symmetries as observed are fully in accord with those indicated by the considerations set forth above. Attention may also be drawn to the extreme sharpness of the peaks of absorption as recorded by the spectrophotometer in both figures. Such sharpness is a natural consequence of the free vibrations of the structure of diamond exhibiting a set of nine precisely defined monochromatic frequencies. It should also be remarked that the frequencies determined spectroscopically as well as their observed activities are in satisfactory accord with those deduced theoretically. Further on the basis of the spectroscopically determined frequencies alone and without using any other data, the heat capacity of diamond can be evaluated theoretically over the entire range from the lowest to the highest temperatures; the results obtained are in highly satisfactory agreement with the thermally determined values. The reader will find these and many other matters set out and discussed in the memoir cited.

LOCATION OF WELL-MARKED JET-STREAMS IN THE ABSENCE OF HIGH LEVEL WIND DATA

N. C. RAI SIRCAR AND D. N. SIKDAR

Meteorological Office, Bombay Airport, Bombay-29

WITH the advent of the jet age, the forecasting responsibility of the Main Meteorological Office at Bombay, the western gate of India, has increased considerably. In this study, it has been examined whether it is possible to locate the jet-stream with its core near the 200 mb. level and fluctuating about 30° N over the Middle East witn the help of temperature data when the wind observations are meagre or absent. Some instances of very strong and relatively very weak upper wind fields over the middle-east countries have been examined with reference to the horizontal temperature distribution at 300 mb. level over the same area and the results discussed in some detail.

For the issue of forecasts for operations of Jet aircraft, 300, 200 and 100 mb. constant pressure charts are prepared as a routine. It is seen from the day-to-day analysis of these charts that the isotherms are generally nearly parallel to the latitude lines, and that the temperature gradient is steep at 300 mb. level over the middle-east region, weak at 200 mb. level and reversed at 100 mb. level, suggesting that the jet core is generally located near the 200 mb. level. A qualitative analysis has been made of the temperature data at 300 mb. level, to see if the high or low temperature gradient at this level is, in practice, invariably associated with strong or weak wind fields respectively above this level and whether this information could be utilised for the purpose of practical forecasting of jet-streams in the absence of high level wind data.

The present study is based on the available data from: (1) Aden (lat. 12° 50 N, long. 45° 02 E); (2) Aswan (lat. 23° 58 N, long. 32° 47 E); (3) Bahrein (lat. 26° 16 N, long. 50° 37 E); (4) Cairo (lat. 29° 52 N, long. 31° 20 E); (5) Basra (lat. 30° 34 N, long. 47° 47 E); (6) Mersa Matruh (lat. 31° 20 N, long. 27° 13 E); (7) Lod (lat. 32° 00 N, long. 34° 54 E); (8) Beirut (lat. 33° 49 N, long. 35° 29 E) and (9) Nicosia (lat. 35° 09 N, long. 33° 17 E).

The cases of very strong wind fields and those of relatively very weak wind fields during the winter months December 1960 to March 1961 were selected for this study. During the winter months, instances of wind speed of 80 to 100 knots between 300 and 200 mb. levels are quite common. The occasions when at least one station reported 125 knots or more and also the occasions when none of the stations recorded winds stronger than 75 knots were sorted out from the daily working charts for the period under study, with a view to examine the distinctive features of the temperature distributions at 300 mb. level under these two types of extreme conditions. The number of each category of such occasions was only five. The horizontal temperature gradient at 300 mb. level over the area in question on the above dates were obtained by plotting 300 mb. temperature *versus* latitude. The available maximum wind in the area is also plotted in the diagrams with its height. In some cases, this height is the maximum height reached by the balloon and as such may not necessarily represent the height of the jet-stream. The jet-stream, when present, was at this height or above. The evening data have been examined as some of the stations under study do not make morning ascents.

Figure 1 represents the temperature curves for the occasions when the maximum wind

speed over the region was 75 knots or less. It will be seen that the slope of the temperature curves was small and generally gradual, suggesting that no well-marked front was present over the area. As such, the slope of the pressure surfaces was small and consequently the wind field, too, was weak.

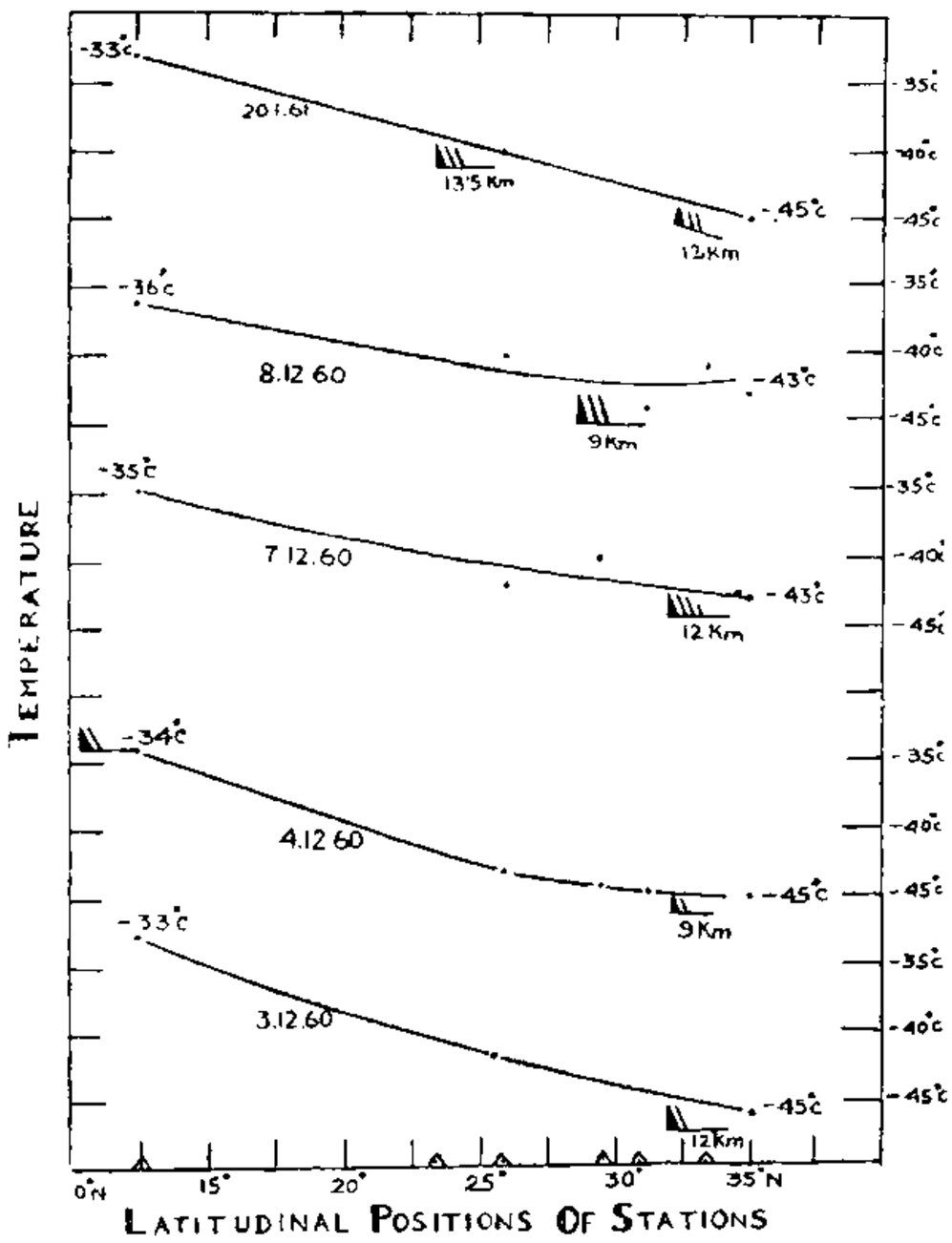

FIG. 1. S–N Temperature distribution at 300 mb. level (Weak wind fields).

The temperature curves for the occasions when well-marked jet-streams were present are shown in Fig. 2. It will be seen from these curves that except on 28-1-1961, a sharp temperature gradient was present at 300 mb. level in the vicinity of the jet-stream on all the above occasions. Of all the jet-streams examined in this note, the one present on 27-1-1961 was the strongest. Bahrein reported 130 knots, Beirut 160 knots and Nicosia 150 knots. In fact, two cores were present on this day—one near Bahrein and the other near Beirut. These two cores were separated by relatively weak winds, Lod (lat. 32° N) an intermediate station having reported only 95 knots. The core of both the jet-streams were located near the 200 mb. level. There were, in fact, sharp temperature changes below the above level both near Bahrein and Beirut. The strong jet-stream near Beirut continued next day (28-1-1961) also but the strong temperature gradient at 300 mb. level did not persist. The high level wind data of Beirut were not received on this day, but it is seen that the available maximum wind over the area was 150 knots at 9 km. reported from Nicosia. Winds at higher levels over this station were not available. If it is assumed that the jet core was at about 9 km. on this day, one cannot expect high temperature gradient at 300 mb. level which should be a level of equalisation of temperature. High temperature gradient should, in fact, exist in the lower levels. The temperature curve for 400 mb. level for the same day is shown in dotted lines. This curve shows that there was actually a sharp temperature drop near Beirut and Nicosia. The winds over Bahrein also continued strong on this day. But it is not clear how such winds could exist there without the presence of a high temperature gradient.

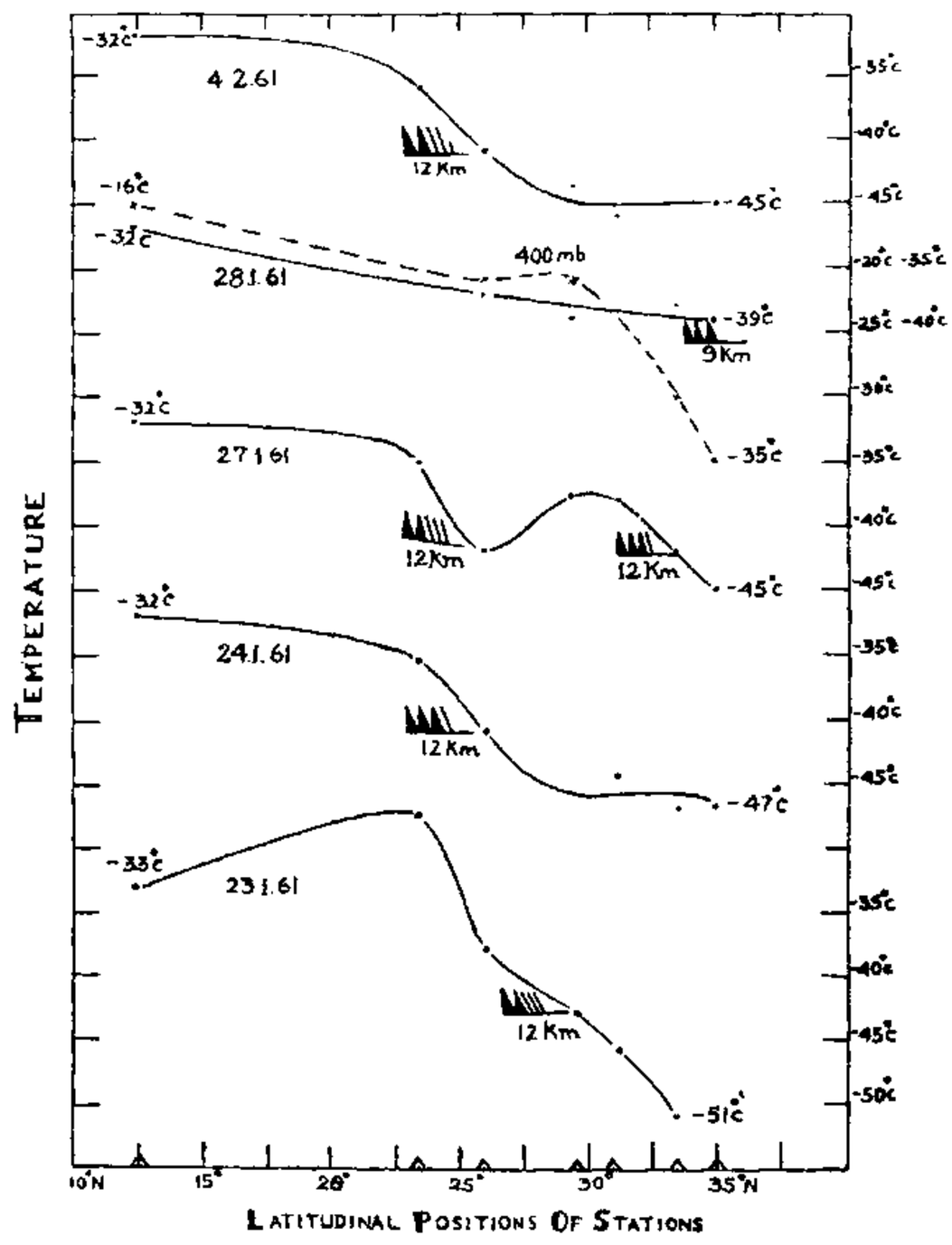

FIG. 2. S–N Temperature distribution at 300 mb. level (Strong wind fields).

It would, thus, appear from the instances examined in this note, that the horizontal temperature gradient at 300 or 400 mb. level generally gives some useful indication about the presence or otherwise of a well-marked jet-stream aloft and its geographical location. In the absence of high level wind data, this method may be of some use to a forecaster in giving information about jet-streams to pilots.