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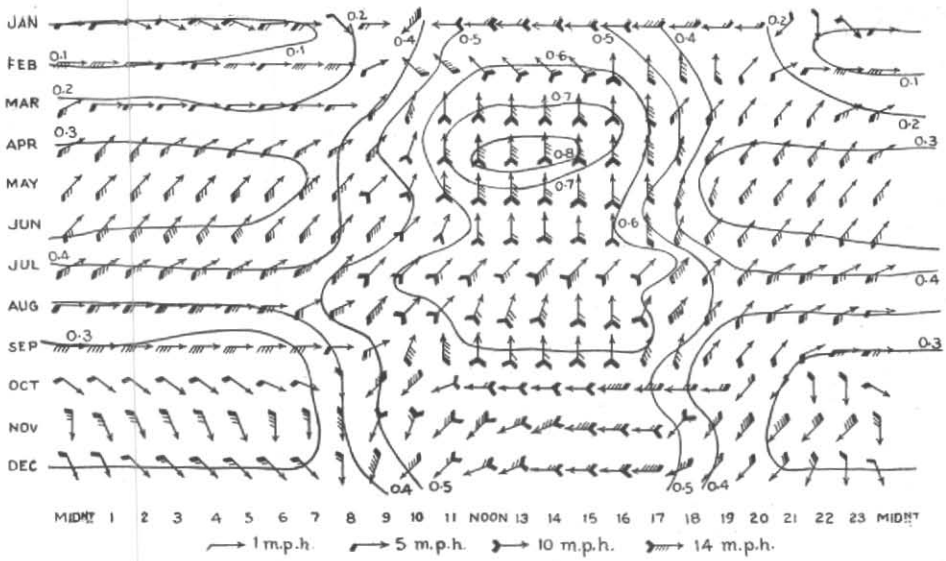
GUSTINESS OF WIND IN RELATION TO ITS SPEED AND DIRECTION AT VISAKHAPATNAM

In two previous papers (Agarwala 1951, 1953), the gustiness and the diurnal and seasonal variations of the surface wind at Visakhapatnam (lat. 17° 42 'N, long. 83°20'E) were studied. In the present note gustiness has been studied in relationship to the speed and direction of wind at Visakhapatnam. The prevailing wind directions at Visakhapatnam at 3-hourly intervals for each month of the year and the mean hourly values of the speed of wind for different months of the year for all the 24 hours are already available in one of the previous papers (Agarwala 1953). A chart showing the direction and speed of the wind based on the above data was drawn up and it was found that the pattern of this chart was the same as that of the chart showing the prevailing ground wind at each hour at Visakhapatnam published in the *Climatic Charts of India and Neighbourhood for Meteorologists and Airmen* (1943). In view of the above and as the latter chart gives the data for all the 24 hours instead of data at 3-hourly intervals only, this chart has been made use of in the present note and isolines of gustiness factor based on the data given in the previous paper (Agarwala 1951) have been drawn on it.

Relationship between wind speed and gustiness

In the chart (Fig. 1) the direction and speed of the prevailing ground wind at each hour of the day and for each month of the year are shown by means of arrows and feathers. The data of mean hourly values of the gustiness factor for each hour of the day and for each month of the year given in Table 1 of one of the previous papers (Agarwala 1951) have now been represented graphically on this chart in the form of isopleths of gustiness. The diagram brings out the following main points of interest —

(*i*) The diagram displays two distinct patterns of isopleths of gustiness—(1) the day-hours pattern and (2) the night-hours



PREVAILING GROUND WIND AT EACH HOUR AND ISOPLETHS OF GUSTINESS AT VISHAKHAPATNAM

Fig. 1

pattern. In the months of January to September the gustiness is generally high during the day-hours and it is the highest in March and April while in the months of October, November and December there is little variation in gustiness during these hours. On the other hand, during the night-hours the gustiness is very small in the months of January and February but increases slowly in subsequent months upto July and shows a decreasing trend in later months. There is a well-marked maximum of wind speed in the early afternoon in all the months and the gustiness also attains a maximum value by 1300 to 1400 IST. Thereafter, the wind speed as well as the gustiness begin to decrease.

(*ii*) The epoch of commencement of the day oscillation in wind speed occurs at 0600 to 0800 IST and that of termination at 1900 to 2100 IST, *i.e.*, its duration is about 13 hours generally. In the case of gustiness the mean period of day variation is from 0700 to 1900 IST, *i.e.*, the duration is about 12 hours. The epochs of commencement and termination of the day variation lag behind the times of sunrise and sunset respectively by 1 to 2 hours in both the cases.

(*iii*) The maximum value of mean hourly gustiness is found to occur in the month of April, *i.e.*, during the hot season; the mean hourly speed also attains its maximum value in the same month. The isopleth for 0·8 gustiness factor in Fig. 1 is noteworthy. On the other hand 0·1 isopleth for minimum gustiness falls on the night-hours in the months of January and February, *i.e.*, during the dry season.

Relationship between direction of wind and gustiness

Fig. 1 also illustrates how gustiness changes with different types of wind at Visakhapatnam and shows the relationship of gustiness with the prevailing wind direction. The following features are brought out from an examination of the diagram.

(*i*) During the months of January to September the most frequent wind in the early morning hours is generally westerly or southwesterly and this continues upto about 0900 IST when the wind suddenly changes

direction to southerly. It is this southerly wind which is comparatively very gusty as will be seen from the isopleths of gustiness in Fig. 1. This southerly wind, which is the sea breeze, continues upto about 1900 IST. It is also observed from the diagram that the wind from 1100 to 1800 IST in the months of March to September is strikingly southerly with a speed of 10 mph or more and with gustiness value of 0·6 to 0·8.

(*ii*) After about 1900 IST southwesterly wind generally prevails. This is the land breeze and has lesser gustiness (0·3 to 0·4).

(*iii*) In the months of October, November and December northerly to northwesterly wind prevails upto about 0800 IST with gustiness value of 0·3 to 0·4. Thereafter the wind direction changes to easterly and northeasterly; this wind is comparatively more gusty (gustiness factor 0·5). The most frequent direction is northeasterly during these months on account of the onset of the northeast monsoon.

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