

ON THE IMPORTANCE OF THE MID- AND UPPER TROPOSPHERIC THERMAL SYSTEMS IN THE DEVELOPMENT OF WEATHER IN NORTH-EAST INDIA AND EASTERN PAKISTAN DURING THE NOR'WESTER SEASON

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IN a recent issue of this Journal, the present authors¹ had pointed out that extensive and destructive nor'westers in West Bengal and Eastern Pakistan and the adjoining areas of Orissa, Bihar and Assam are invariably associated with cold pools or cold thermal troughs at the 500 mb. level and that the actual outbreak of nor'westers is preceded 18-24 hours ahead by the development of these thermal systems not only at the 500 mb. level but also possibly at the 300 mb. level. It was also shown by the authors that cold-advection associated with these systems appeared to be the final determining factor in the outbreak of the nor'westers. In view of the obvious importance of this subject, the authors have pursued this problem further by an analysis of the 500 and 300 mb. partial thickness patterns for the whole of May 1953. This period was characterised by exceptionally severe nor'wester activity during the first half of the month and by unusually fair weather during the last ten days. Thus the authors had an excellent opportunity of getting during the course of one month, two distinct types of weather situations in North-East India and Eastern Pakistan. For purpose of this study, the partial thickness charts were prepared in the same way as was done in the earlier investigation. For the reasons stated in the earlier paper, more weightage was given to the thermal winds than to the Radiosonde thickness values while drawing the thickness lines. Special attention was given, while drawing the lines, to the *principle of continuity in space and time*—a point which has been so rightly emphasised by Petterson² and Priestley. In regions where data were wanting, due attention was also paid to the normal partial thickness patterns* in the same way as the normal upper winds are taken into account while drawing upper wind stream lines on constant level upper wind charts in regions of sparse data. The thunderstorms which were reported (thunder heard was also taken as thunderstorm for this purpose) between 03 GMT of

the next day and 03 GMT of the following day were plotted on the 500 mb. chart to bring out conspicuously the association between the thunderstorms and the thermal systems.

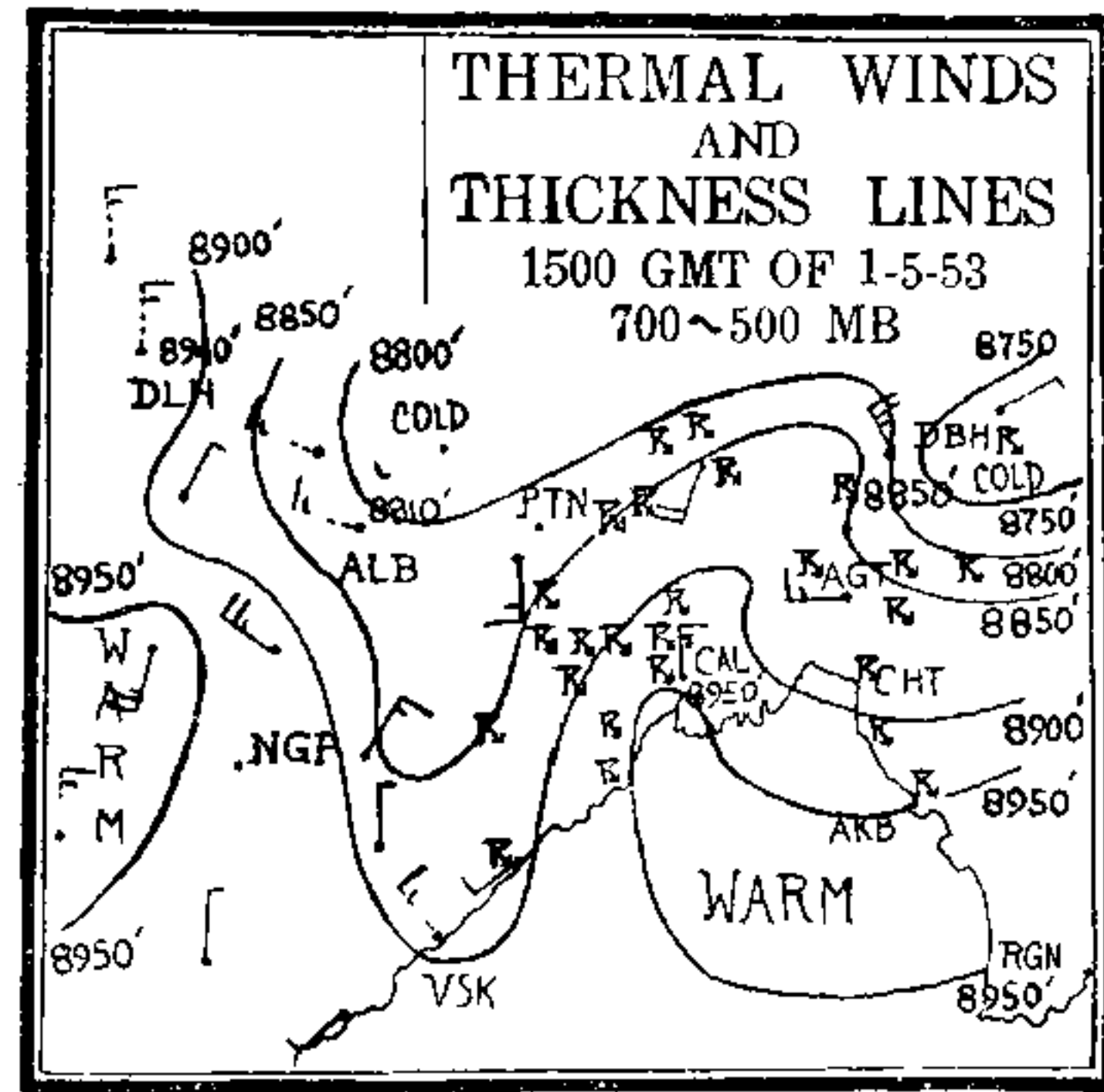


FIG. 1

The study of the charts thus prepared and analysed has not only confirmed the results presented in the earlier paper but has also brought to light a number of new points of interest which are briefly stated below:

(i) A very large proportion of the thunderstorms in North-East India and Eastern Pakistan during the month, irrespective of their spatial distribution and intensity, were associated with a cold thermal trough or cold pool at the 500 mb level except where orography had played an important part. The thunderstorms (irrespective of their intensity) lay mainly in the eastern half of the cold thermal system. It was interesting to find that, out of a total number of 438 thunderstorms in North-East India and Eastern Pakistan during May 1953, as many as 311 thunderstorms (i.e., 70 per cent. of the total) occurred to the east of the thermal trough line while only 127 thunderstorms (i.e., only 30 per cent.), occurred to the west of the thermal trough line.

(ii) The cold thermal troughs (or cold pools) at the 500 mb. level persisted generally for 2 or 3 days with varying intensities and shifting their positions eastwards or westwards during the period. With the shifting of the thermal systems and with the changes in their intensities,

* These are being published separately. They also show strikingly the association between the 500 mb. partial thermal patterns and the normal monthly distribution of thunderstorms in North-East India and Eastern Pakistan in March, April and May.

charts, constant level upper wind charts below 10,000' and the subsidiary charts showed more or less the same features as on other days when few or no thunderstorms developed in the respective regions (e.g., compare the charts for the 9th and 14th with those for the 8th and 28th respectively). In contrast to this, on every one of these occasions, the partial thickness charts for the 500 mb. level showed well-marked cold troughs or cold pools close to the region where the thundersqualls developed. The situation on the 14th May 1953 deserves special mention. Even a forecaster who believed in "taking no risks", would have predicted on this day on the basis of the usual charts, only a few thunderstorms over this division. And yet, on this evening, severe thundersqualls developed over every district in the division.

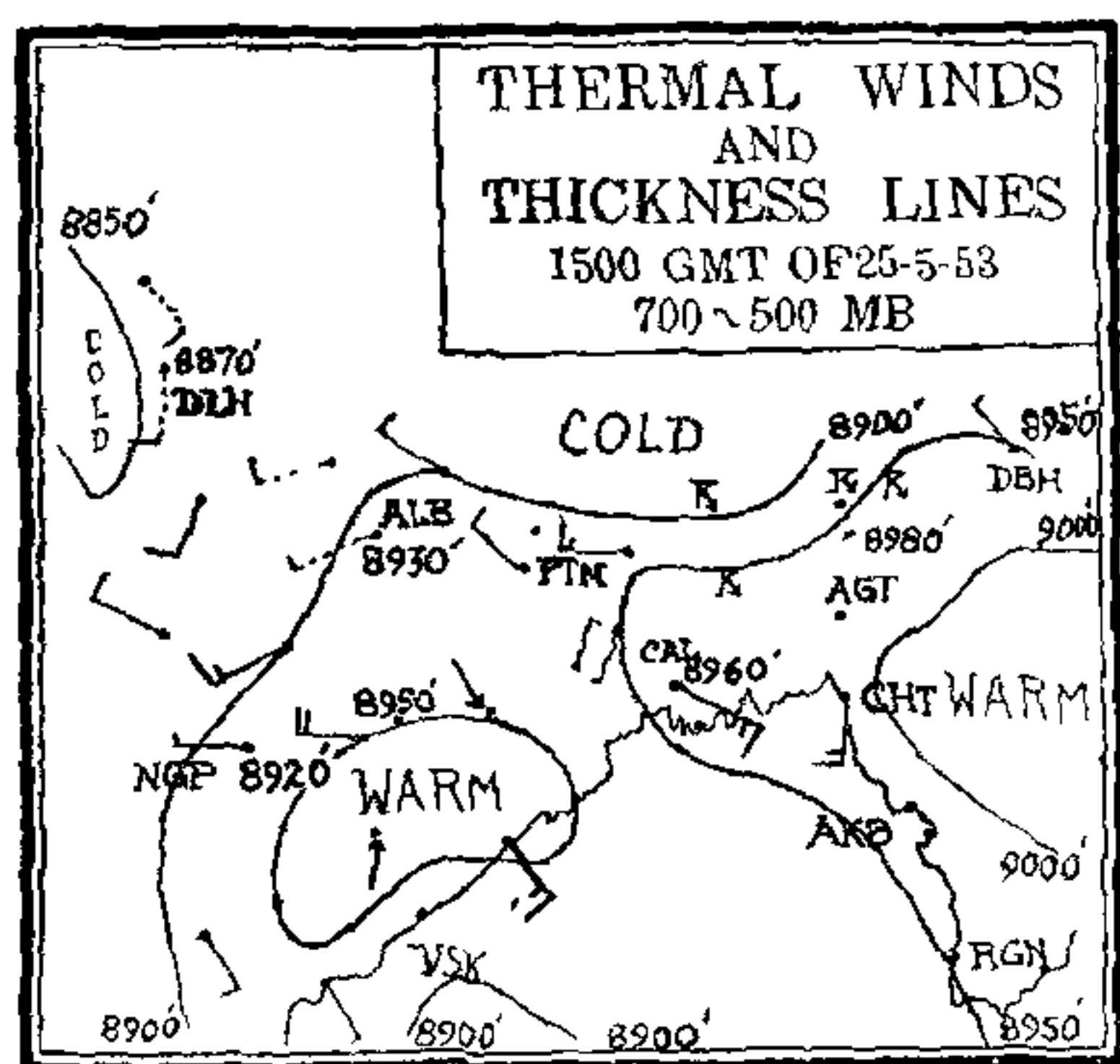


FIG. 4

Figs. 1-4 show the partial thickness charts at the 500 mb. level on a few interesting situations and the thunderstorms which occurred between 03 GMT of the next day and 03 GMT of the following day (*vide* para 1 above). Fig. 1 (1-5-1953) shows the asymmetric development of the thunderstorms with respect to cold troughs and also how two cold troughs can each produce its own set of thunderstorms. Note the ENE, 5 knots thermal wind over Dibrugarh, NNW, 25 knots thermal wind over Tezpur and westerly 15 knots thermal wind over Agartala, clearly indicating a cold trough over Assam.†

† The thickness value at Shillong was obviously too high compared to its value on the previous day and the following day. Hence it was suitably corrected.

The absence of thunderstorms over the central districts of Eastern Pakistan where a warm ridge exists, is interesting. It would also appear that North Orissa and the adjoining parts of Gangetic West Bengal were in a confluent thermal jet and that the comparatively greater concentration of thunderstorms in that region could, to some extent, be attributed to this additional factor.

Fig. 2 (5-5-1953) shows the inhibiting effect of a warm pool. Note the widespread thunderstorms in the cold trough and the conspicuous absence of thunderstorms in East Pakistan where the northerly thermal winds over Chittagong, southerly thermal winds over Jalpaiguri and west-south-westerly thermal winds over Agartala clearly suggest the existence of a warm area.

Fig. 3 (8-5-1953) shows the thermal situation which led to a record squall of 86 m.p.h. at the Calcutta Airport. The most interesting feature of this case is the south-south-east thermal wind (based on radar wind at 15 00 GMT) of 20 knots over Calcutta between 700 and 500 mb. levels‡ (i.e., roughly between 10,000' and 20,000'). The thermal wind between 15,000' and 20,000' worked out to as much as 150°, 32 knots!

Fig. 4 (25-5-1953) illustrates the inhibiting effect of a warm ridge at the 500 mb. level. The complete absence of even thunder over Gangetic West Bengal and Chotanagpur on this day in spite of the favourable lower level conditions is highly significant.

The question may be asked whether the time lag observed between the appearance of the thermal system and the subsequent weather developments has any theoretical justification. The answer to this must await further studies which are in progress. However, J. S. Sawyer¹ has published isopleths of thermal vorticity and relative divergence in certain specific situations and the actual weather developments at sea-level 12 hours and 24 hours later. These seem to support the idea that

‡ The radiosonde thickness value at Calcutta was too high. It had to be corrected to maintain continuity with respect to the previous day's pattern, to avoid unjustifiable crowding of thickness lines to the west of the cold pool, to fit in the westerly thermal wind over Chittagong and south-south-easterly thermal wind over Calcutta and to avoid undue deviation from the normal thickness pattern in North Bay of Bengal where the normal partial thermal winds are between SSW and WSW in May.

there can be an appreciable time lag as have been observed by us. Also C. K. M. Douglas⁵ has found that the cold pools are especially important in European regions for forecasting beyond 24 hours. In view of these, the time lag observed in the case of nor'westers over North-East India and East Pakistan need not cause surprise. On the other hand, we can go forward with the hope that the time lag, what-

ever be its cause, should be of great value in predicting these thundersqualls.

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1. Ramaswamy, C. and Bose, B. L., *Curr. Sci.*, 1953, 22, 103. 2. Petterson and Priestley, *Det Norske Meteorologiske Institutt, V. T. M.*, 1946, No. 2. 3. Sutcliffe and Forsdyke, *Quart. Jour. Roy. Met. Soc.*, 1950, 76, 189. 4. Sawyer, J. S., *Centenary Proceedings, Roy. Met. Soc.*, 1950, 107. 5. Douglas, C. K. M., *Met. Magazine*, 1947, 76, No. 904, 225.
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PSYCHOLOGY OF EXCELLENCE

A COMMENT that might be made on contemporary psychology both by other scientists and by our colleagues in the humanities is that in its necessary concern with average and subaverage people it has given too little direct attention to those who are outstanding for excellence of some kind. This forms the topic of Prof D. W. Harding's address this year to Section J (Psychology) of the British Association. It seems important to understand the conditions of excellent achievement, since general progress commonly occurs through advances made by unusual people and gradually followed up by the social group as a whole. The relation between outstanding people and the rest of us is part of the broader question of relations between people of different levels of ability or quality of mind. Waste of human resources occurs through the obstruction or neglect suffered not only by the very great but also by many people of more moderate excellence, including gifted children whose potentialities have not been discerned, and may excel those of their teachers and parents.

Two broad problems concern the psychologist: first, that of the mere perception of excellence, especially excellence surpassing one's own; secondly, that of the response to perceived excellence, whether it excites, for example, generous admiration or jealousy and attempted disparagement. A good relation between people of differing levels of ability depends on the attitude of the abler as well as that of the less able person. If the latter is to maintain his self-respect and psychological security he must feel that the other recognizes the value of his contribution, however small, to the common

task; and recognizes his equality as a person, however subordinate his function may be. The ability to convey to subordinates one's recognition of their equality as persons is one mark of good leadership, and the basis of it deserves more attention from psychology. In some activities (for example, in amateur games and sports) the perception of excellence is aided by objective assessments of performance, and response to it is so controlled by usage and convention that good relations are maintained between people of widely contrasting levels of ability. When less objective performances and more intangible qualities are in question, the difficulties of assessing oneself in comparison with others become formidable and various.

We know rather little at present, not only about the recognition of excellence in others, but even about the psychological processes involved in making an advance ourselves and recognizing that our own present standards are higher than those we once accepted. Many of the unanswered psychological questions in this field are the concern of the social and experimental psychologist; others invite the aid of the psychopathologist, for example, the effect of the child's view of his parents and the effect of sibling jealousy on his later attitudes to greatness and superior achievement in others. Any direct psychological study of the conditions governing the achievements of distinguished people, whose minds may far excel those of the psychologists who undertake it, must raise special problems of technique which have up to the present received comparatively little attention.

(—By courtesy of Nature.)