Letters to the Editor

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A STUDY OF UPPER WINDS, TEMPERATURE AND HUMIDITY OVER MADRAS IN RELATION TO PRECIPITATION OCCURRENCES THERE DURING THE MONSOON SEASON

In this note, a study has been made to find out whether the strengthening or weakening of the zonal or meridional components of upper winds over Madras has any bearing on the development of weather at this station and neighbourhood during the next 24 hours. It has also been examined if there is any significant variation in the vertical distribution of temperature and humidity associated with dry days or wet days over the same area.

There are 15 rain-recording stations within a radius of 20 miles around Madras (Meenambakkam). For the purpose of the present study, a dry day has been defined as the day when none of the above observatories reported any measurable amount of rain. On the other hand, a day when at least 50 per cent of these observatories registered measurable precipitation has been considered as a wet day. The data studied in this note pertain to the monsoon months, June to September, during the period 1957 to 1963. The rainfall data for August 1962 and for September 1963 were not, however, available and as such these 2 months are excluded from the study. The distinguishing features of winds, temperature and humidity on occasions leading to the above two distinctly different types of weather have been examined and discussed below.

Analysis of the wind data — The percentage frequencies of dry and wet days (as defined above) in different months during the period under study are shown in Table 1.

TABLE 1

Percentage frequencies of wet and dry days during June–September

Month	Dry days (%)	Wet days (%)
June	43	14
July	20	28
August	24	26
September	33	26

It will be seen from the table that the figures for dry and wet days do not differ very appreciably during the above period except in the month of June when dry days are more.

The zonal and meridional components of the winds over Madras at different levels at 0530 IST of days previous to the dry and wet days were computed and their average values determined separately. These values are plotted in Fig. 1 for the four months. The northerly and easterly components have been taken as positive and southerly and westerly components as negative. The dotted lines refer to occasions leading to dry days and continuous lines to wet days. It will be seen that the meridional components are generally northerly and they are nearly equal on both sets of occasions upto about 500-mb level in the months of July, August and September. Above this level, stronger components are associated with wet days in June and August and with dry days in July and September. As regards the zonal components, it will be seen that they are westerly upto about 400 or 500-mb level and easterly aloft during this season. The low level westerly components are stronger prior to wet days during June and August and dry days in July and September. Thus there is some similarity in the behaviour of the high level meridional components and the low level zonal components. The strengthening of these components leads to wet days in June and August and dry days in July and September. The same conclusion also holds good to some extent in respect of high level zonal components which are ordinarily stronger prior to dry days in July and September. But in June and August, the components corresponding to dry and wet days are more or less the same. Thus, no uniform relationship exists between the wind field and the impending rainfall for all the four monsoon months. However, it is seen that the features noticed in June are generally similar to those in August and the features in July are similar to those in September. Fig. 2 shows the vertical distribution of speed of the zonal and meridional components respectively for the four months. It will be seen from the figure that the depth of the westerly current is more or less the same on both the two sets of occasions and hence this parameter does not appear to be a suitable guide for predicting rain. It is also seen that there is a certain region where southerly components exist on the above occasions but the depth of this region is less on occasions leading to wet days.

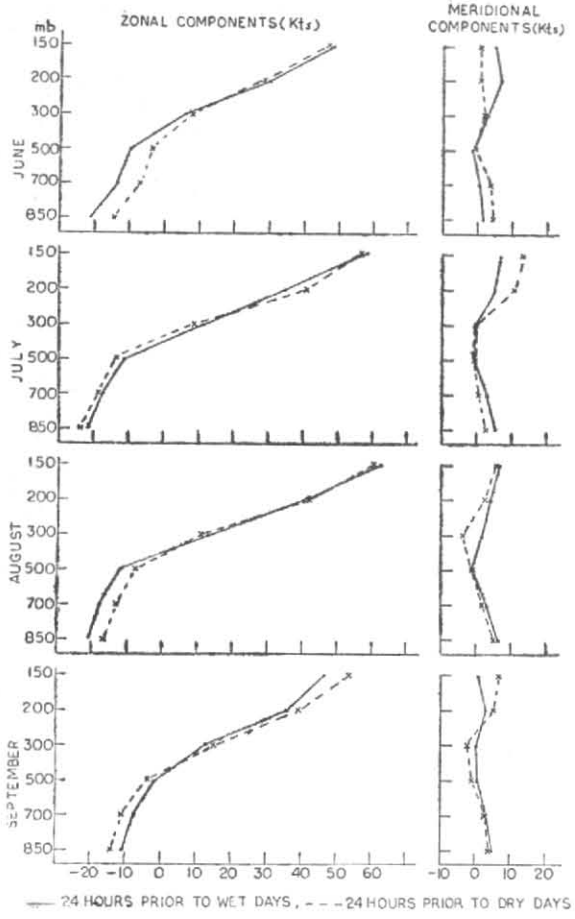

Fig. 1. Zonal and meridional components of winds in knots (for different months separately)

——— 24 hours prior to wet days

..... 24 hours prior to dry days

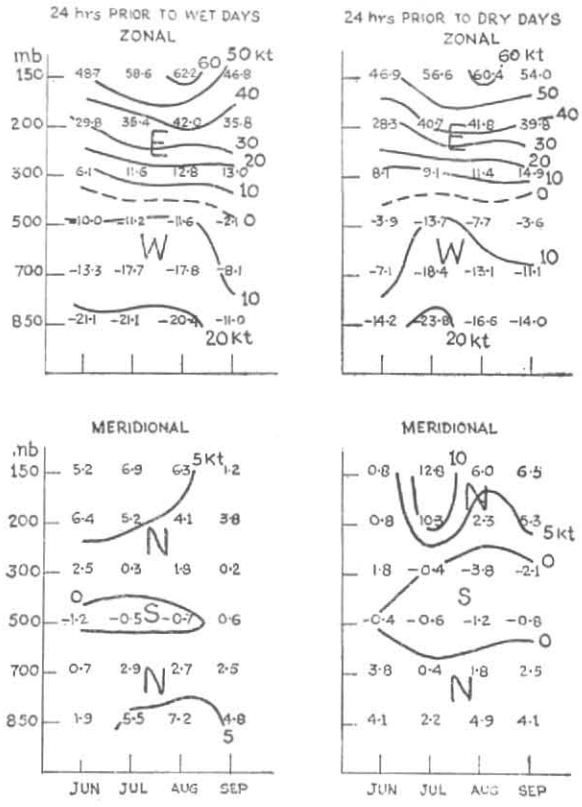

Fig. 2. Zonal and meridional components of winds in knots (for different months taken together)

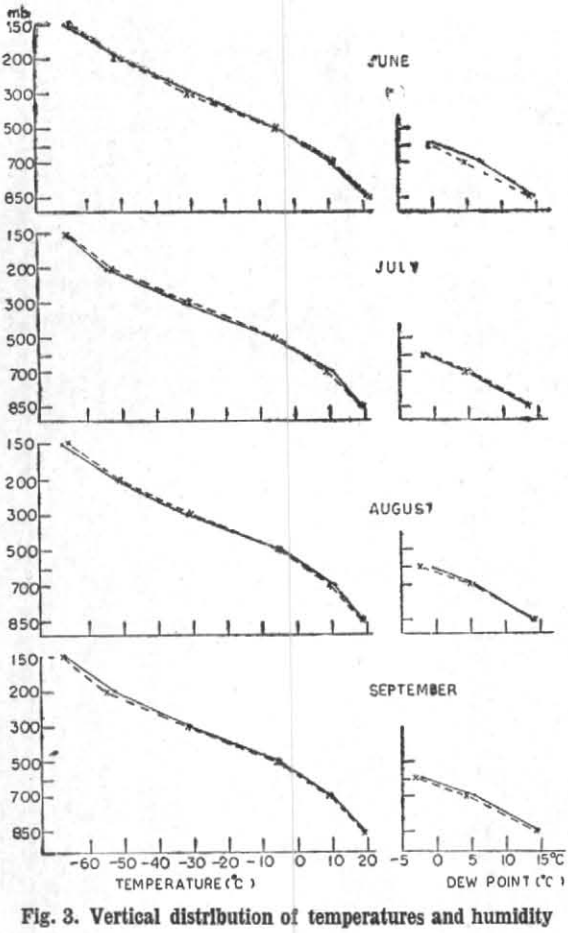

Fig. 3. Vertical distribution of temperatures and humidity

The above findings on the relationship between the wind structure and the rainfall during the next 24 hours may be of some interest to the forecasters in connection with the issue of local forecasts for the Madras City and its suburbs.

Analysis of the Temperature and Humidity data — The mean air and dew point temperatures over Madras corresponding to the two different sets of occasions were also worked out for the various standard levels and these are plotted in Fig. 3. It is seen that the curves corresponding to occasions leading to dry weather practically coincide with those for days leading to wet weather in all the four months. This would suggest that the information on vertical distribution of temperature and moisture alone may not be of much use for the purpose of prediction of rainfall during the next 24 hours in the City of Madras and neighbourhood during the season under study.

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