NOTES AND CORRESPONDENCE

A Note on Stratospheric Midwinter Warmings in the Southern Hemisphere

KARIN LABITZKE[1] AND HARRY VAN LOON

National Center for Atmospheric Research, Boulder, Colo.

6 November 1964

In a recent article (Labitzke, 1965), a connection was found between stratospheric midwinter warmings and simultaneous and subsequent events in the troposphere. It was shown that a pronounced negative deviation of sea level pressure from normal over northern Europe presumably induced a warming in the middle stratosphere (30 km), which in turn was followed after about ten days by a stationary meriodional circulation pattern (blocking) at sea level.

Since blocking is also inherent in the southern hemisphere atmospheric circulation, and since stratospheric midwinter warmings are known to occur in the southern hemisphere (Phillpot, 1964), it seemed logical to assume that the same chain of events which was described by Labitzke as taking place over Europe might happen in the southern hemisphere. For that reason the southern hemisphere part of the IGY World Weather Maps (South African Weather Bureau, 1962 *et seq.*) was examined to see if any examples could be found. The synoptic patterns during the period 25 July to 13 August 1957, appeared to be similar to those found together with stratospheric midwinter warmings over Europe. Unfortunately, at that time temperature measurements in the middle stratosphere were rare, but even the sparse data available made it obvious that a warming took place in the lower stratosphere. The shape of the temperature curve at Campbell Island (52°33′S, 169°07′E) indicates that the warming increased with height (Fig.

[1] On leave from Institut für Meteorologie und Geophysik der Freien Universität Berlin.

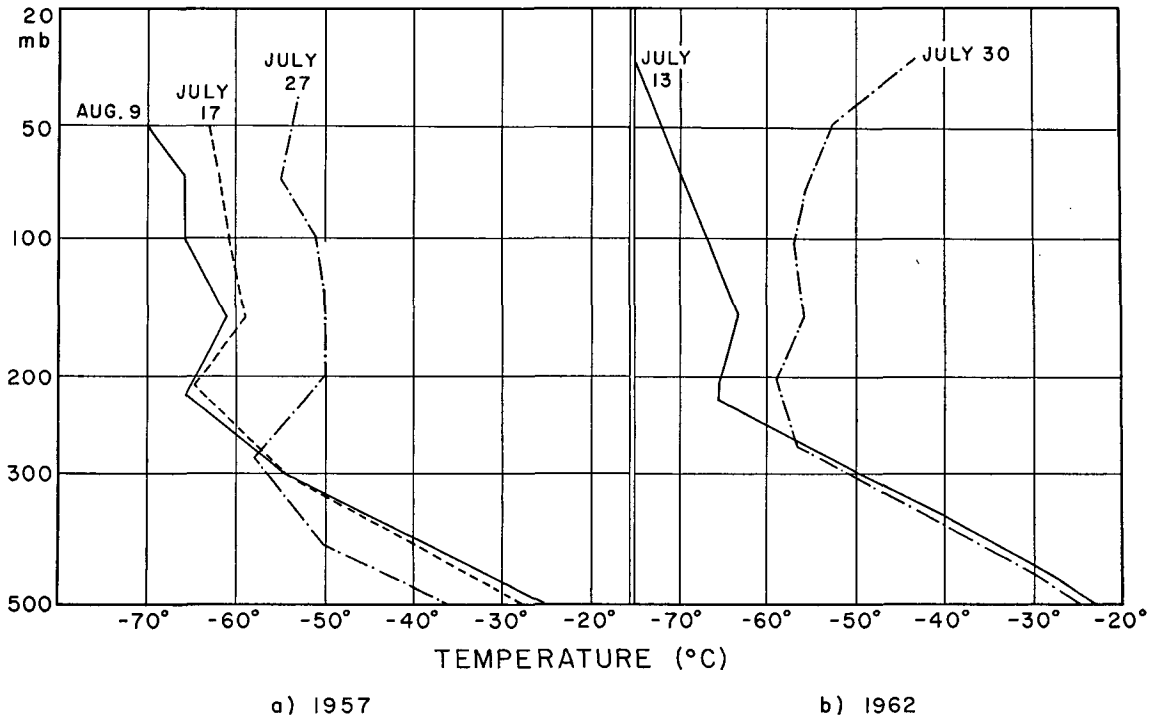

FIG. 1. Temperature soundings above the 500-mb level at Campbell Island for a) July, 1957, and b) July 1962 (after Phillpot, 1964).

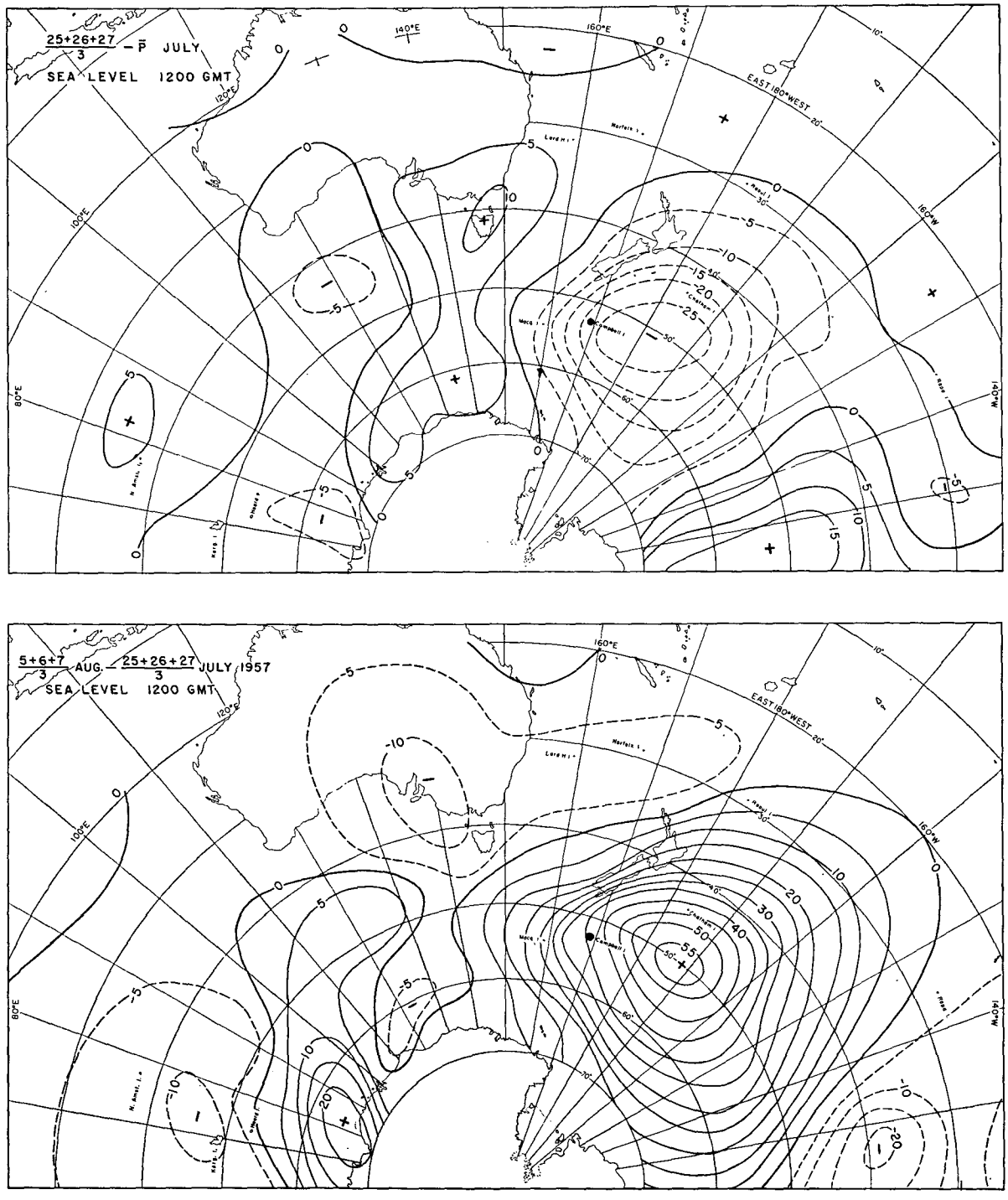

FIG. 2. Deviation of the three day mean from normal pressure at sea level at the time of the stratospheric warming (top), and pressure change at sea level from the time of the warming to eleven days after (bottom). Units are millibars.

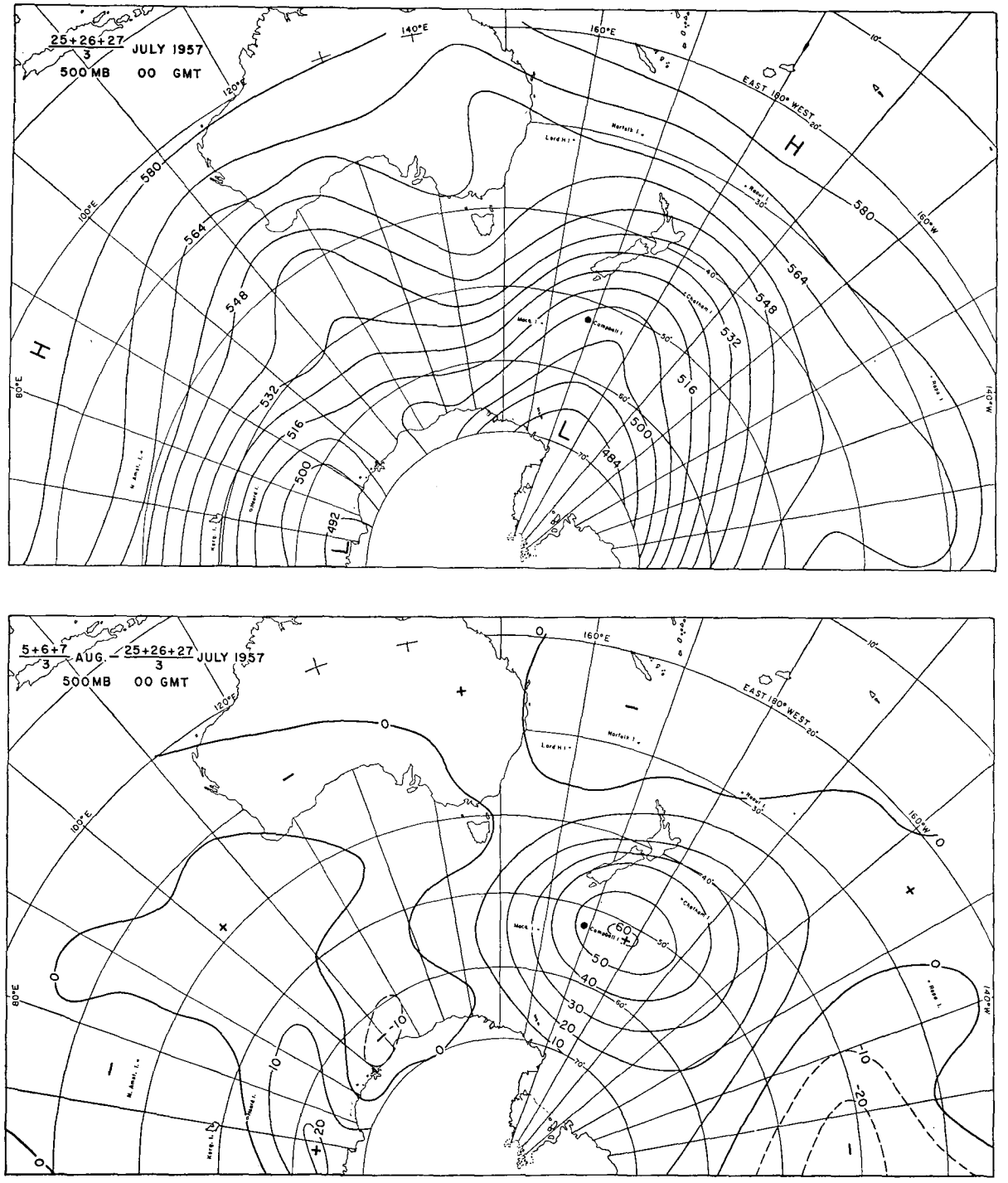

FIG. 3. The synoptic situation at the 500-mb level at the time of the warming (top), and change in height from the time of the warming to eleven days later (bottom). Units are geopotential dekameters.

1a), as in the example given by Phillpot (1964), which is shown for comparison in Fig. 1b.

The sea level pressure pattern at the time of the warming, expressed as the deviation of a three-day mean from normal pressure at sea level is shown in Fig. 2. In the same figure the pressure change is given from the time of the warming to the period eleven days later. It is seen that in the same spot, to the southeast of New Zealand, pressure rose from 25 mb below to 30 mb above normal. Similarly, at the 500-mb level where a strong trough was present when the warming took place (Fig. 3), the rise of height over the same period amounted to 600 geopotential meters.

Labitzke's European type of stratospheric midwinter warmings in middle latitudes is followed by a blocking pattern. From the evidence in her paper it may be deduced that blocking will follow such a warming only over a region with favorable conditions for the establishment and maintenance of blocking highs. The Australian sector of the southern hemisphere resembles the region over North Africa and Europe with respect to temperature distribution at the surface and in the troposphere in winter (van Loon and Taljaard, 1958), and pronounced meriodional circulation patterns, often resulting in blocking, are frequent in winter in this sector (van Loon, 1956).

As in the northern hemisphere, this kind of stratospheric warming should not be confused with the final warming in spring when the stratospheric circulation changes to a summer pattern. In this context it is worth noting that the final warming in the southern hemisphere always began south of Australia in the seven years examined by Phillpot (1964).

REFERENCES

Labitzke, K., 1965: On the mutual relation between stratosphere and troposphere during periods of stratospheric warmings in winter. *J. Appl. Meteor.*, 4, 91–99.

Phillpot, H. R., 1964: The springtime accelerated warming phenomenon in the Antarctic stratosphere. International Antarctic Analysis Centre, *Technical Report*, 3, Commonwealth Bur. of Meteor., Melbourne.

South African Weather Bureau, 1962 *et seq.*: *International Geophysical Year World Weather Maps*, Part III, southern hemisphere south of 20S. Daily sea level and 500-mb charts.

Van Loon, H., 1956: Blocking action in the southern hemisphere. *Notos*, 5, 171–178.

——, and J. J. Taljaard, 1958: A study of the 1000–500 mb thickness distribution in the southern hemisphere. *Notos*, 7, 123–158.