

6. UNUSUAL WARMING BETWEEN 700 AND 300 MB AT CASEY IN JUNE 1970

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During the period 10 to 15 June, the southward extension of an upper ridge from the Indian Ocean brought unusually warm temperatures over East Antarctica. The temperature structure throughout the period at Casey (66° 16'S, 110° 38'E), where the warming was particularly pronounced is shown in Fig 6.1 and 6.2 together with the changes in surface pressure, temperature and wind speed; normals used here are the June zonal means after Crutcher *et al* (1971). The synoptic sequence is illustrated in Fig 6.3 by the daily 500 mb geopotential and isotherm analyses at 0000 GMT.

At 0000 GMT on 10 June, Casey was under the influence of a weak ridge with a cold trough approaching from the west and its temperature profile was quite close to the normal. At the same time, a marked ridge extended from the Indian Ocean through 55°S 90°E. By 0000 GMT on 11 June, Casey was on the western side of the cold trough and temperatures below 400 mb had fallen to 5 to 10°C below normal. The effect of the northern ridge had penetrated to south of Mirny, and a warm centre had appeared near 63°S 94°E.

The ridge moved southeast during the next 24 hours and penetrated well into the continent towards Vostok. At 0000 GMT on 12 June, the warm pool was located just west of Casey where the temperature structure had returned to near, but above normal below 350 mb. Above that level, temperatures had fallen to as much as 12°C below normal.

By 0000 GMT on 13 June, the ridge had strengthened further and dominated most of the Antarctic sector between longitudes 90°E and 180°. The warm pool had moved to the northeast to near 61°S 112°E. Temperatures at Casey were 8 to 12°C above normal up to almost 250 mb - they had risen by an average of 15°C at levels below 300 mb from 11 June. The ridge weakened during the following 48 hours and the warm pool moved towards Macquarie Island; it subsequently merged into an isotherm ridge over New Zealand. Temperatures at Casey by 14 June had reverted to below but near normal values.

The relative rarity of the warming over Casey may be gauged by Fig 6.4 which presents the highest temperatures and geopotentials observed at that station during Junes 1969 and 1970 (Commonwealth Bureau of Meteorology archives) and at Wilkes during Junes 1959-1968 (CBM archives, ANARE (1963-1970) at 850, 700, 500, 400, 300 and 200 mb. Wilkes station operated at almost the same location as Casey, prior to the establishment of the latter in 1968. The extrema at each level during each year were not always recorded on the same date.

Temperatures observed on 13 June 1970 were exceeded on several occasions during Junes in the 10 years prior to 1970 at 850 and 700 mb whilst the 200 mb temperature was exceeded at least once during each of the earlier Junes. At the other levels however, the June 1970 temperatures were higher than any previous June values, ranging from 2.1°C to 4.4°C higher than earlier 500 mb and 300 mb extrema, respectively.

Geopotential heights observed on 13 June 1970 were lower than many earlier extrema at lower levels but reached new extreme values at 300 and 200 mb being 2 dm and 18 dm respectively greater than the previous highest values.

In view of the comparative rarity of this event, the prognosis of its development may pose a challenge to, and be a guide in the assessment of, the relative skills of various numerical models.

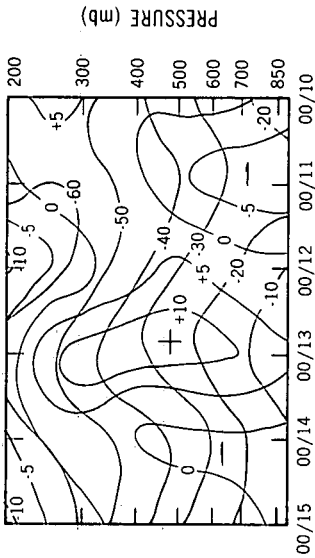


Fig 6.1 Temperature time section for June 10 to 15 1970 at Casey.

Brown lines: isotherms;

Black lines: isotherms of temperature departure from the June zonal mean at latitude 65°S (after Crutcher et al 1971).

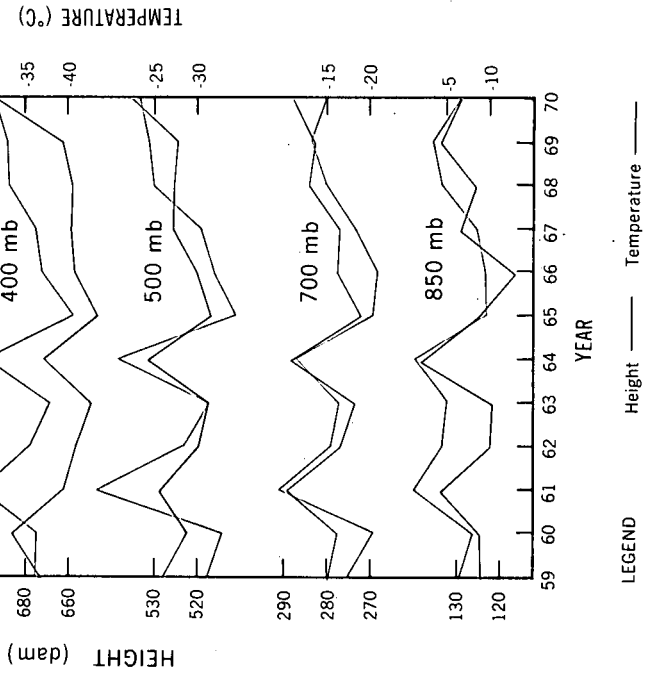


Fig 6.2 Variation of 300 mb and 500 mb temperature and surface pressure, wind speed and temperature from June 10 to 15 1970 at Casey.

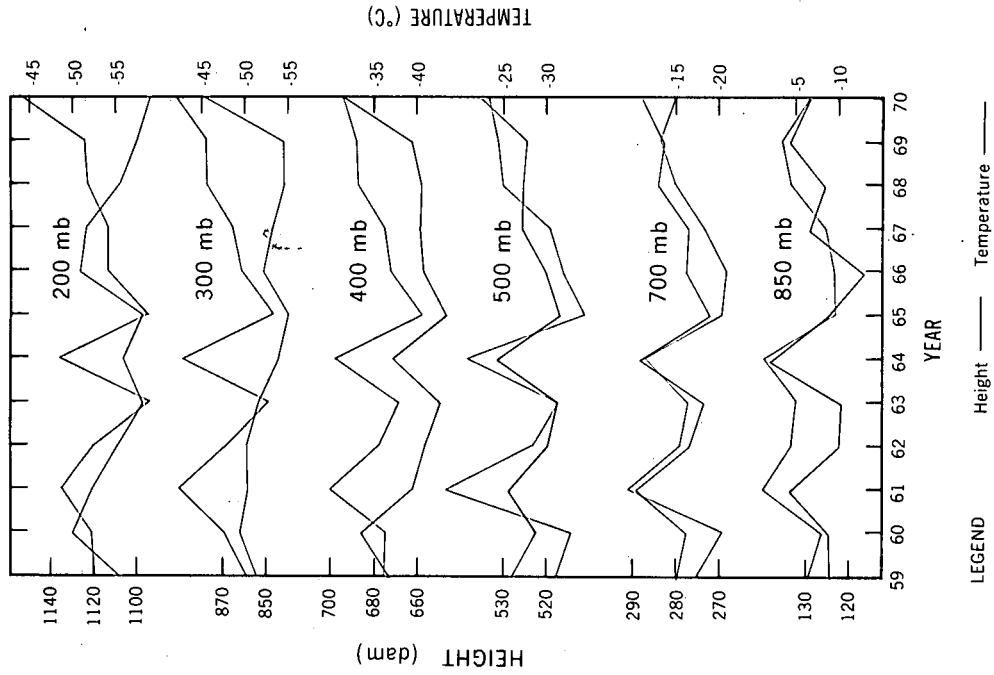


Fig 6.3 Extreme June maximum heights and temperatures at Wilkes (1959-1968) and Casey (1969-1970).

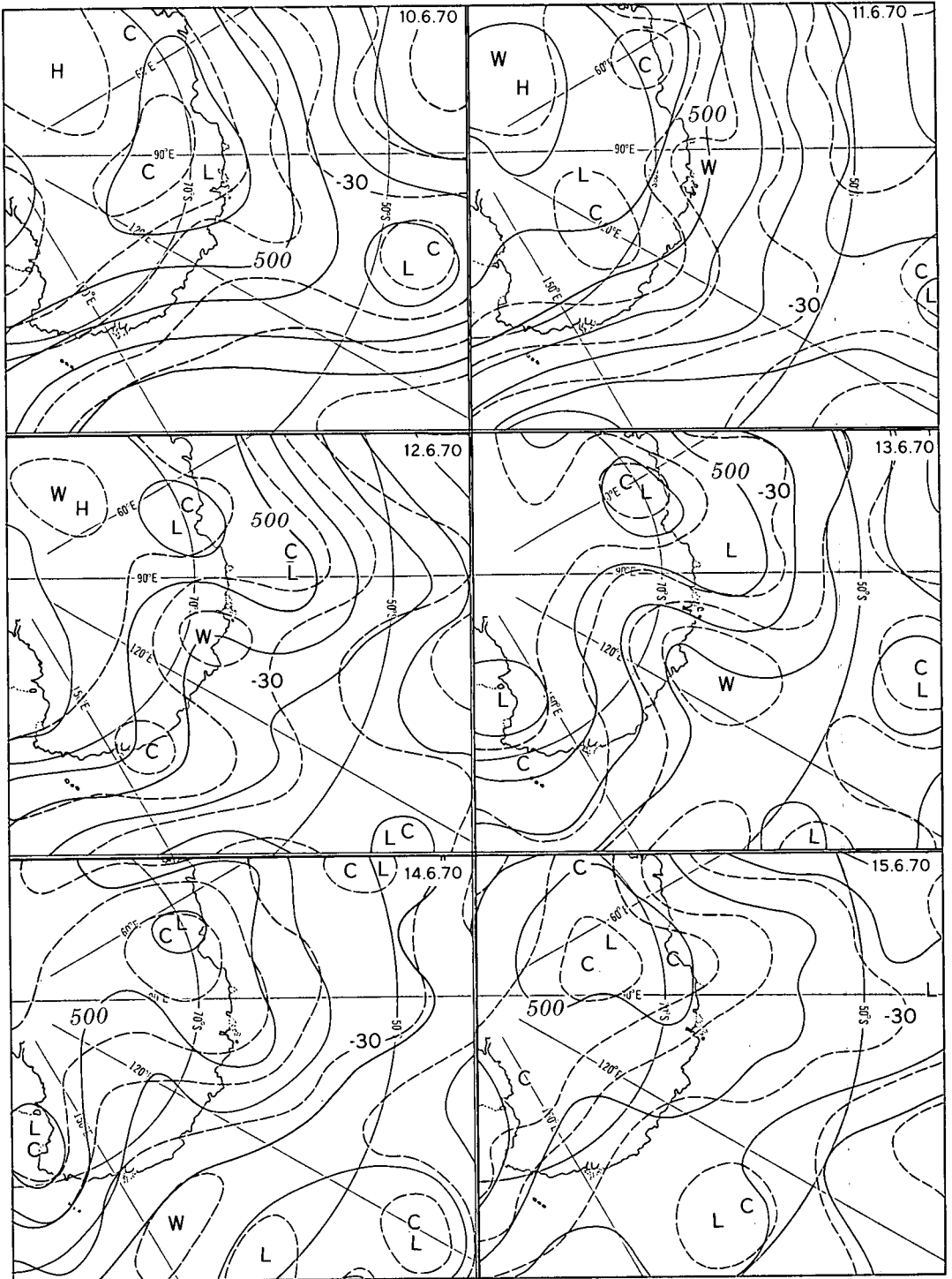


Fig 6.4 500 mb geopotential contours at 16 day intervals (solid lines) and isotherms at 5°C intervals (broken lines) at 00 GMT from June 10 to 15 1970.