

SHORTER CONTRIBUTIONSCROSS SECTION OF SOUTHERN OCEAN CYCLONE FROM
OBSERVATIONS AT KERGUELEN AND HEARD ISLANDS

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(Manuscript received 12th August 1955)

Assuming that over a period of 36 hours or so cyclone systems undergo little change in structure over the southern ocean, a series of observations at an isolated station will give a cross section through a cyclone. With two stations a fairly full description of the cyclone should be possible. A description is given of the application of this idea to a summer open warm sector cyclone which passed between Kerguelen and Heard Island.

Shaw (1955) has used this cyclone in demonstrating the anomalous reports of wind and cloud from the observing station at Heard Island.

Using the classical model of a frontal cyclone, from the Kerguelen report at 0600 G.M.T. 2nd January 1954 giving a surface wind 310° 30 knots was in the warm sector, it may be assumed that the cyclone was moving southeastward at more than 30 knots.

By a process of trial and error it is possible to arrive at a velocity of the cyclone centre when a large portion of the sequence fits the classical theory. Figure 1 shows the result together with comments on the wind at Heard Island. Simultaneous Kerguelen and Heard Island reports are plotted so that the stations are positioned relative to each other and the plottings of reports at three hourly intervals are 135 miles apart on a line northwest/southeast, i.e. the cyclone is moving southeastward at 45 knots.

The radiosonde and associated radiotheodolite winds at Heard Island (fig. 2) show that a frontal zone was passed through by the sounding between 750 mb. and 652 mb., where potential temperatures rose markedly and the wind backed with height. The hodograph of these winds (fig. 3) is confirmatory evidence. A pilot balloon flight six hours later shows the chaotic wind conditions

in the lee of Big Ben (Table 1). This flight is unlikely to be of high accuracy as the computations are based upon an assumed rate of ascent.

Table 1. Visual Pilot Balloon Flight, Heard Island

1000 G.M.T. 2nd January 1954

1000 feet	200°	8 knots	4000 feet	200°	6 knots
2000 "	100°	8 "	5000 "	200°	14 "
3000 "	130°	8 "	7000 "	190°	13 "

The situation of 26th to 29th June 1953 was analysed in a similar manner as an occluded cyclone whose centre passed between Kerguelen and Heard Island. In this case while the construction of the isobaric situation was satisfactorily drawn, the lack of a radio-sonde flight on 27th June renders the analyses less complete.

It appears to be practicable in certain situations to regard the sequence of observations taken at Kerguelen and Heard Island as giving a cross section through a pressure system and particularly through a depression.

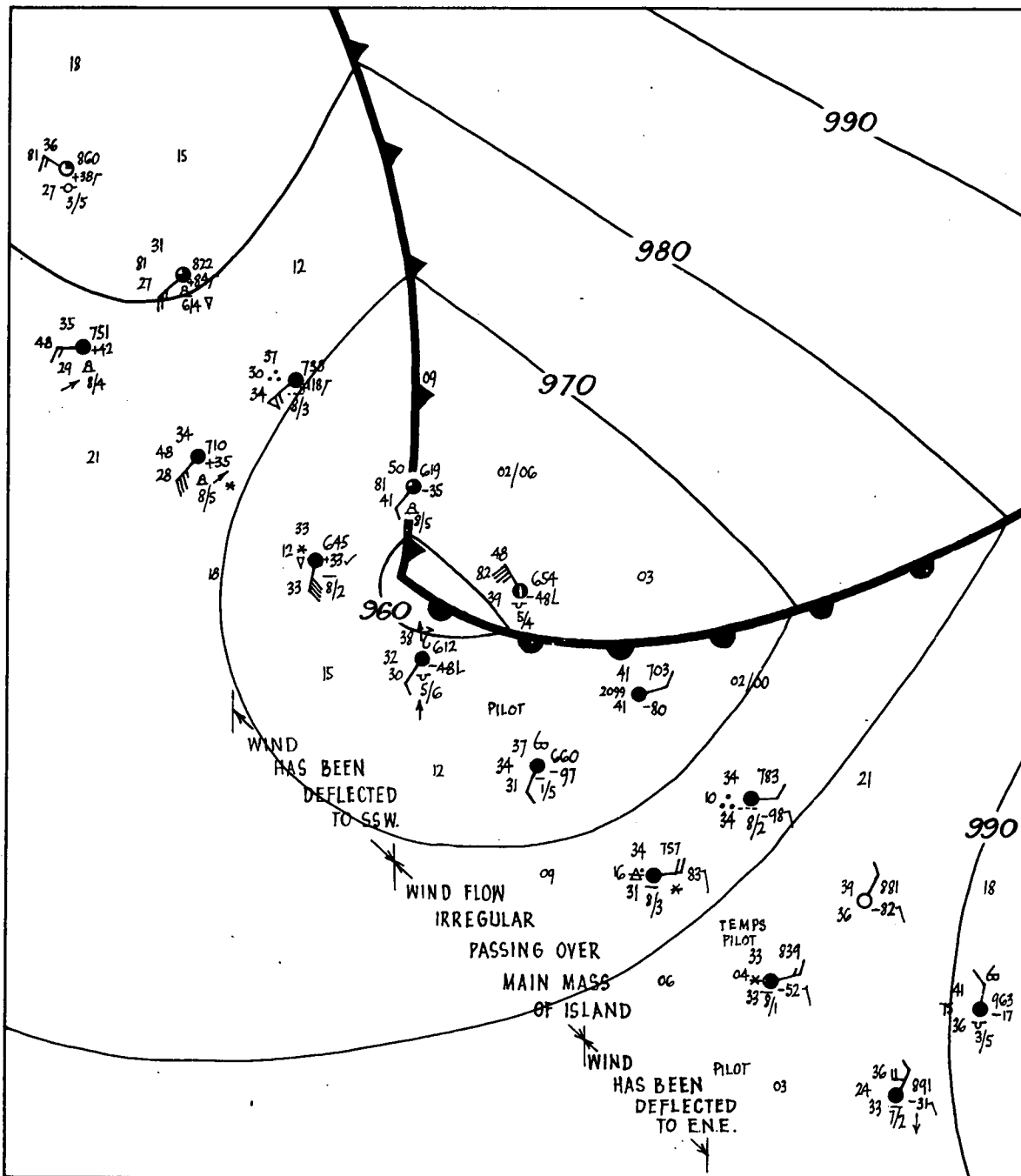


FIGURE 1. 1st 2nd JANUARY 1954. Plot of Heard lower line and Kerguelen upper line observations as though the cyclone remained stationary and the observing points moved through the cyclone. The times of the Heard and Kerguelen observations are written vertically below and above the plots respectively. 02/03 means 0300 GMT. 2nd. January 1954.

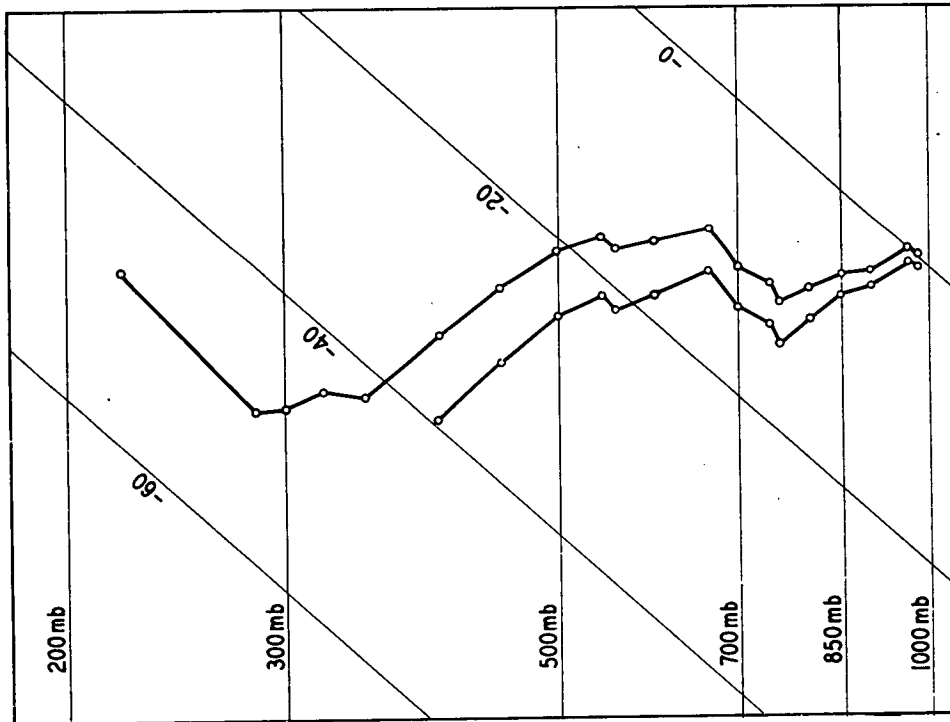


FIGURE 2. HEARD ISLAND 0415 Hrs. GMT. 2nd. JANUARY 1954. SHOWING A SOUNDING THROUGH A WARM FRONT.

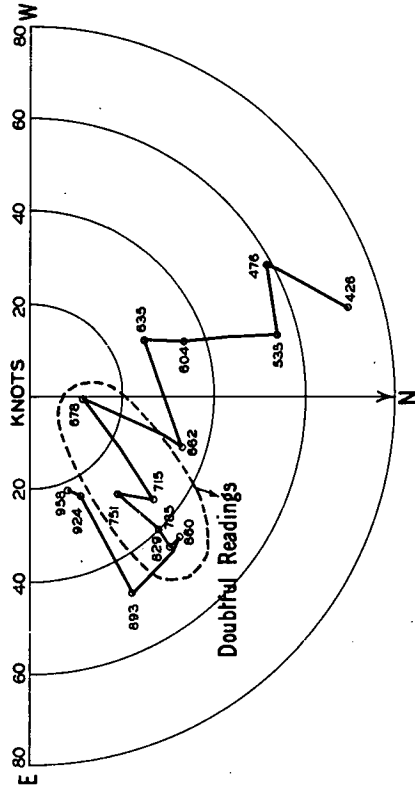


FIGURE 3. Hodograph of radio theodolite winds 0415 Z 2nd. January 1954. Points on the Hodograph are pressures at tops of layers of which wind is the mean. Wind values from 860 to 678 mb. are doubtful as angles of elevation were below critical value.