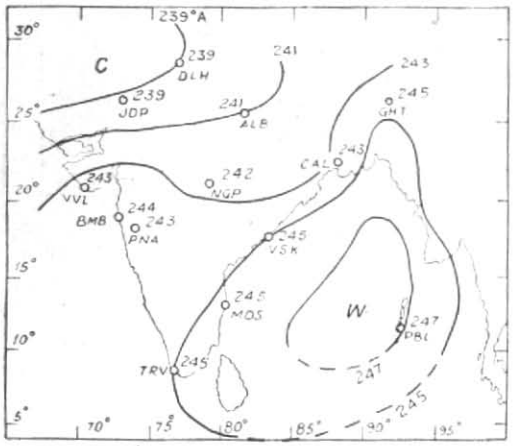

Fig. 2. (May)

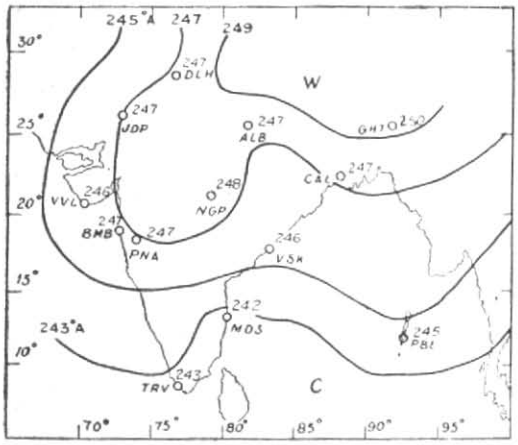

Fig. 3. (August)

The normal distribution of temperature at 300-mb levels in January, May and August, representing the winter season, the pre-monsoon season and the monsoon season respectively are shown in Figs. 1—3. It is seen that, in winter the warmer region at the surface level (charts not reproduced here) lies over the Indian Ocean. During the pre-monsoon months it shifts northwards and is situated over the central and northwestern parts of the country. From the premonsoon to the monsoon season, there is, however, no large change in the pattern of the temperature distribution. At 300-mb level, there is, in January, a thermal high over the Indian Ocean adjoining the south Bay of Bengal (Fig. 1). This high slowly moves northwards and reaches its northernmost position over the Himalayas and the Tibetan plateau during the monsoon months, July and August (Fig.3). Later, it retraces its position till it is again over the Indian Ocean in winter. The seasonal changes in the position of the thermal high are found to be more marked in the higher levels than at the surface. The temperature patterns at the surface and 300-mb level for May of the three years under study are discussed below with reference to the normal patterns for the same month and the actual time of onset of the monsoon in these years. The location of the thermal high aloft in this month would appear to give some useful prior indication about the time of arrival of the monsoon over the country. Its presence near the normal position appears to lead to nearly timely monsoon while its location to the north or south of the normal position seems to be associated with early or late monsoon respectively.

In 1955, the Arabian Sea branch of the monsoon extended into Kerala by 29 May and into north Konkan and south Gujarat by 12 June. The Bay branch advanced into Assam on 2nd and into sub-Himalayan West Bengal on 4 June. It extended into Gangetic West Bengal, Orissa and Bihar by 9th and into east Uttar Pradesh by the next day. The monsoon extended into north

Gujarat and east Rajasthan by 18th and 21st respectively. It extended into west Uttar Pradesh and Punjab (I) in the last week of the month and into the rest of the country by the next week. Thus, the monsoon arrived that year over most parts of the country within a few days of the normal dates.

The temperature pattern at 300-mb level for May of the above year is shown in Fig. 4. It is seen that the thermal high was over the Bay of Bengal near its normal place (Fig. 2) and the monsoon, too, was timely that year.

In the year 1956, a major part of the country was under the sway of the monsoon by as early as the end of May. The Bay branch appeared in the Andaman Sea and the southeast Bay in the 2nd week of May—about two weeks earlier than the normal date—while the Arabian Sea branch struck the Malabar coast by 21 May—about ten days ahead of the usual time. The northward progress of the monsoon current was also quite rapid. It advanced into Gujarat, Madhya Pradesh and the Bihar by the beginning of June. It extended into the Punjab(I) and east Rajasthan in the 4th week and into the rest of the country by the end of the month. Thus, the monsoon generally prevailed over the country 10—15 days ahead of the normal time.

It is seen from Fig. 6 that the thermal pattern at 300-mb level for May of the above year (1956) was similar to the normal pattern for August (Fig. 3), having the higher temperature region over the Himalayas and the monsoon, too, arrived unusually early that year.

As the monsoon had already extended into a large part of the country during the last 10 days of May 1956, it may be argued that the mean temperature chart for this month did not provide information of forecasting value. Therefore, the mean temperature chart for the first half of the month when the monsoon was absent over the

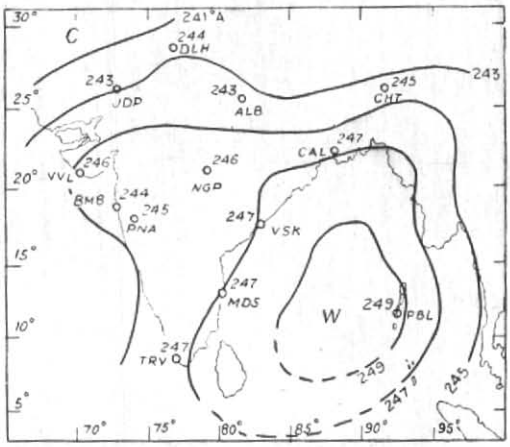

Fig. 4. May 1955 (300 mb)

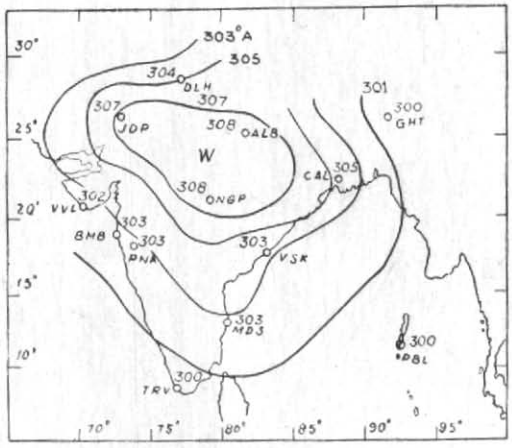

Fig. 5. May 1955 (Surface)

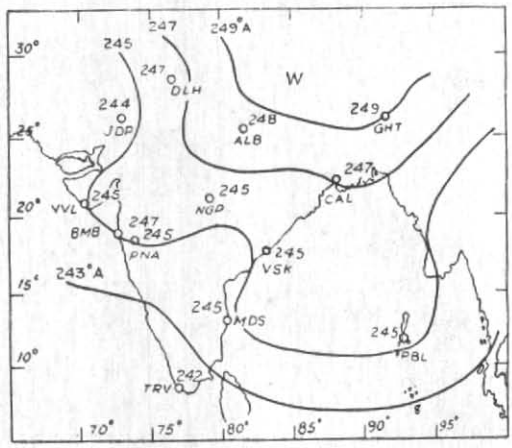

Fig. 6. May 1956 (300 mb)

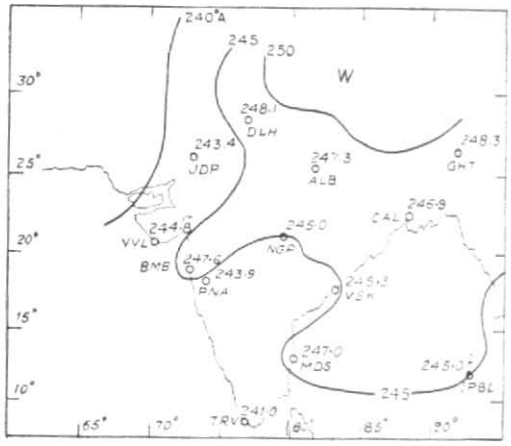

Fig. 6(a). 1—16 May 1956 (300 mb)

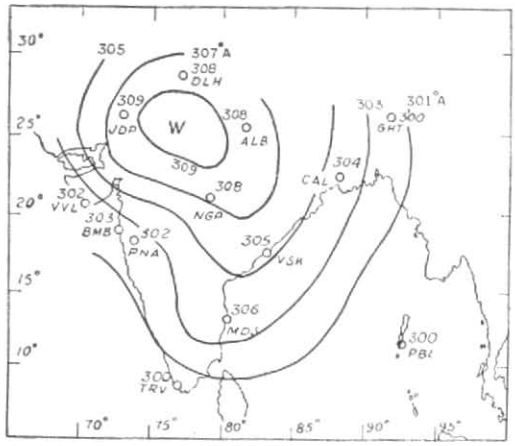

Fig. 7. May 1956 (Surface)

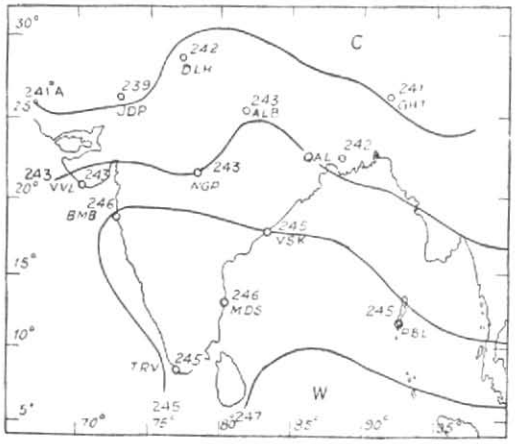

Fig. 8. May 1957 (300 mb)

country is shown in Fig. 6(a). It will be seen that the thermal high was located over the Tibetan region even during the above period, also, suggesting an early onset of the monsoon.

In 1957, the monsoon arrived over most parts of the country 10—15 days after the normal time. The Arabian Sea branch advanced into Kerala on 1 June and temporarily extended to coastal Mysore on 5th. Thereafter, there was a lull in the activity of the monsoon. The Arabian Sea branch remained practically confined to Kerala while the Bay branch to the southeast and east central Bay until about the middle of the month. The Arabian Sea branch then advanced as a feeble current into south Konkan on 19th and into north Konkan and Maharashtra on 22nd—nearly two weeks after the normal time. The Bay branch advanced as a feeble current into Assam on 21st and into West Bengal and Orissa on 23rd. Thus the monsoon was also delayed in the above region by 10-15 days. The Arabian Sea branch extended into Saurashtra, Kutch, north Gujarat and southeast Rajasthan in the last week of June and Bay branch into Punjab (I) and Himachal Pradesh on 9 July. The monsoon prevailed over the rest of the country towards the middle of the month (July).

Fig. 8 shows that the thermal pattern at 300-mb level for May of the above year was similar to the normal pattern for January (Fig. 1), the warmer region lying to the south over the Indian Ocean. It has also been seen that the monsoon, too, was actually late that year.

As regards the surface temperature (Figs. 5, 7 and 9), no well marked changes are noticed in the position of the thermal high during the three different years. The north-south temperature gradient was, however, higher in the early monsoon year (1956).

Temperature distribution at the other standard levels (*viz.*, 850, 700, 500, 200 mb)

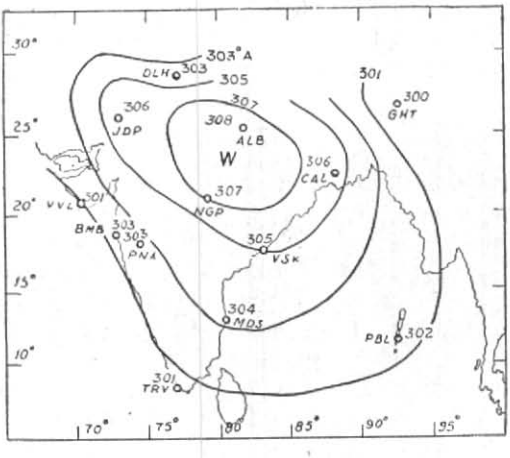

Fig. 9. May 1957 (Surface)

were also examined. The patterns at 200-mb level were found to be similar to those at 300-mb level. The distinctive features of the three occasions became somewhat less marked as the height decreased. It is further seen that the charts for May brought out the distinctive features more clearly than the charts for April and therefore, only the May charts are included in the note.

It would appear from this study that the thermal conditions over the Himalayas and the Tibetan plateau may have considerable influence on the northward progress of the monsoon current. Early warming up of the air over the above region apparently leads to early monsoon while late warming causes late monsoon. There is a proposal for starting a few high level observatories in the above region and some radiosonde units along the foot of the Himalayas. The data from these stations will be found very useful for a more critical and detailed study of the subject.

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