COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD No. 1964/160

ISOGONIC MAP OF AUSTRALIA AND NEW GUINEA FOR THE EPOCH 1965.0

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ILLUSTRATIONS

SUMMARY

The map accompanying this report shows lines of equal declination, over Australia and the Territory of Papua & New Guinea, predicted for the epoch 1965.0. It continues the series of isogonic maps started in 1950 and published by the Bureau of Mineral Resources, Geology & Geophysics at intervals of five years.

Three insets on the map show:

(a) The isogonic lines of an area in the Indian Ocean bounded by latitudes 8 degrees to 16 degrees south and longitudes 96 degrees to 108 degrees east.

(b) The rate of change of declination (i.e. secular variation) in minutes per year.

(c) The density of declination stations in Australia and the Territory of Papua & New Guinea.

1. INTRODUCTION

Isogonic maps of Australia and the surrounding area have been published for the epochs 1942.5 (Rayner, 1944), 1950.5 (Holmes, 1951), 1955.5 (Wood and Everingham, 1953) and 1960.5 (Parkinson, 1959). The accompanying map is the next of this series. In conformity with recent recommendations of the International Association of Geomagnetism and Aeronomy, the epoch of this map is the beginning of a year, not the middle of a year. The main map shows smoothed isogonic lines (i.e. lines of equal magnetic declination).

Three insets on the map show:

(a) The isogonic lines of an area in the Indian Ocean bounded by latitudes 8 degrees to 16 degrees south and longitudes 96 degrees to 108 degrees east.

(b) The rate of change of declination (i.e. secular variation) in minutes per year.

(c) The density of declination stations in Australia and the Territory of Papua & New Guinea.

2. SOURCES OF DATA

The present map is based on/isogonic map for the epoch 1960.5, which presented all data up to 1959. It was brought up to date by including the regional magnetic field work performed by the Bureau of Mineral Resources, Geology & Geophysics since 1959. The following table shows the number of magnetic stations read since 1959.

Year	Area	Number of Declination Stations	
		Total	Secular Variation
1960	Queensland and New South Wales	43	19
	Western Australia	2	-
1961	Central Australia	51	1
	Victoria	2	2
1962	Australia (First-Order)	28	24
	Territory of Papua & New Guinea	10	2
	South-western part of Western Australia	94	-
1963	Western Australia (First-Order)	4	4
	Territory of Papua & New Guinea	7	2
	South-eastern corner of South Australia	149	-
	Eastern part of New South Wales	151	-
1959 and 1964	Cocos Islands	2	2
	Christmas Island	1	1
	Nauru	1	1
	Ocean Island	1	1

The 28 first-order stations listed above as secular variation stations had been read several times during the last 50 years (van der Linden, in preparation). They furnish fairly accurate field measurements for determining the secular variation. The remaining magnetic stations reoccupied for secular variation give less accurate determinations; most of these were occupied in 1960, from which date the rate of secular variation has been extrapolated to 1965.0.

Data from the magnetic observatories at Port Moresby, Gnangara, and Toolangi permit accurate determinations of both magnetic declination and rate of secular variation.

3. TREATMENT OF DATA

The isogonic map for 1965.0 was compiled in three stages. The first stage was to draw an isoporic map, i.e. a map showing the rate of change of declination in minutes of arc per year. Data used for this map cover the period 1957.5 to 1965.0.

The second stage was to compute the 1965.0 declination values of 350 stations occupied between 1956 and 1965, using the 1965.0 isoporic map. For stations read between 1956 and 1959, the 1957.5 values as tabulated by Parkinson and Curedale (1960 & 1961) were used. The 1965.0 declination values were plotted on the 1960.5 map and vectors were drawn to indicate the magnitude and direction of change in position of isogonic lines since the epoch 1960.5.

The third stage was to move the 1960.5 isogonic lines to a position which made the sum of the vectors approach zero. Vectors showing anomalous values for a single station were ignored. In this last stage the smoothed results from declination surveys were fitted in areas that had been surveyed in detail (van der Linden, in preparation).

The isogonic lines in the most easterly part of Australia had to be moved the equivalent of about 5 minutes of arc westward. In Tasmania, Victoria, most of New South Wales and Queensland, South Australia, and the Northern Territory the lines had to be moved about 15 minutes westward. In the southern part of Western Australia the lines had to be moved about 10 minutes westward, but in the most northerly part of that State about 10 minutes eastwards. The detailed declination survey in the south-western part of Western Australia required changes of up to 30 minutes to be made.

The smoothed pattern of the detailed declination surveys in South Australia and New South Wales did not cause any appreciable changes in the lines as drawn in the third stage of compiling the 1965.0 map.

The positions of the isogonic lines over the oceans surrounding Australia were adjusted by computing 1965.0 values for Lord Howe Island, Willis Island, Noumea, Nauru, and Ocean Island in the Pacific Ocean, and for Christmas Island and the Cocos Islands (West Island and Direction Island) in the Indian Ocean. These lines conformed quite well to the expected pattern. However, the positions of the isogonic lines in the oceans south-west, south, and south-east of Australia are uncertain.

4. PRESENTATION OF RESULTS

The 1965.0 declination map is drawn in the same form as the previous isogonic maps. The half-degree lines over the oceans are omitted because the values there are less reliable.

The pattern of the isogonic lines is regular and smooth except for areas where several stations indicate a large-scale departure from a smooth pattern, e.g. in the south-western part of Western Australia.

The three insets on the main map show:

(a) The isogonic lines over an area of the Indian Ocean. These lines are controlled by observations on the Cocos Islands and Christmas Island, and the trend of the isogonic lines on the west coast of Australia.

(b) The rate of secular variation in minutes of arc per year. This has been calculated by assuming a constant rate at any one place between the epochs 1957.5 and 1965.0.

(c) The density of stations at which declination observations have been made between the years 1912 and 1964. A much better network of data points was available for the 1965.0 isogonic map because of the stations read in Central Australia in 1961 (van der Linden & Parkinson, 1963). However, there are still some gaps in the northern and southern desert areas of Western Australia and in the most northerly and north-westerly part of the Northern Territory.

5. REFERENCES

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INDIAN OCEAN AREA

Estimated rate of annual change :-
Cocos Islands −2 minutes (increasing westerly)
Christmas Is and −1 minute (increasing westerly)

Christmas Island

Cocos Islands

SECULAR VARIATION

RATE OF CHANGE OF DECLINATION (1965·0) IN MINUTES PER YEAR

Positive value indicates value is increasing easterly

LEGEND

Observations 1912 – 1964

Declination Stations at approx 5-mile intervals

DENSITY OF DECLINATION STATIONS

AUSTRALIA AND NEW GUINEA

LINES OF EQUAL MAGNETIC DECLINATION AS AT 1965·0

The lines indicate the general trend of Magnetic Declination without allowance for local anomalies

\+ Means Declination is East and correction must be added to Compass Bearing to give true Bearing

− " " " West " " " " subtracted from " " " " "

MERCATOR PROJECTION

STATUTE MILES

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics G96-79