SHORTER CONTRIBUTIONS

AN INSTANCE OF A STRATOSPHERIC "EXPLOSIVE" WARMING

Walter C. Conover

U. S. Army Signal Research and Development Laboratory, Fort Monmouth, N. J.

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Time sections for Belmar, New Jersey, are presented for the period 8 to 14 January 1960. They illustrate one of the mid-winter stratospheric "explosive" warmings, as first reported by Richard Scherhag (1952). These charts are of more than normal interest in that they appear to completely encompass the

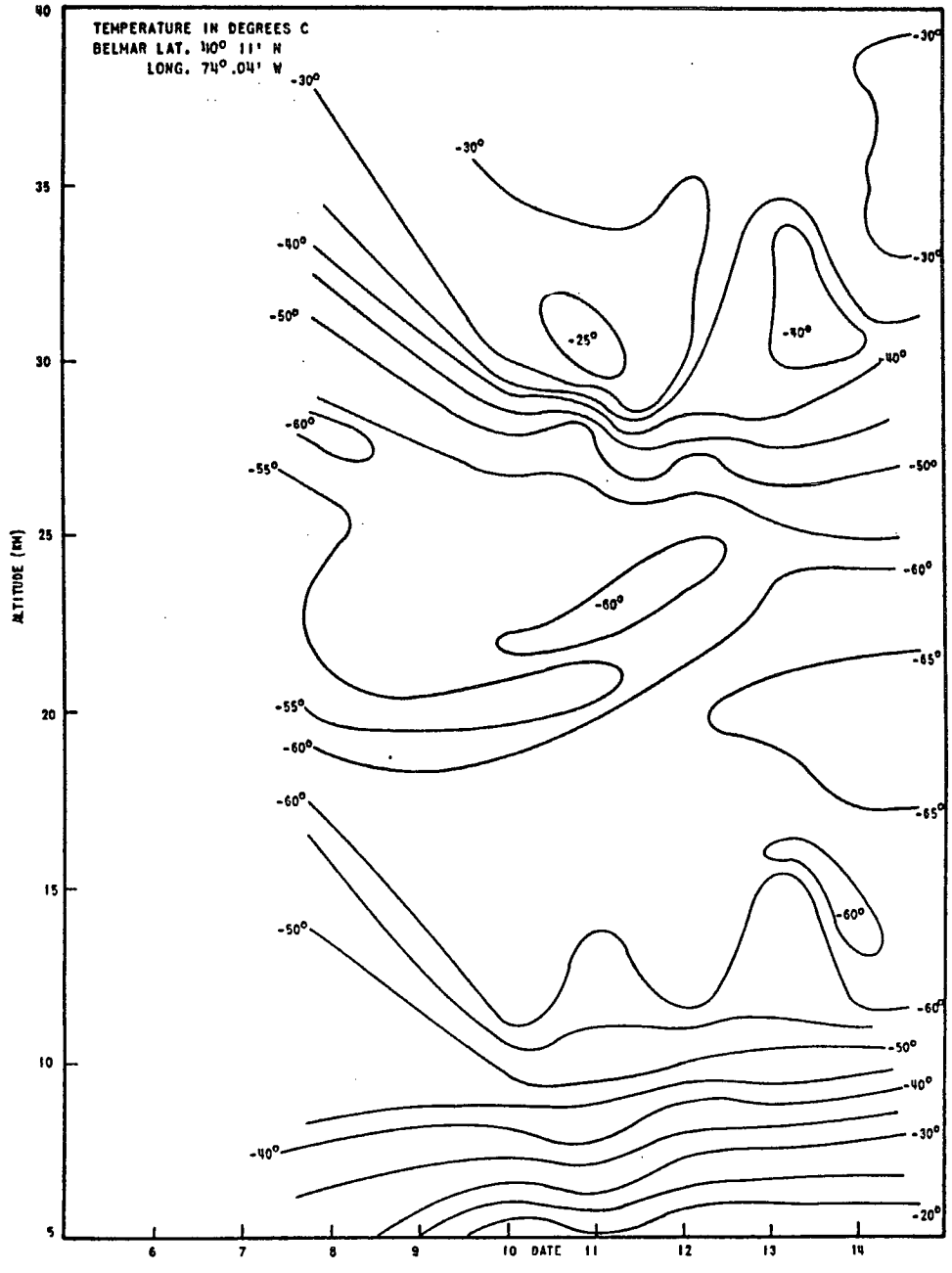

FIG. 1. Temperature time-section for Belmar, N. J., 8–14 January 1960.

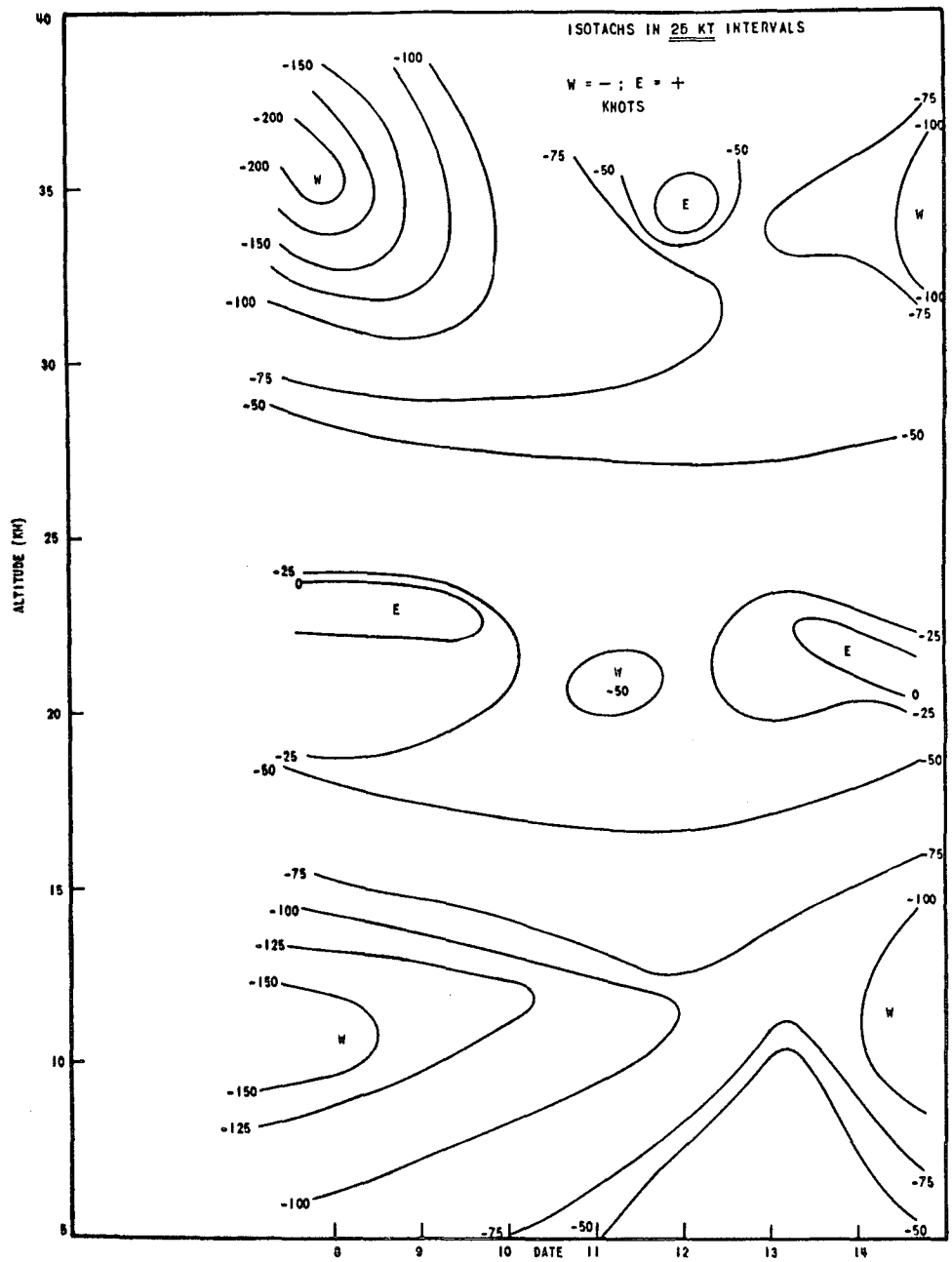

FIG. 2. Zonal wind time-section.

center of warmer air. This was made possible through the use of specially fabricated high-altitude neoprene balloons, which were able to attain higher altitudes than are reached in standard practice.

The data were obtainable up to 35 to 39 km. Accurate, hypsometric pressure sensors were used, permitting proper altitude placement of measured temperatures.

A communication from Dr. Scherhag to Dr. aufm Kampe, of this Laboratory, told of increasing stratospheric temperatures over Berlin. This prompted us to begin this short series of flights which captured the evidence of stratospheric warming over this station.

Fig. 1 is the temperature time-section. At 30.5 km, the temperature on 8 January is −50C. Along this level, the temperature increases rapidly up to 11 January, where it becomes −25C. Thenceforth, the temperature decreases to −40C, remaining about this temperature for some days beyond the limit of this chart.

Two levels, one above and one below the area of high temperature on 11 January, are of considerable

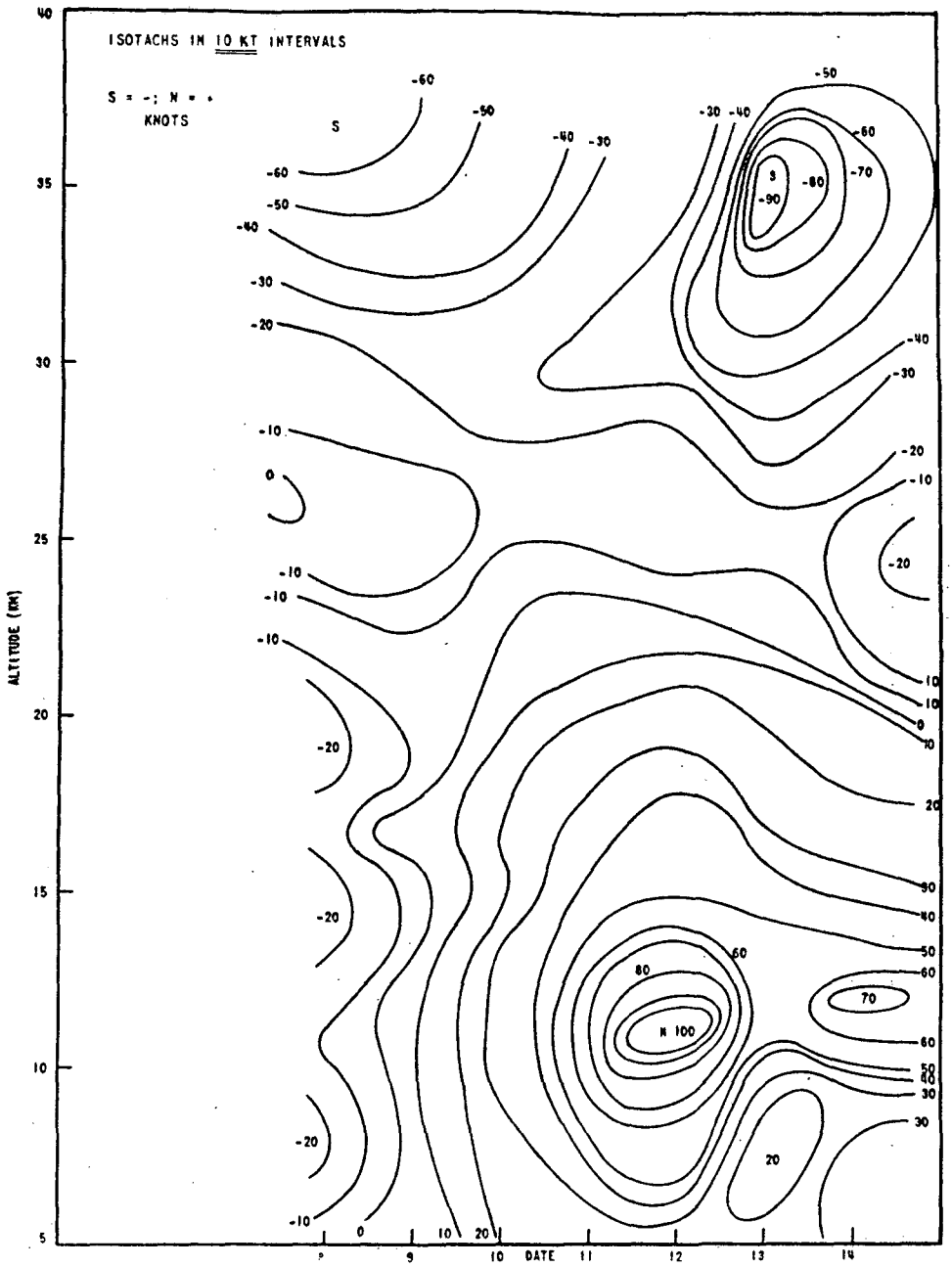

FIG. 3. Meridional wind time-section.

interest in that their temperatures remain relatively constant with time. The temperature at 35 km remains at roughly −30C across the chart. The temperature at 26 km is almost a constant −55C. These two levels effectively isolate, in time and altitude, the 30.5-km warm area.

There appears to be an intriguing symmetry to the temperature distribution: below the center of warming on 11 January, at altitudes under 25 km, the temperatures are lower than on the days on either side of 11 January.

Fig. 2 is a zonal wind-time section for the period under discussion. Fig. 3 shows the meridional wind. A relationship between the change in wind and the change in temperature with time is evident. In fig. 2, at 35 km, the zonal wind on 8 January is westerly at 200 kn. The speed rapidly decreases to a light easterly on 12 January and then increases to a 100-kn westerly on 15 January. The center of light easterly zonal wind is displaced from the center of high temperature by one day and 4 km in altitude. Note the evidence of vertical and time symmetry of wind systems,

corresponding to the changes in the temperatures of fig. 1.

Scherhag has printed (as yet unpublished) daily 10-mb northern hemisphere charts. These charts trace the progress of changes in position and intensity of the cold circumpolar low and lower latitude warm highs. We have not received 10-mb charts for the period covered here. However, the 10-mb charts for other periods during this and last year show the relative permanency of these circulation systems. It is a reasonable assumption that these circulation systems were in evidence during the period of concern here. It is easy to picture that these Belmar time sections reflect the daily changes of position and intensity of the circumpolar low and its associated highs.

REFERENCE

1. Scherhag, R., 1952: *Die explosionsartigen Stratosphärenerwärmungen des Spätwinters 1951–52.* Ber. Deutch. Wetterd., U. S. Zone, No. 38, p. 51.