

66/158

3.

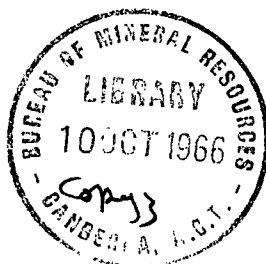
COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

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RECORD No. 1966/158



PRELIMINARY ISOMAGNETIC MAPS OF  
AUSTRALIAN ANTARCTIC TERRITORY  
AND ADJOINING AREAS  
FOR THE EPOCH 1965.0

by

*J. van der Linden*

The information contained in this report has been obtained by the Department of National Development as part of the policy of the Commonwealth Government to assist in the exploration and development of mineral resources. It may not be published in any form or use in a company prospectus or statement without the permission in writing of the Director, Bureau of Mineral Resources, Geology and Geophysics.

**Note:** The original Record contains overlays for plate/s 6 - 10. If you wish to view the original, please contact the N.H. (Doc) Fisher Geoscience Library.

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### SUMMARY

Preliminary isomagnetic maps of the Australian Antarctic Territory and adjoining areas are presented for the epoch 1965.0. The coverage of magnetic stations is rather sparse and the maps give only the approximative positions and directions of the contour lines.

## 1. INTRODUCTION

Isomagnetic maps for the epoch 1965.0 of Australian Antarctica and adjoining areas are presented. Contours of equal value of the magnetic components of declination (D), horizontal intensity (H), vertical intensity (Z), total intensity (F), and inclination (I) are shown. Superimposed on these are contours indicating the annual rate of change of each component.

Since 1954, regional magnetic field work has been done in Australian Antarctic Territory by geophysicists of the Bureau of Mineral Resources, Geology and Geophysics (BMR), who were en route to, or from, Antarctic bases.

The results of this field work have been published for 1954 to 1958 (Pinn, 1960), 1959 to 1961 (van der Linden & Parkinson, 1963), 1962 (van der Linden, 1965a), and 1963 (van der Linden, 1965b). A report including the Antarctic field work in 1964 is in preparation.

Three magnetic observatories are maintained by the BMR in the region of Antarctica : Mawson (from 1955), Macquarie Island (from 1950), and Wilkes (from 1959). The last was initiated by the government of the United States of America in 1957 and has been operated by the BMR since early 1959. At Heard Island a magnetic observatory was maintained from 1952 to 1955. After this base was closed down, the site of the magnetic observatory was revisited at infrequent intervals for repeat readings.

## 2. SOURCES OF DATA

The maps are based on data from all observatories in Australian Antarctica and adjoining areas and on data obtained from field magnetic stations. The following table shows the number of magnetic stations read :

Year	D		H		Z	
	New	Repeat	New	Repeat	New	Repeat
1954-58	17	7	18	4	17	4
Compass traverse 1957-58	49					
1959-61	8	5	7	4	6	4
1962	4	4	3	4	4	4
Wilkes-Vostok traverse 1962	43		27		35	
1963	4	3	4	3	4	3
1964	4	3	4	3	4	3

Observatory data were obtained from the following observatories :

Year	Observatory	Sponsoring Country
1952-55	Heard Island	Australia
1950-65	Macquarie Island	"
1955-65	Mawson	"
1957-65	Wilkes	"
1957-58	Little America V	United States of America
1960	Byrd	"
1959-60	South Pole	"
1955-61	Hallet	New Zealand
1957-58	Scott Base	"
1950-65	Amberley	"
1959-61	Syowa	Japan

Other survey information was obtained from the results of flights over the Indian Ocean area and the Ross Dependency undertaken as part of the United States Navy Project 'Magnet'.

### 3. TREATMENT OF DATA

#### Reduction to 1965.0

For each Australian observatory, smooth curves were drawn through the plotted annual mean points of D, H, Z, F, and I (Plates 1, 2, 3, 4, and 5). The value of the secular variation of each element for 1965.0 was scaled from these curves. For the other observatories the secular variation was extrapolated from the annual mean values as published.

For each component, secular variation values were plotted and isopors (contours of equal change) were drawn; information from repeat field stations was also included.

The positions and values of the isopors are very tentative, particularly away from the observatories and over the Indian and South Pacific Oceans.

The values at the field stations were corrected to 1965.0 using the values of the isopors. Most field stations were not too distant from observatories and the correction for secular change can be considered to be fairly accurate.

#### Isomagnetic charts

The field and observatory data adjusted to 1965.0 were plotted for each element on maps, and smooth contour lines were drawn. Positions of magnetic dip poles were compared with, and if necessary corrected to, the position as given by Watford *et al* (1965). The contours were extended over the Indian Ocean following their trend and joined surprisingly well with the results of the United States Navy Project 'Magnet' and the contours over Australia and New Zealand.

### 4. PRESENTATION OF RESULTS

Plates 1, 2, 3, 4, and 5 show the variation with time of the five components D, H, Z, F, and I at the observatories at Mawson, Wilkes, Macquarie, and Heard Island, and the field station at Davis. Plates 6, 7, 8, 9, and 10 are maps showing the isomagnetic contours for 1965.0 of D, H, Z, F, and I, respectively, in the Australian Antarctic Territories and adjoining areas, particularly the areas to the north. The isopors for 1965.0 are superimposed on the contours of equal value.

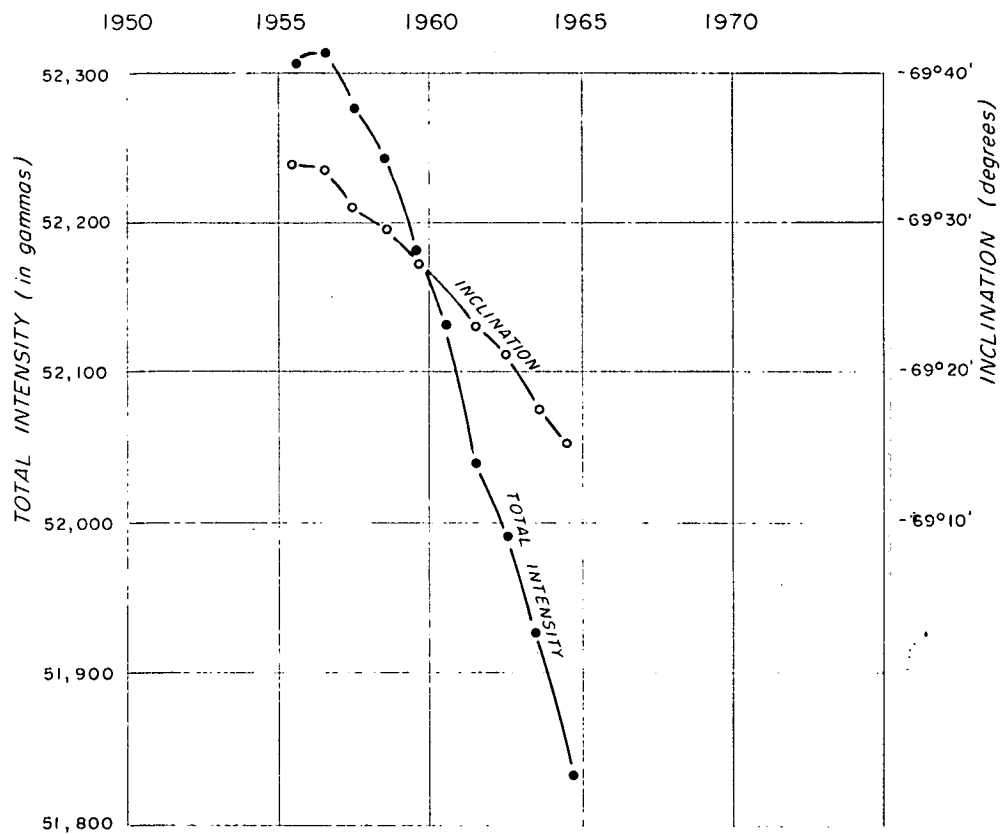
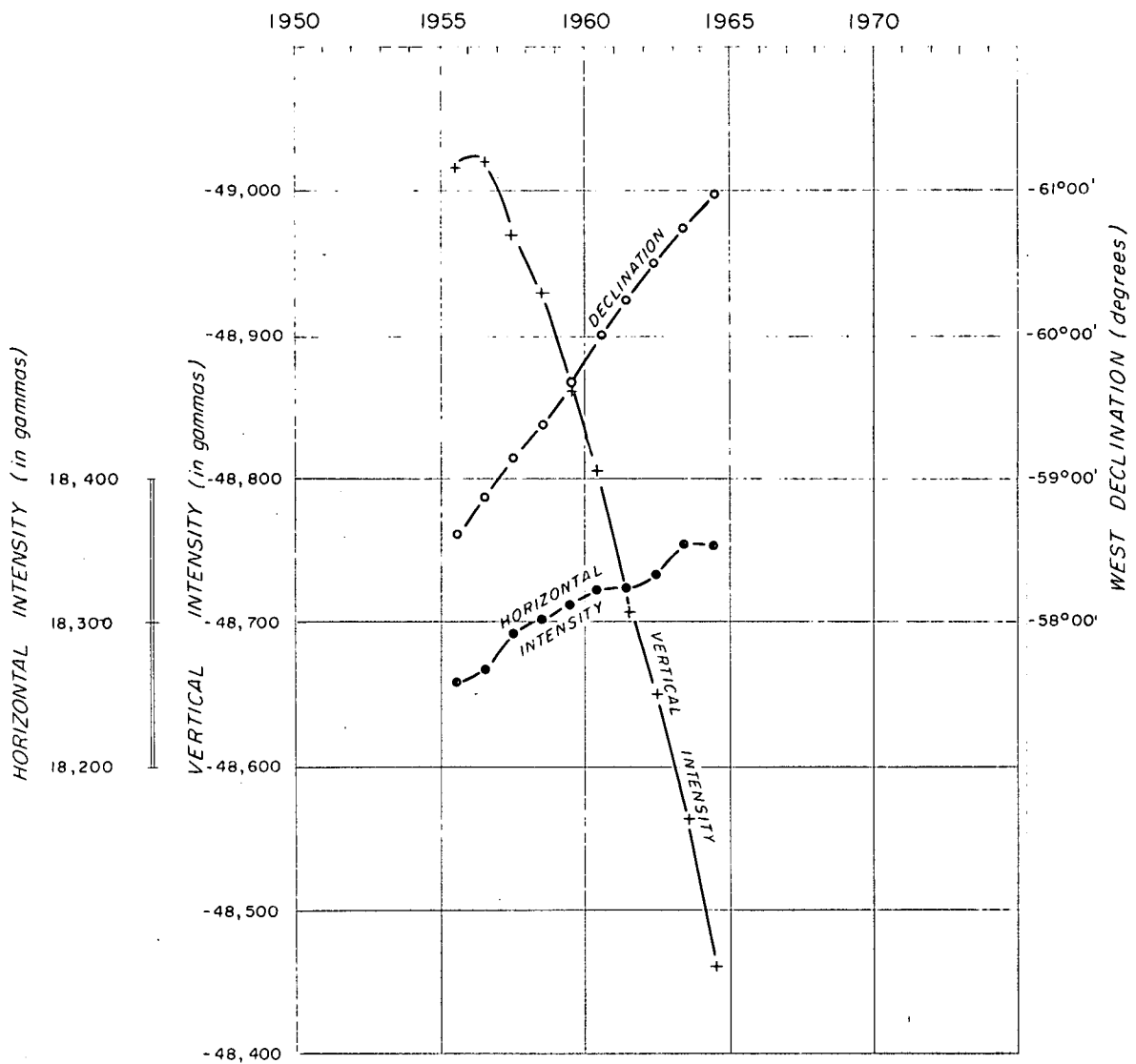
### 5. DISCUSSION OF RESULTS

The coverage of magnetic field stations in the Australian Antarctic Territory is still rather sparse and is generally confined to the coast and to an area near Mawson Observatory. A coverage sufficient to draw more accurate contours will not be achieved for many years. The Wilkes-Vostok traverse was very useful for obtaining the position of isomagnetic contours. Some Antarctic stations have been regularly re-occupied, but the great magnitude, and frequency, of magnetic disturbances in Antarctica makes it difficult to reduce the observed values to a given epoch and to determine the rate of secular variation with any accuracy. An exception is the field station at Davis, which was re-occupied yearly for the last five years. Observations were generally extended over several days.

The maps of isomagnetic contours must be considered as preliminary only. Much more information is required for reliable maps.

6. REFERENCES

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- VAN DER LINDEN, J. and PARKINSON, W. D. 1963 Regional magnetic surveys in Australia and Australian Antarctica 1960-61.  
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- VAN DER LINDEN, J. 1965b Regional magnetic surveys in Australia, Australian Antarctica, and the Territory of Papua and New Guinea during 1963.  
Bur. Min. Resour. Aust. Rec. 1965/218.
- WATFORD, O. B., FRANCIS, W. A., 1965 Isomagnetic patterns in the regions of  
WALKER, G. B., and FABIANO, E. B. the 1965 dip poles.  
Trans. Amer. Geophys. Un. 46 (4), 661-664.



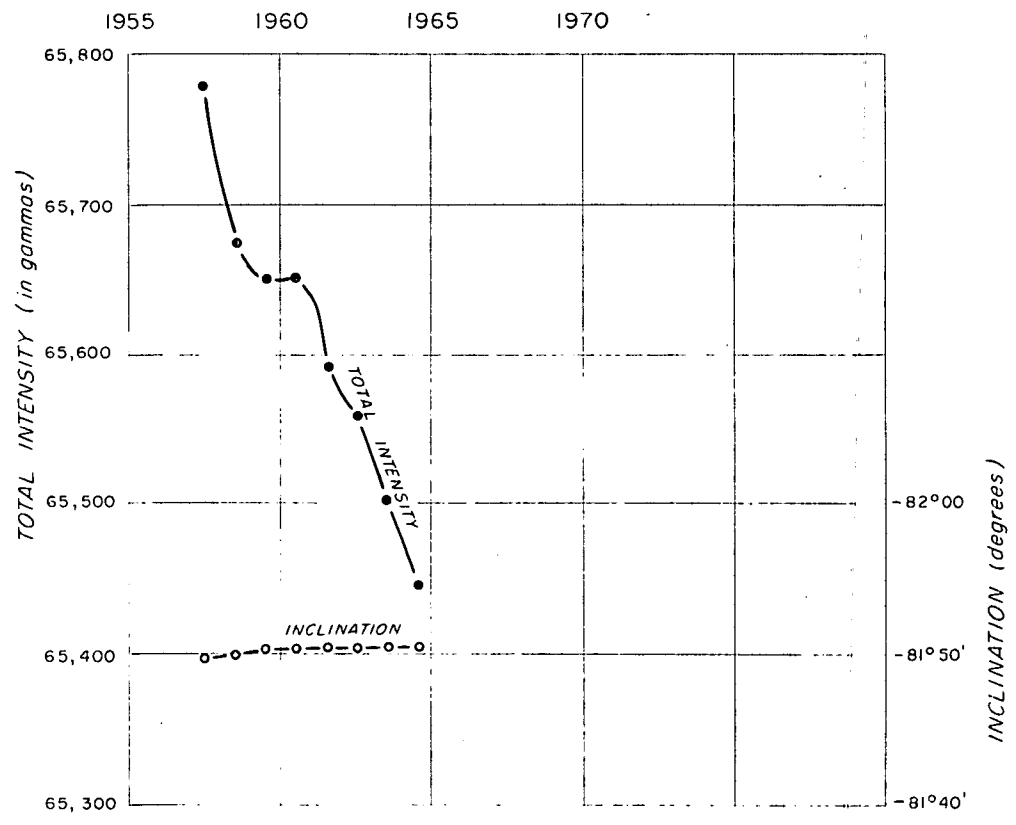
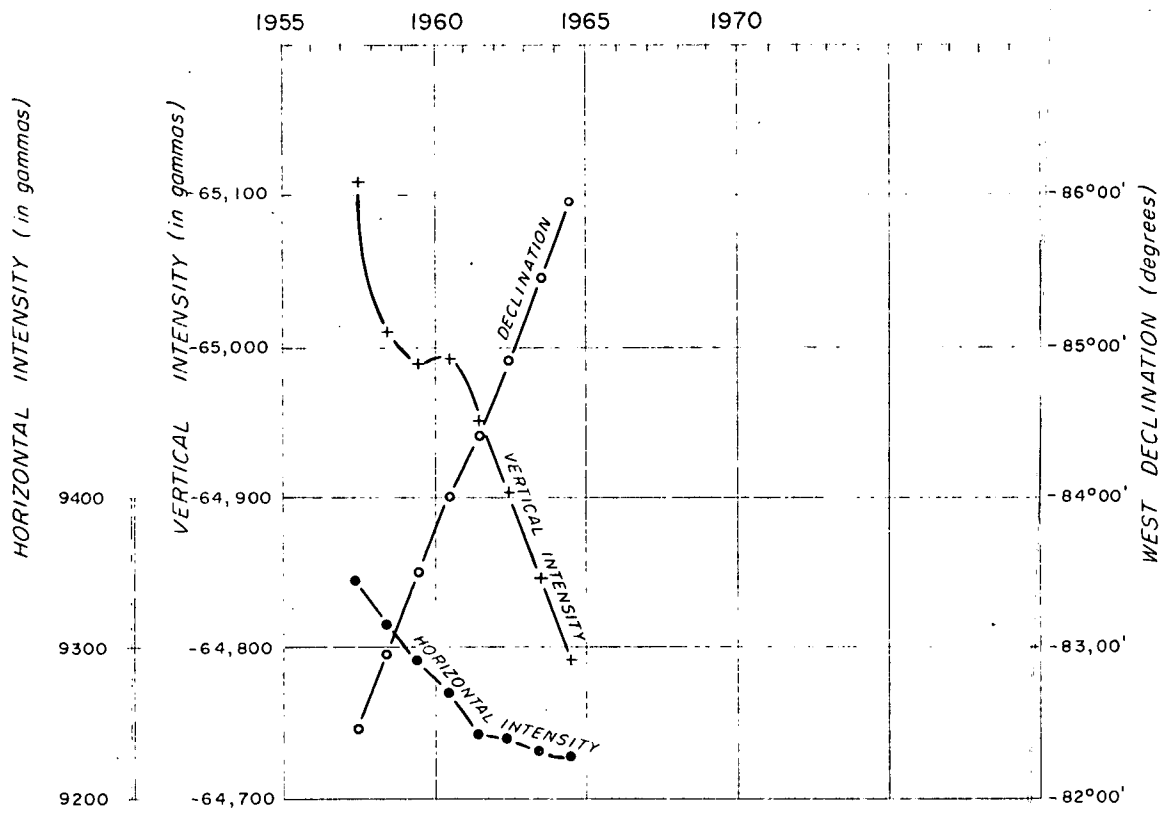
VARIATION OF MAGNETIC COMPONENTS AT  
**MAWSON**  
between 1955 and 1965

Latitude 67° 36.3' S

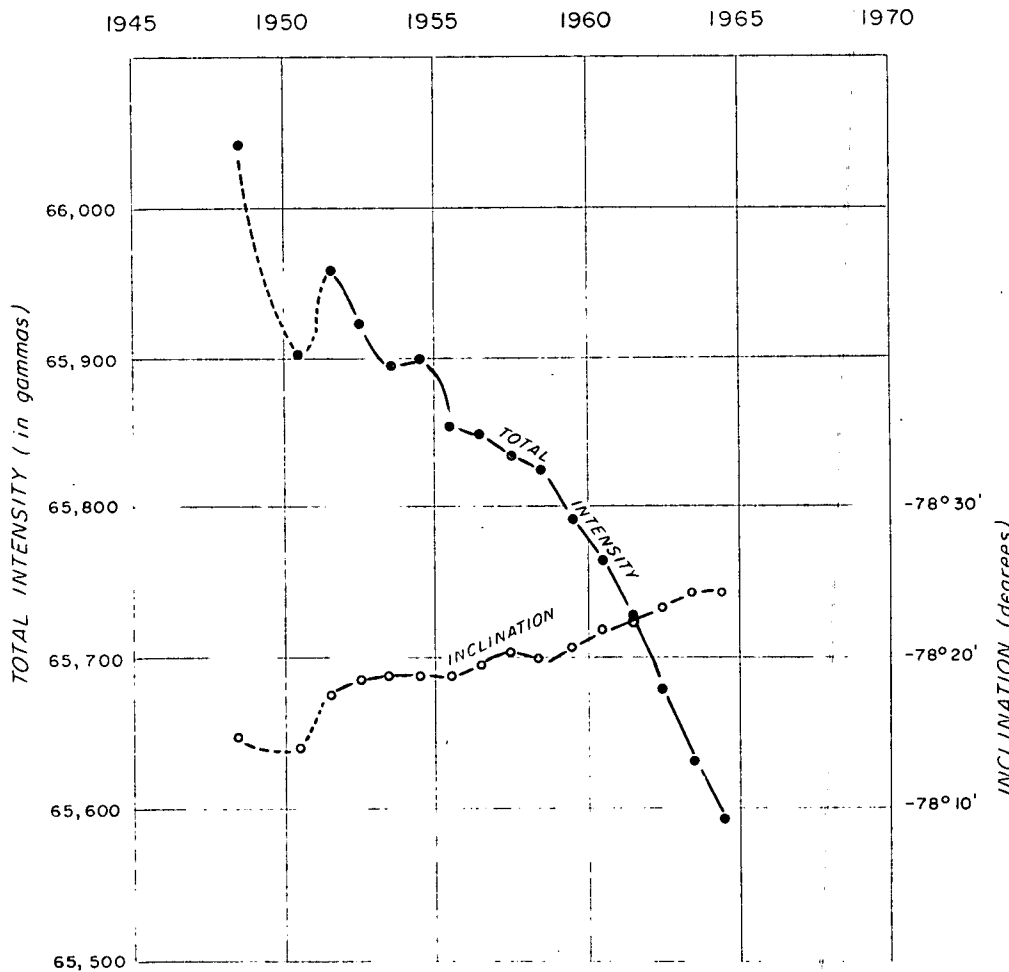
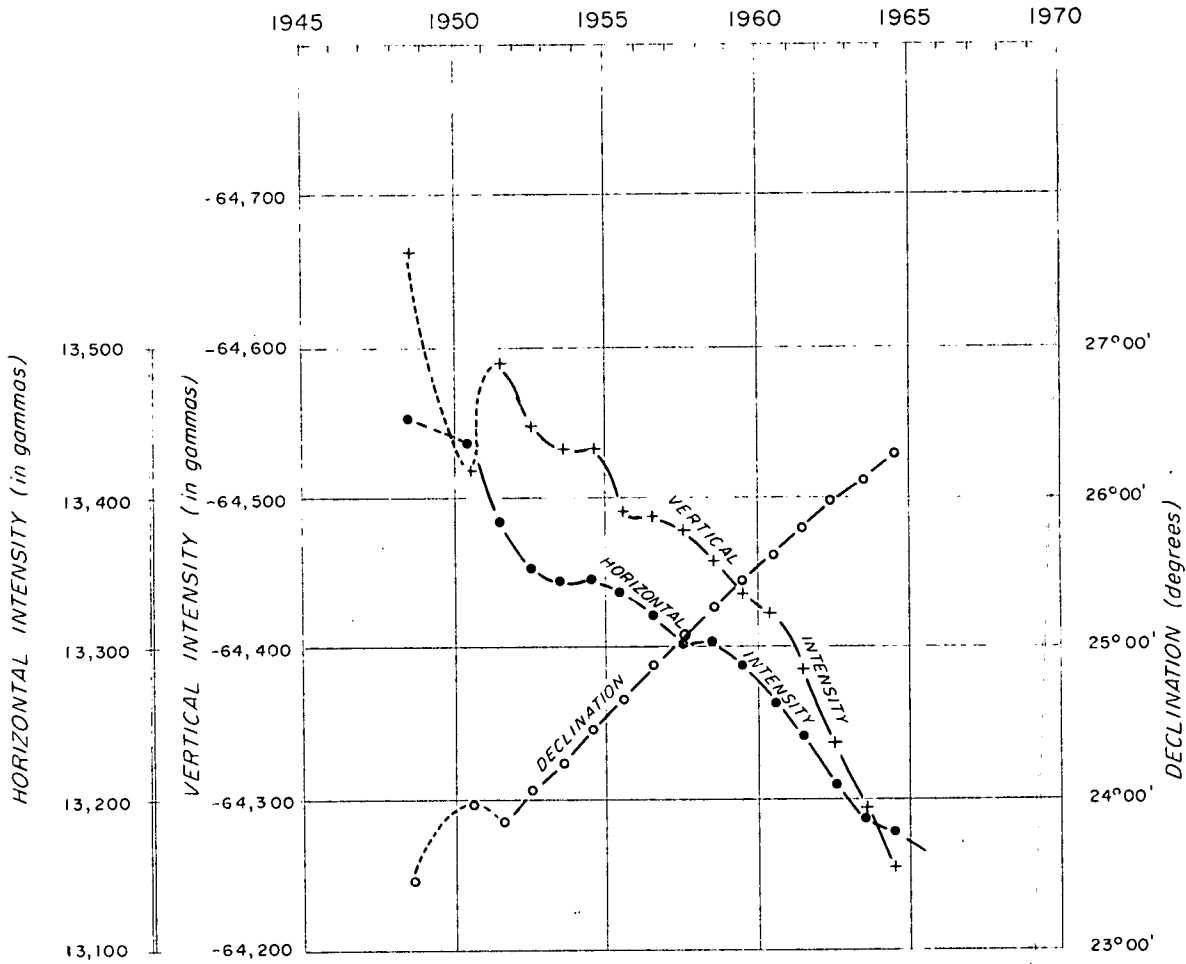
Longitude 62° 52.6' E

GEOPHYSICAL BRANCH, BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

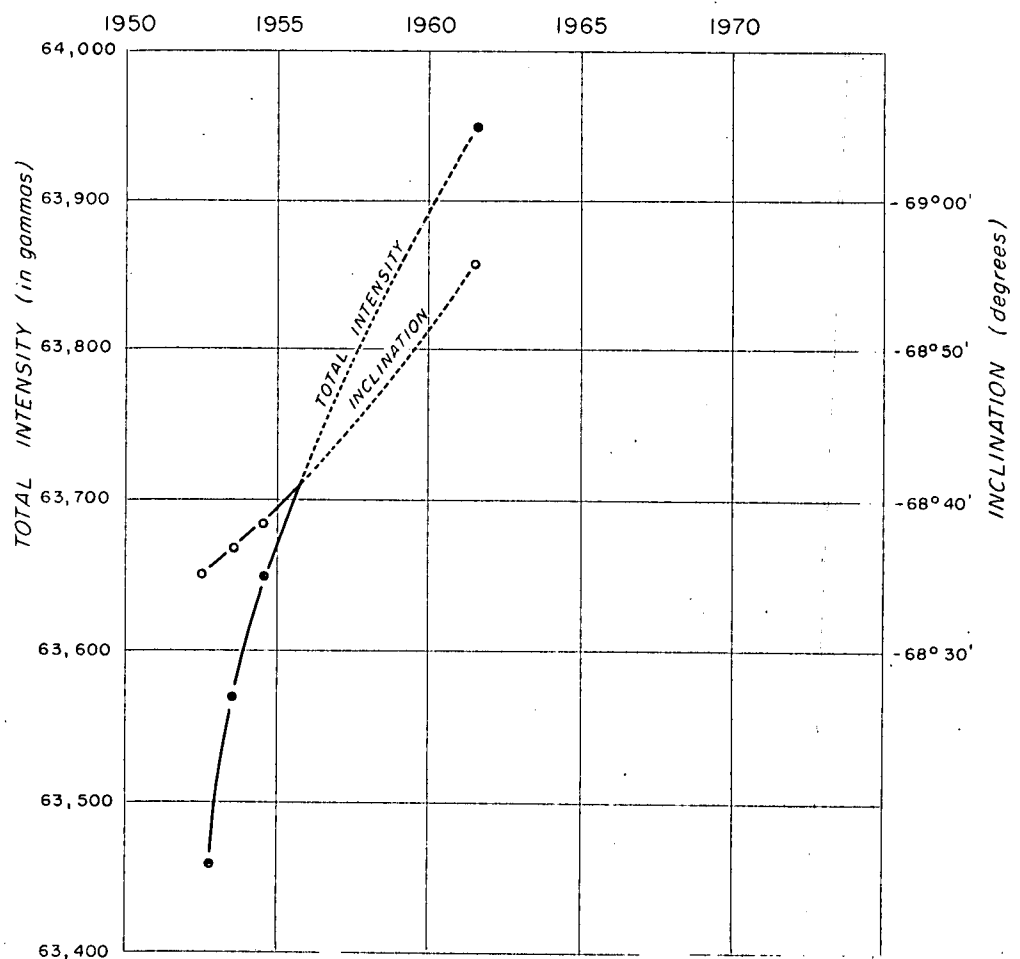
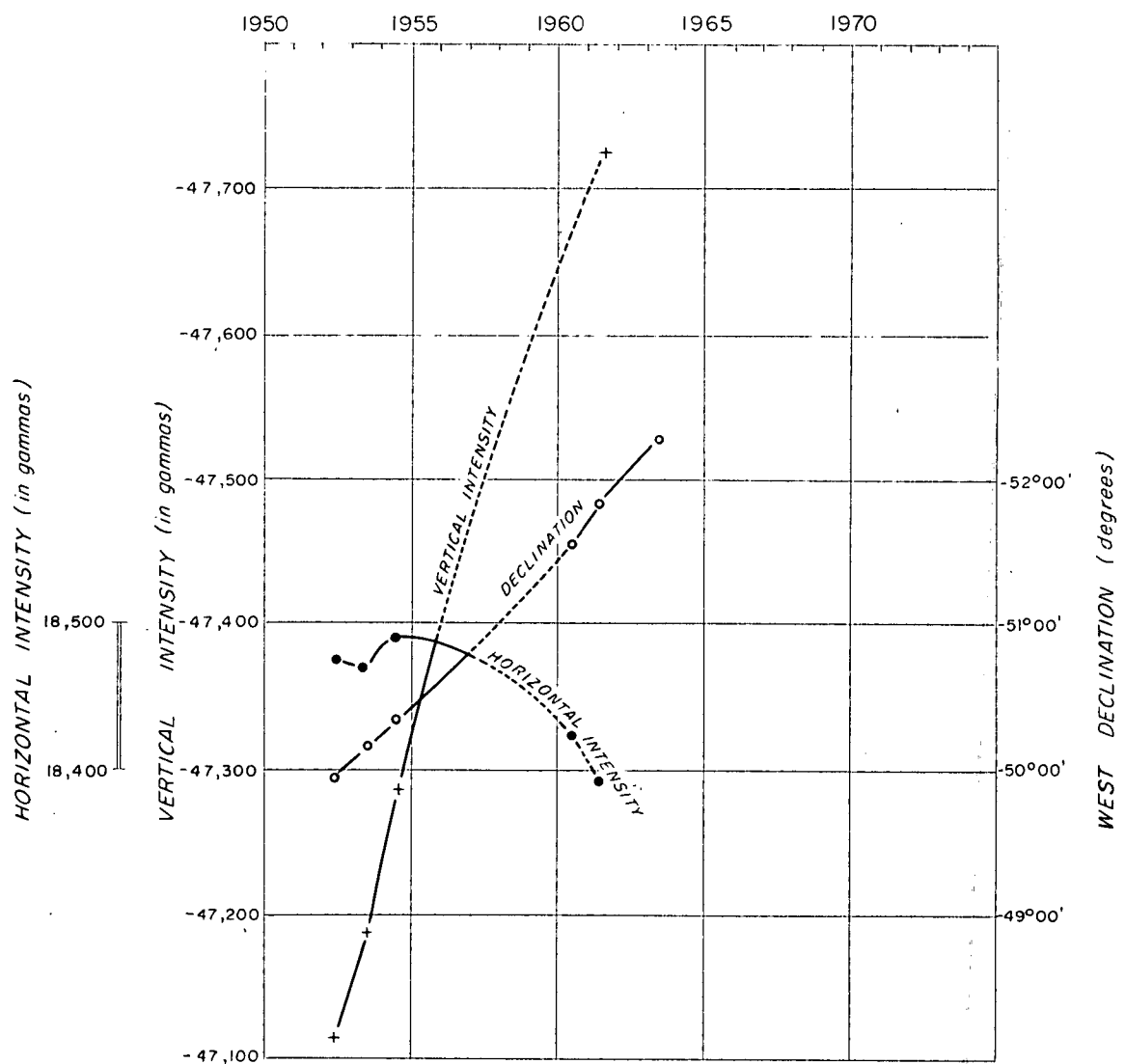
G96-158



VARIATION OF MAGNETIC COMPONENTS AT  
**WILKES**  
Latitude 66° 15' S  
Longitude 110° 35' E  
between 1957 and 1965  
G96-157  
GEOPHYSICAL BRANCH, BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS  
TO ACCOMPANY RECORD No. 1966 / 158

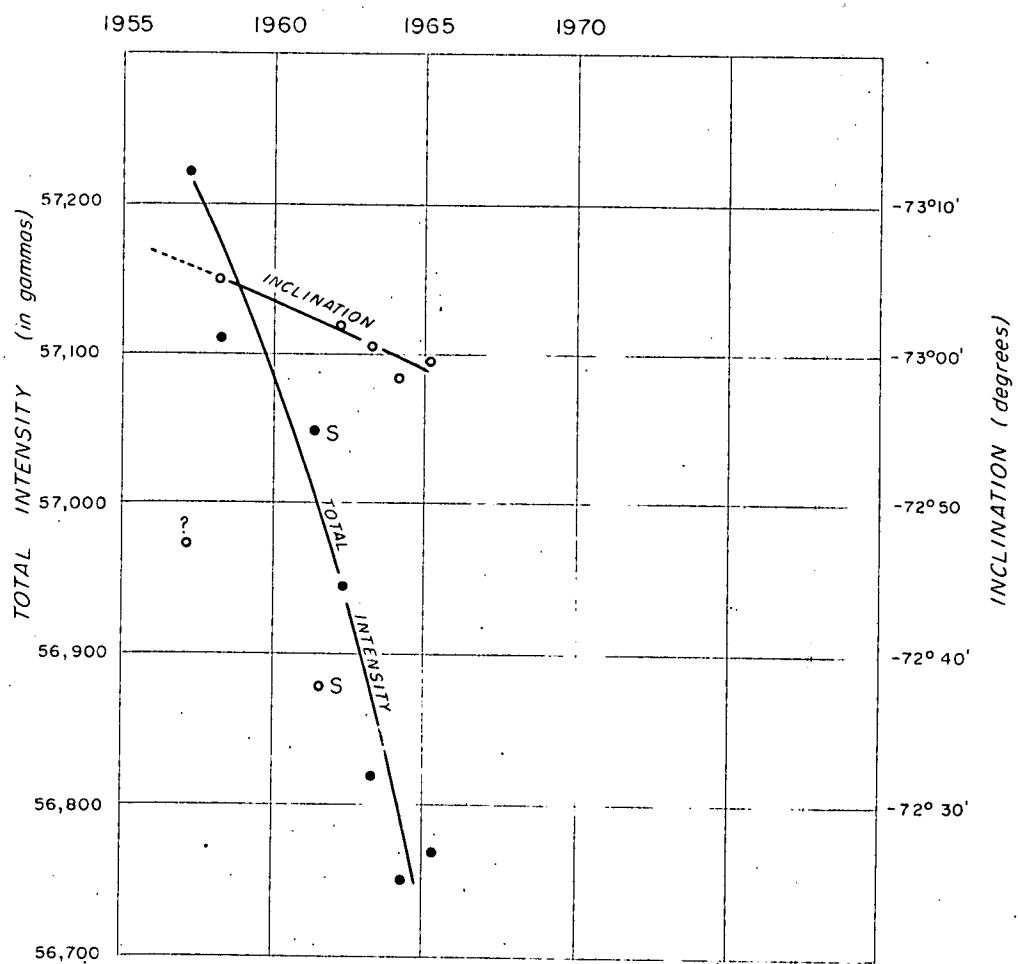
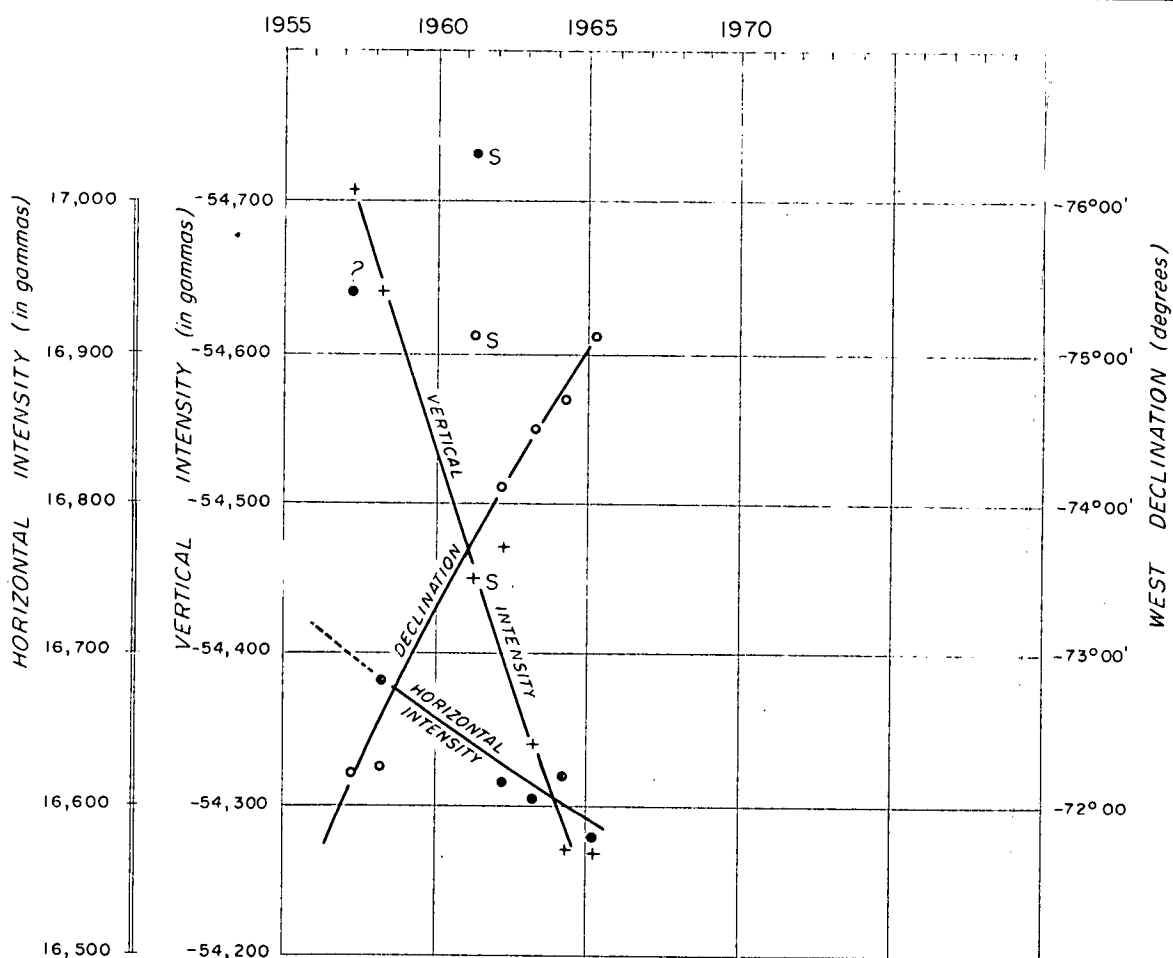


VARIATION OF MAGNETIC COMPONENTS AT  
MACQUARIE ISLAND  
between 1948 and 1965  
Latitude 54° 30·0' S  
Longitude 158° 57·0' E  
GEOPHYSICAL BRANCH, BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS  
696-160



VARIATION OF MAGNETIC COMPONENTS AT  
HEARD ISLAND  
between 1952 and 1964  
Latitude 53° 01.9' S  
Longitude 73° 21.9' E





S = Magnetic storm during observations

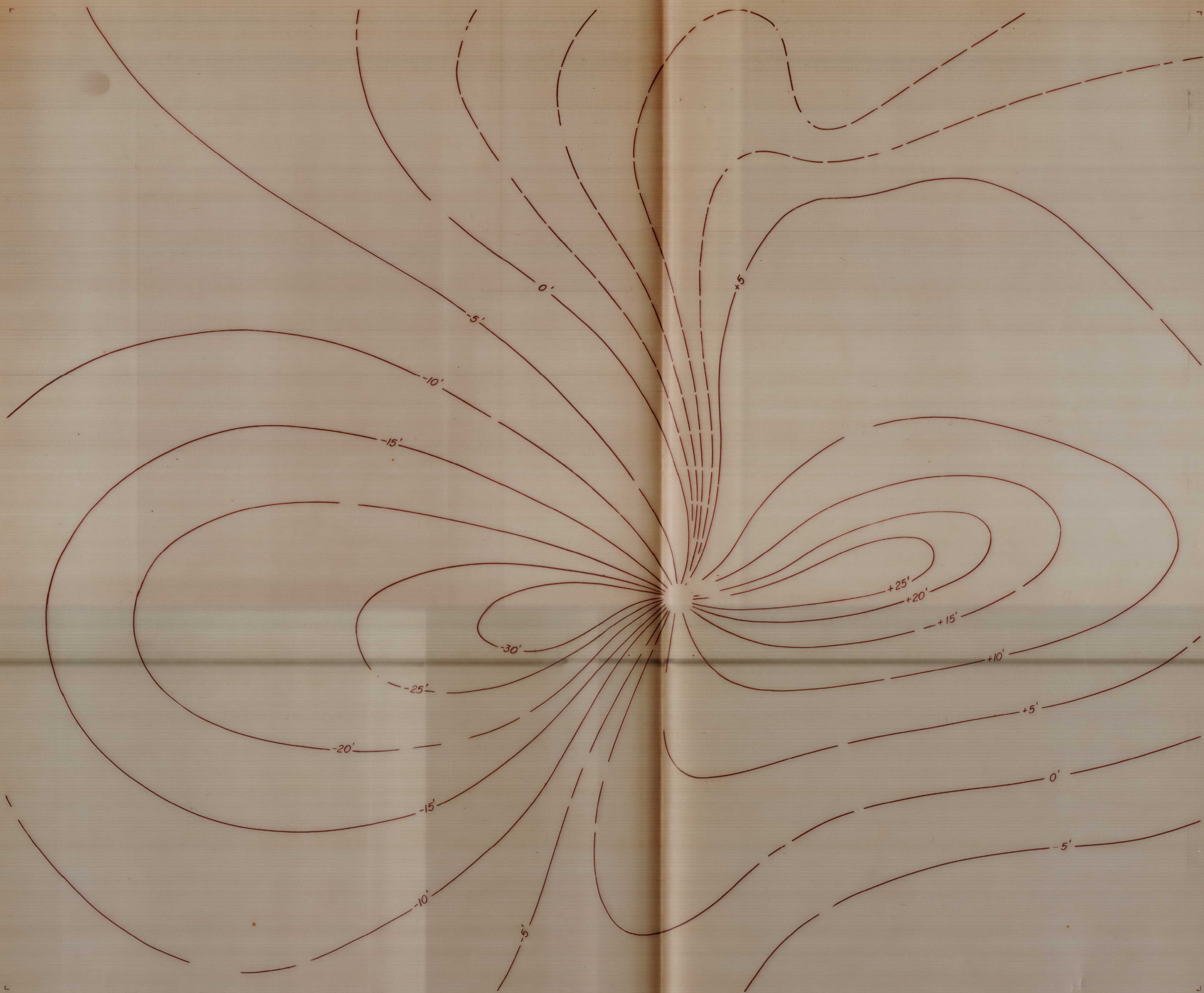
VARIATION OF MAGNETIC COMPONENTS AT  
 DAVIS  
 between 1957 and 1965  
 Latitude 68° 35' S  
 Longitude 77° 58' E

GEOPHYSICAL BRANCH, BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

G96-156

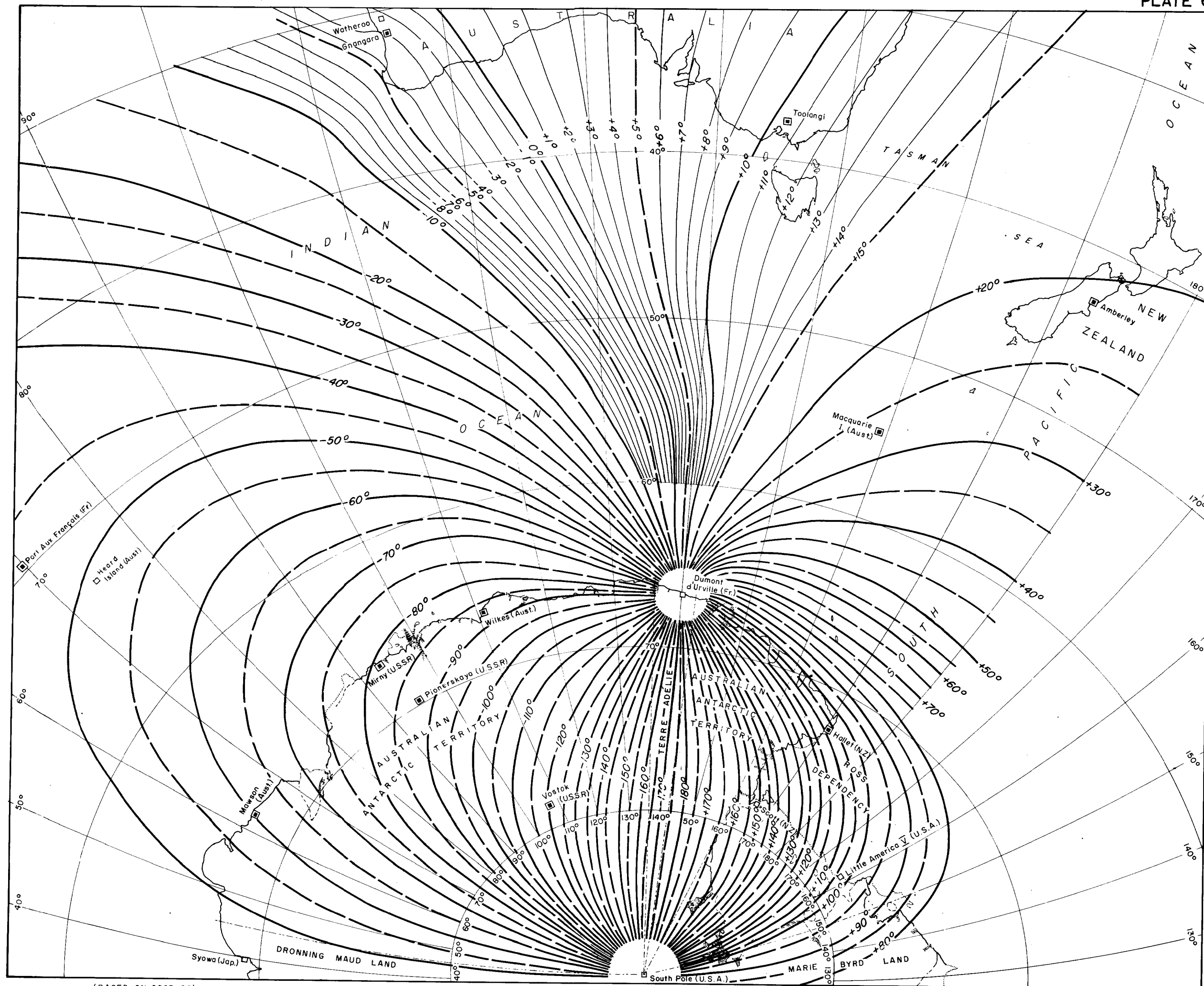
TO ACCOMPANY RECORD No. 1966/158





— -10' —





(BASED ON G265-98)

LEGEND

MAGNETIC OBSERVATORIES

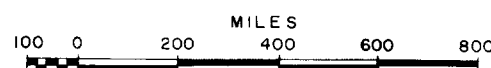
- Permanent
- Closed

— +10° — Lines of equal declination in degrees

Positive value indicates east declination. Negative value indicates west declination

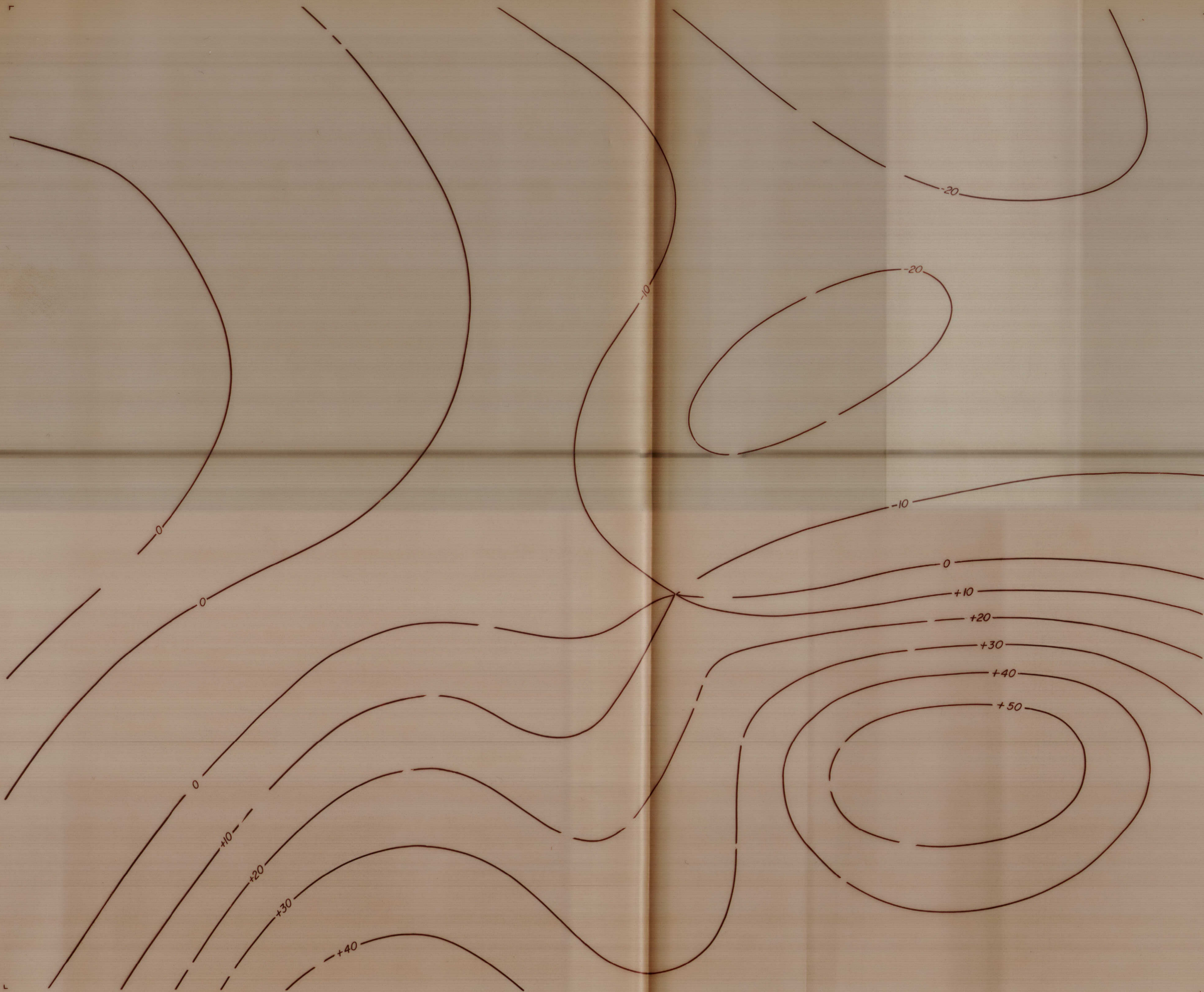
Lines of equal rate of change of declination in minutes per year,

Positive value indicates value is increasing easterly. Negative value indicates value is increasing westerly.



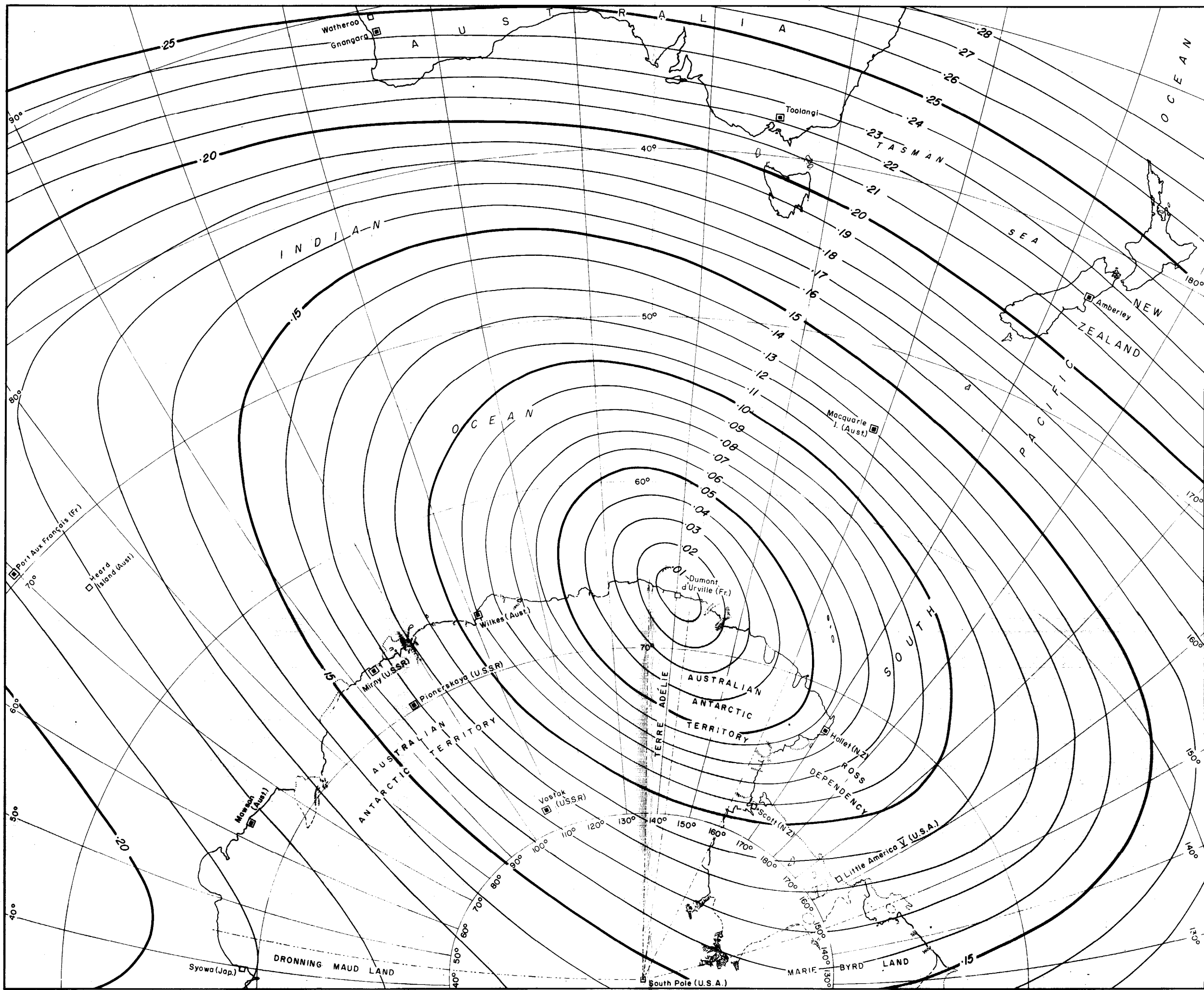
PRELIMINARY ISOMAGNETIC LINES  
AUSTRALIAN ANTARCTIC TERRITORY  
DECLINATION  
1965.0





— +10 —





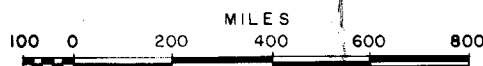
(BASED ON G265-98)

LEGEND

MAGNETIC OBSERVATORIES

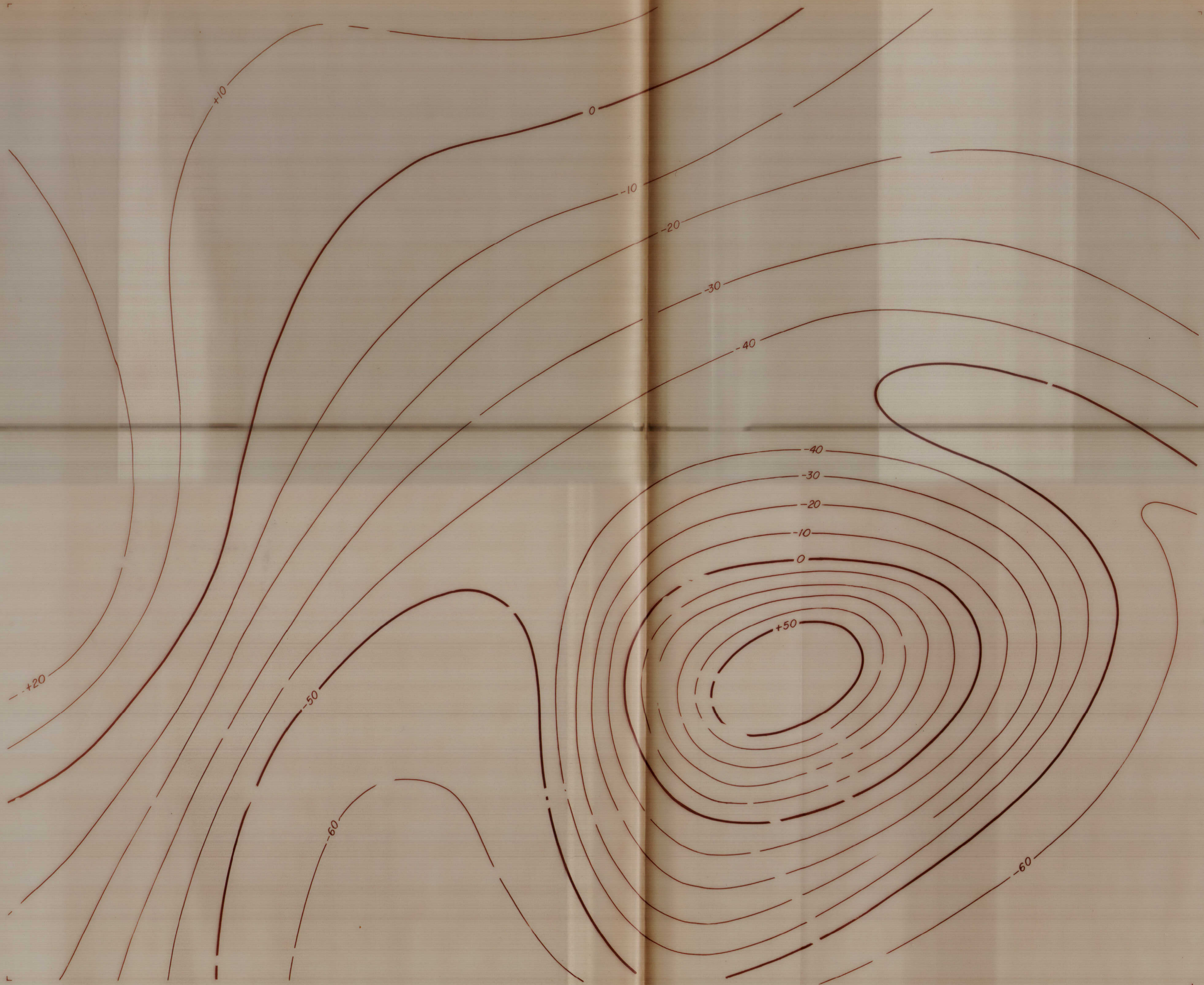
- Permanent
- Closed

— 10 — Lines of equal horizontal intensity in Gauss.  
 Lines of equal rate of change of horizontal  
 intensity in Gammas per year.



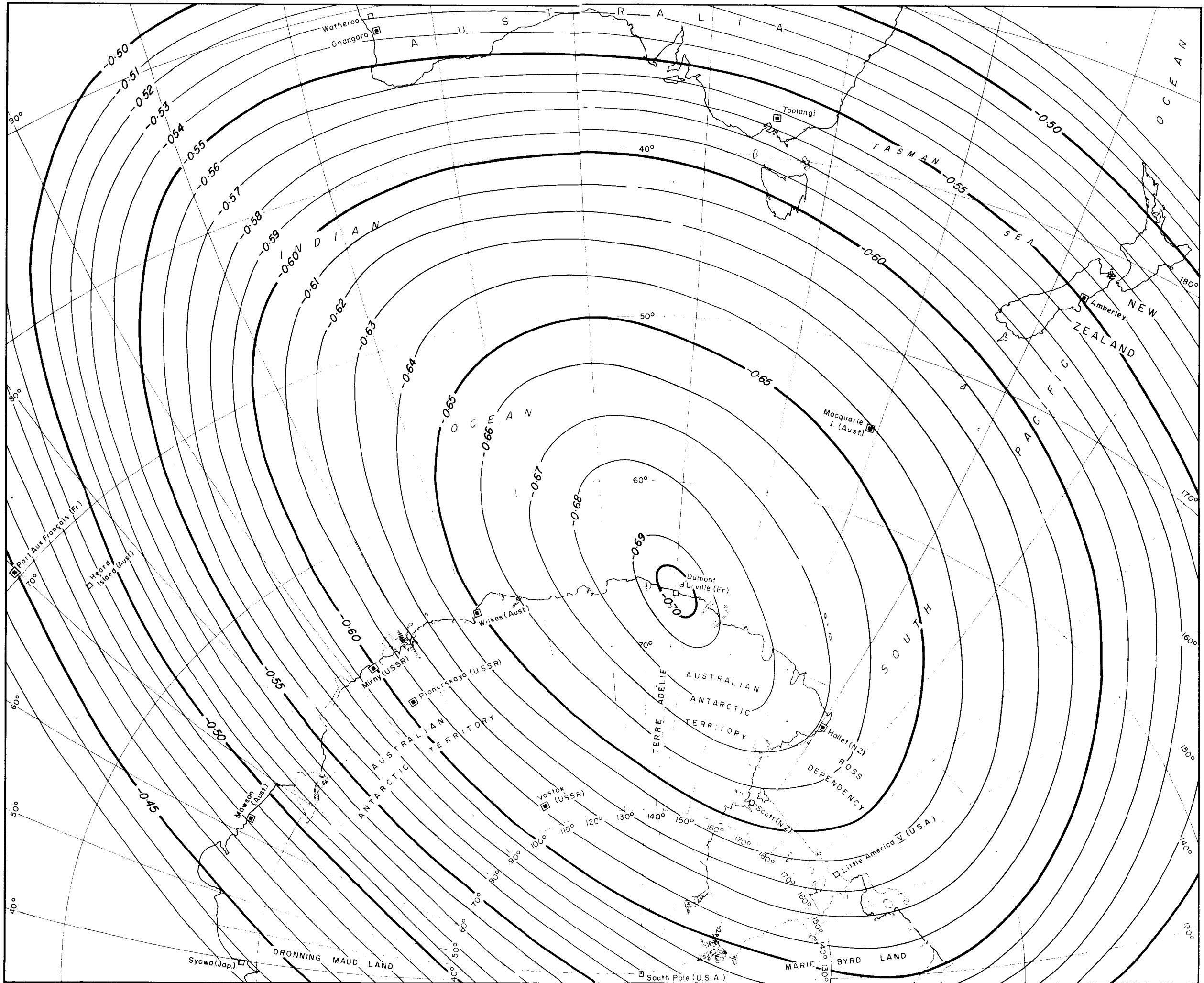
PRELIMINARY ISOMAGNETIC LINES  
 AUSTRALIAN ANTARCTIC TERRITORY  
 HORIZONTAL INTENSITY  
 1965.0





— -50 —





(BASED ON G265-98)

LEGEND

MAGNETIC OBSERVATORIES

- Permanent
- Closed

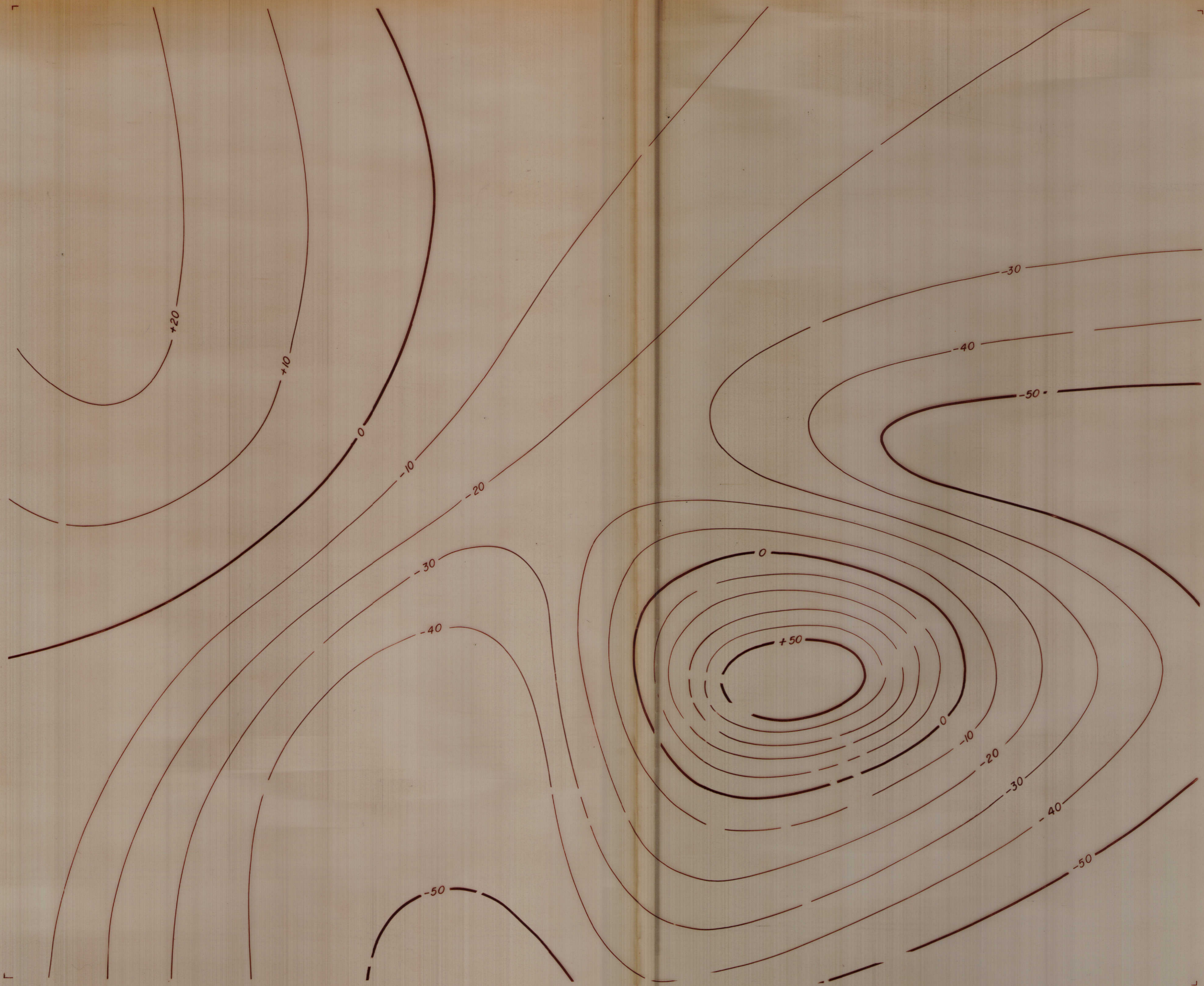
-0.60

Lines of equal vertical intensity in Gauss.  
Lines of equal rate of change of vertical  
intensity in Gammas per year.  
Positive values indicate increasing negatively.



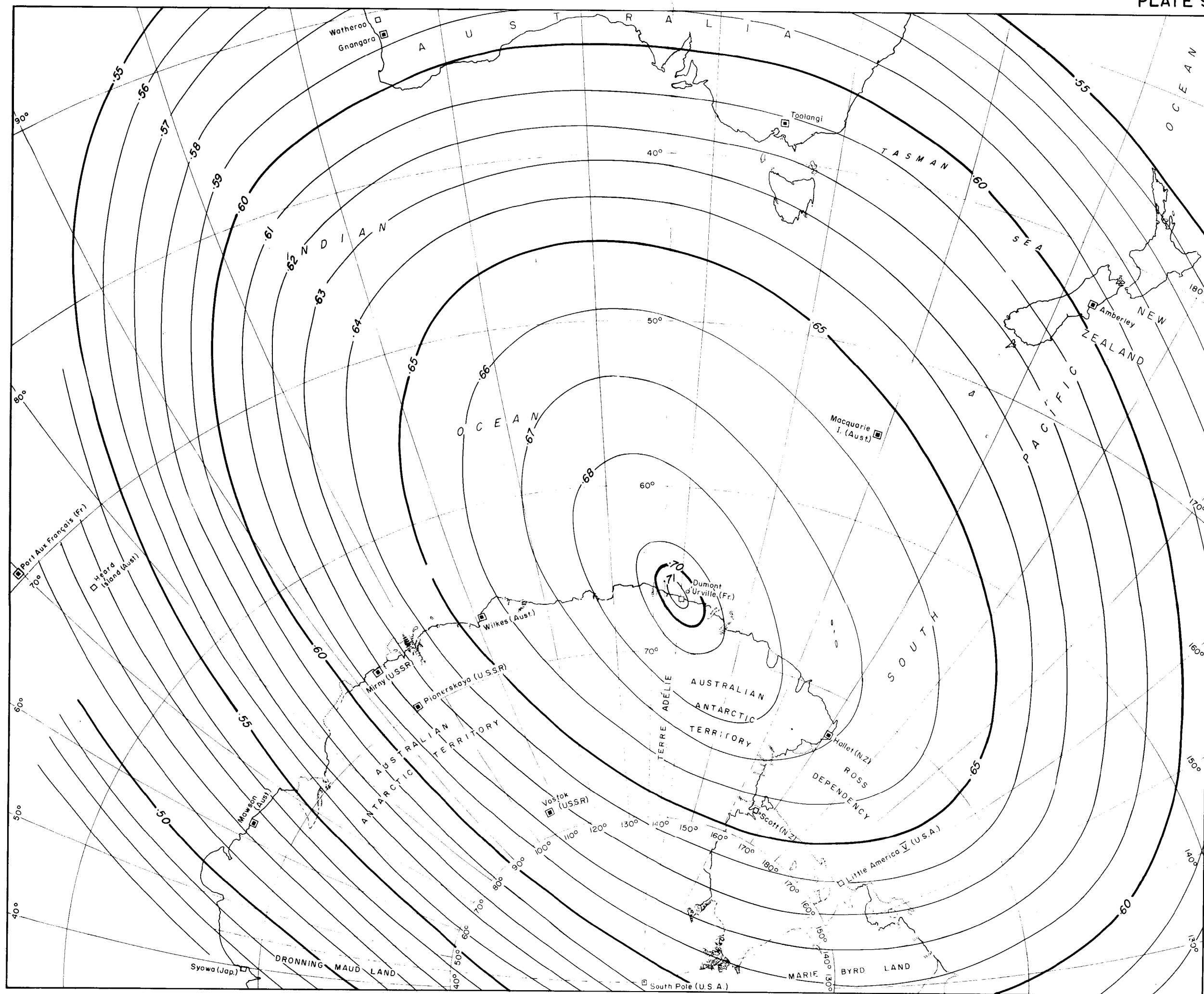
PRELIMINARY ISOMAGNETIC LINES  
AUSTRALIAN ANTARCTIC TERRITORY  
VERTICAL INTENSITY  
1965-0





— -10 —





(BASED ON G265-98)

LEGEND

MAGNETIC OBSERVATORIES

- Permanent
- Closed

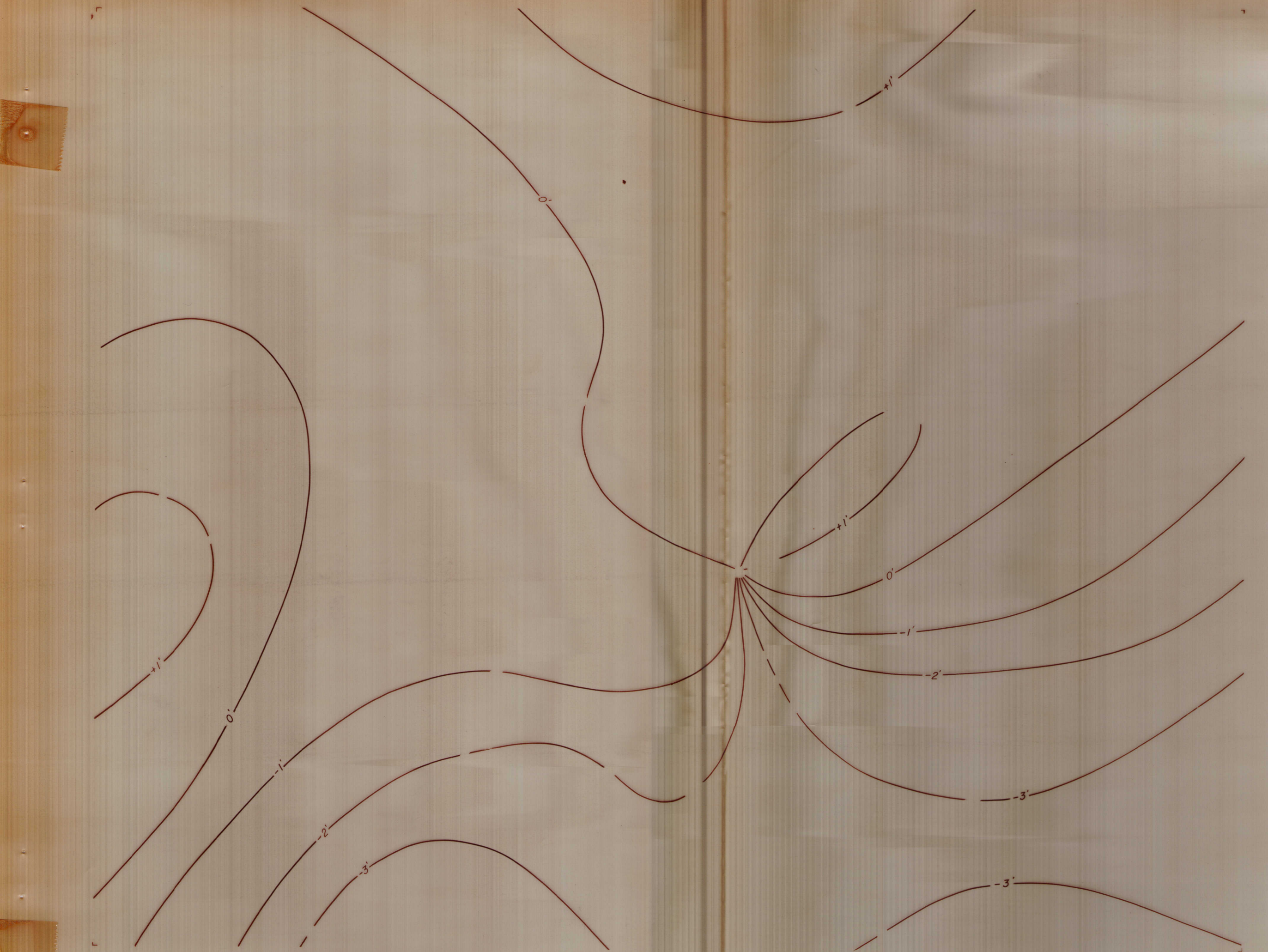
— 60 — Lines of equal total intensity in Gauss.  
Lines of equal rate of change of total  
intensity in Gammas per year.



PRELIMINARY ISOMAGNETIC LINES  
AUSTRALIAN ANTARCTIC TERRITORY

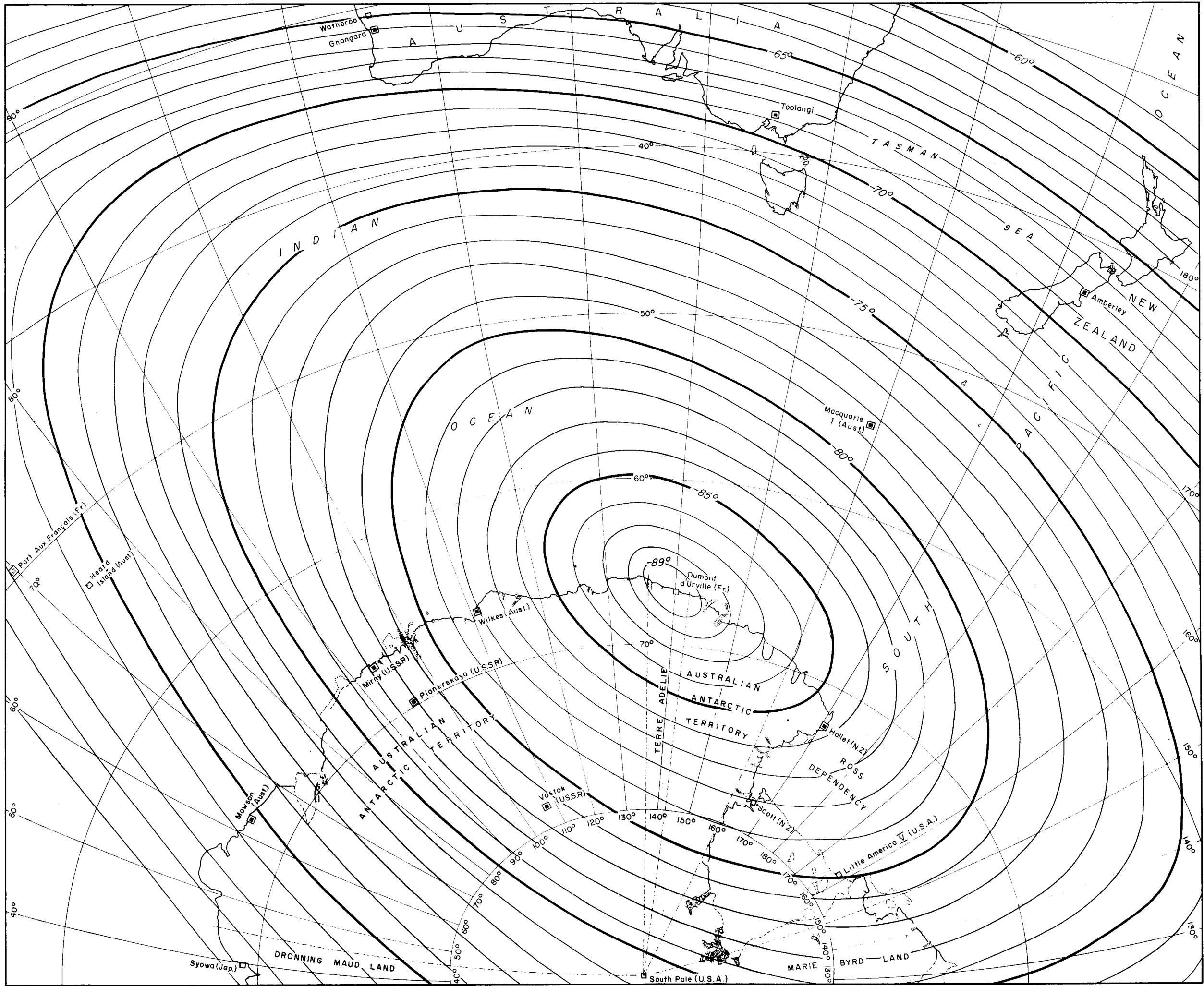
TOTAL INTENSITY  
1965.0





— 2' —





(BASED ON G265-98)

LEGEND

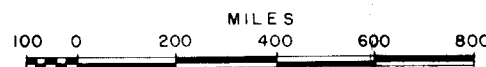
MAGNETIC OBSERVATORIES

- Permanent
- Closed

—60°— Lines of equal inclination

Lines of equal rate of change of inclination in minutes per year

Positive value indicates value is increasing negatively



PRELIMINARY ISOMAGNETIC LINES  
AUSTRALIAN ANTARCTIC TERRITORY

INCLINATION  
1965.0