

Letters to the Editor

551-557 (54)

UTILITY OF 850-MB CHARTS FOR ESTIMATION OF UPPER WINDS OVER INDIA

1. One of the main uses of constant pressure charts has been the estimation of winds in regions of sparse data. Though radiosonde ascents commenced in India as early as 1943, comparatively little work has been done to measure the agreement between contour lines and winds over the tropics. A paper based on 6 months' analysis of 850-mb charts (July to December 1945) by Dr. S. K. Pramanik, and S/Shri A.A. Kureshi and D.V. Deshpande was read at a symposium on *Atmospheric Processes* held at Bombay in August 1946. A further analysis of 850-mb charts for 30 months (Jan-Jun 1947, Jan-Dec 1949 and Jan-Dec 1950) has now been carried out and this note gives the preliminary results.

2. For the purpose of this investigation, the height of the 850-mb constant pressure surface over India (as obtained by the evening—generally 1400 GMT—radiosonde ascents) was plotted and contour lines at intervals of 60 ft, equivalent to a difference of roughly 2 mb, were drawn. Winds at 5000 ft reported from the afternoon (about 0900 GMT) pilot ascents were then plotted on these charts. An analysis of the agreement, both as regards direction and speed, between the contour lines at 850 mb and winds at 5000 ft over the Indian area was then carried out. Subsequently, contour lines at intervals of 30 ft equivalent to a difference of about 1 mb, were also drawn on these charts to see whether this would give a better fit.

3. The examination of the charts showed that—

(i) The agreement between the direction of the wind and the contour lines varies from

season to season. The agreement was fair during the SW monsoon months, June to September, on about half the number of days examined; in the post-monsoon period (October to November) fair agreement occurred on about one third of the total number of days, but during winter (December-February) and pre-monsoon months (March to May) fair agreement was only found on very few days.

(ii) During the SW monsoon months, agreement was slightly better in July and September than in June and August. The agreement in the Peninsula was somewhat less satisfactory during this season, as on many days the contour lines ran roughly NW to SE, whereas the winds were westerly. This is often due to the Poona height being higher, as a result of the extension of a ridge of high pressure formed by the flow of monsoon winds against the Western Ghats.

(iii) The agreement was more satisfactory on days when there were depressions and well-marked pressure systems than on other days.

(iv) The agreement is better when the winds are stronger than when they are light.

(v) The qualitative agreement between the strength of the wind and the spacing of the contour lines was satisfactory on less than half the number of days during the SW monsoon, and on a much smaller number of days during the other months. There were also a few occasions when there was only one contour line (at an interval of 60 ft) over the whole country.

(vi) The details were brought out better when contour lines were drawn at 30 ft intervals, than when they were drawn at intervals of 60 ft.

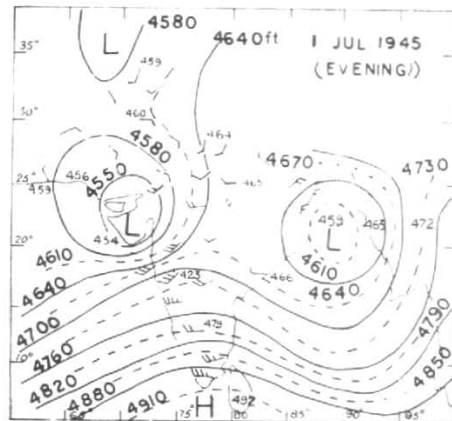


Fig. 1

Contour lines (ft) at 850 mb, winds at 5000 ft

4. A chart indicating satisfactory agreement between the winds and contour lines at 850 mb is shown in Fig. 1.

On the evening of 1 July 1945, a deep depression lay at the head of the Bay of Bengal with its centre about 120 miles SSE of Calcutta. Another monsoon depression over Sind and southwest Rajasthan was merging into the seasonal low over Baluchistan.

A comparison of 850-mb charts on 30 June 1945 and 1 July 1945 shows significant changes. There was a fall of 40 ~ 50 feet in the level of 850 mb surface at Barrackpore (Calcutta), Cuttack and Allahabad. This indicates a westward shift of the contour low over the northeast Bay of Bengal, accompanied by veering of winds over Bengal, Orissa and Bihar. This is borne out by the actual winds at Asansol, Gaya and Jamshedpur. Winds over these places at 5000 ft were generally WNW/NNW on 30 June but became NNE/NE next evening in agreement with the contour low.

Over Sind two closed contour lines, drawn at intervals of 30 ft, give a good fit with the winds at 5000 ft over the area.

The strength and direction of winds over Gujarat and Maharashtra are well brought out by the height gradient between Veraval and Poona.

5. Some of the factors, which may lead to disagreement in the winds and contour lines at 850 mb are (a) Sparse radiosonde network, (b) errors, instrumental or computational, in radiosonde data, (c) time lag between times of radiosonde and pilot ascents and (d) the effect of orography and lack of geostrophic balance. Though on many days the agreement in winds at 5000 ft and contour lines at 850 mb is not satisfactory, it is noteworthy that on days when the synoptic situation is significant, the agreement is quite good. This fact is of considerable practical use, as on such occasions pilot data are meagre because of low clouds and rain.

6. I am indebted to late Dr. S. K. Pramanik for his many helpful discussions and guidance.

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October 1, 1962*