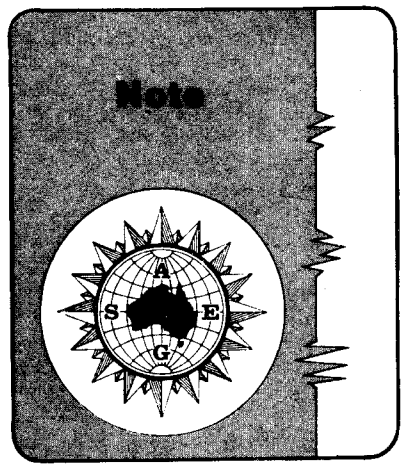

On the Macquarie Harbour Geophysical Anomaly, South-West Tasmania

S. T. Mudge

Gold Fields Exploration Pty Ltd
P.O. Box 590
Fyshwick A.C.T. 2609

Key words: anomaly, magnetic, gravity, interpretation, Tasmania

Abstract

Attention is drawn to major gravity and aeromagnetic anomalies existing in an area between Macquarie Harbour and High Rocky Point in south-west Tasmania. The correlation of these anomalies is discussed in terms of possible mechanisms for their origin. One postulated mechanism involves movement of crustal blocks relative to west Tasmania and raises the question of the origin of King Island, Bass Strait.

1. Main geophysical maps

The aeromagnetic patterns of Tasmania have recently been discussed by Beattie (1978), and the gravity field of Tasmania by Leaman, Richardson & Shirley (1980). Though the work reported by Finney & Shelley (1967, and see discussion by Johnson 1972) covered Tasmania on a regional basis with aeromagnetic profiles, the most detailed magnetic coverage of south-west Tasmania at present available is given in the first magnetic maps produced for the area.

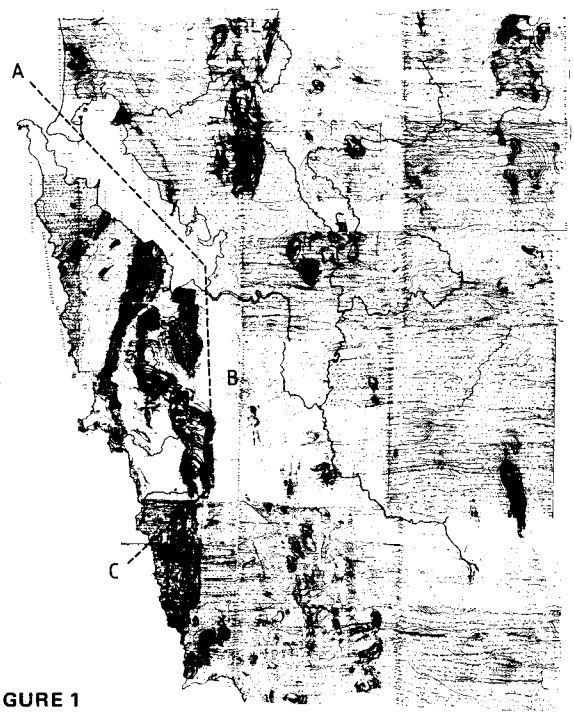

FIGURE 1

Aeromagnetic contours for south-west Tasmania, with boundaries A, B and C marked in as discussed in the text. Macquarie Harbour lies under boundary A. The compilation has been made from data available on 'open file' at the library of the Tasmanian Department of Mines. The maps were produced for Lyell-EZ Explorations in 1957 and 1958. Contour interval is 10 nT.

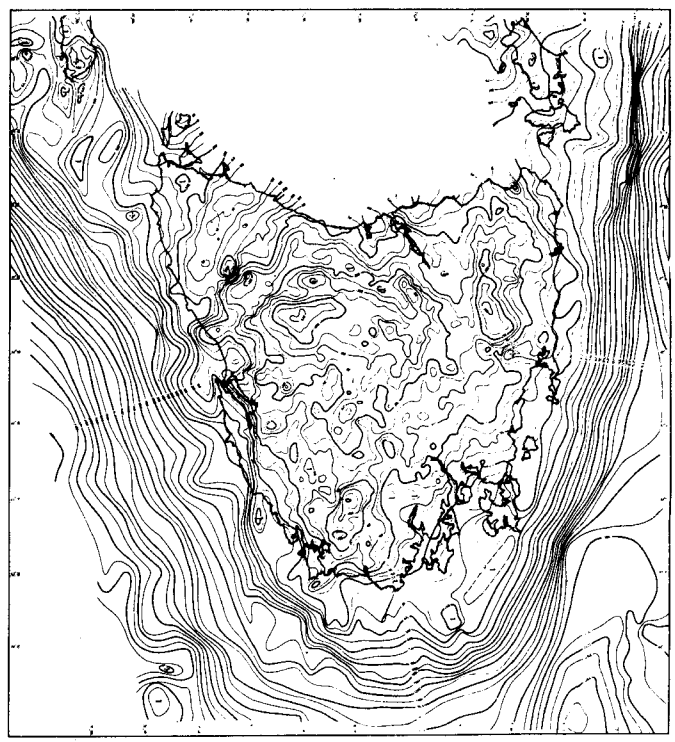

FIGURE 2

Bouguer gravity anomaly map of Tasmania. Contour interval 50 g.u. Reproduced with the permission of the Director of Mines, Tasmania.

A compilation of these early magnetic maps is shown in Fig. 1. The purpose of the present note is to examine particularly the strong magnetic features which occur south of Macquarie Harbour. In Fig. 1 these features have been used as a guide for drawing in boundaries A, B and C which, together with the coastline, mark off a block of continental crust. The geophysical importance of these three boundaries is supported also by characteristics of the gravity map of Tasmania, shown in Fig. 2. Details of the boundaries now follow.

2. Interpreted boundaries

Boundary A is located along the axis of Macquarie Harbour, guided by the sharp change in character of the magnetic pattern from the southern to the northern side. Boundary A *also* marks a line of strike of steep gravity gradient, shown in Fig. 2, and receives support from the mapped geology of the area (see the 1975 Queenstown 1:250,000 sheet, the Tasmanian Department of Mines Geological Atlas sheet SK 55-5).

Boundary B is located on the eastern border of the strong aeromagnetic pattern, and also lies along the strike of the steep gravity gradient.

Boundary C is drawn along a line of steep gradient in the magnetic patterns, and meets the coast in the region of High Rocky Point.

The boundaries described are interpreted to indicate major structural features of the area in question. Two possibilities are advanced.

1. The geophysical anomalies may result from some past vertical movement of the block marked off by boundaries A, B and C, as in an horst and graben structure. The block would otherwise be chronologically and stratigraphically equivalent to the surrounding area.

2. The block in question (enclosed by boundaries A, B, C and the coastline) may have been emplaced following the separation of Australia and Antarctica; especially if shear movement was involved in the motion of this part of Tasmania away from the present East Antarctic.

3. King Island, Bass Strait

King Island is situated some 330 km north of the Macquarie Harbour-High Rocky Point block discussed, and is also on the western edge of the continental shelf of this part of Australia.

An aeromagnetic map of King Island is presented in Fig. 3. King Island is of a similar geographic size to the Macquarie Harbour-High Rocky Point block and it may be relevant to note that if strong shearing occurred along the Tasmanian coast, the magnetic texture of King Island would allow it to have come from the area now occupied by the Macquarie Harbour-High Rocky Point block, were that block (as in mechanism 2 above) to have been moved into its present position from elsewhere.

4. Conclusion

Strong characteristics in the regional magnetic and gravity patterns suggest a distinct origin for a particular block of western Tasmania. Certain similarities with the setting of King Island, Bass Strait, are noted.

Acknowledgments

The compilation of the relevant data and ideas expressed here evolved during the author's employment with Geopeko. The author wishes to acknowledge the benefits of discussion with Geopeko staff, and thanks Geopeko for permission to publish the aeromagnetic data for Fig. 3. Dr David Johnson of Macquarie University is thanked for helpful discussions and constructive criticism of the ideas expressed in this note.

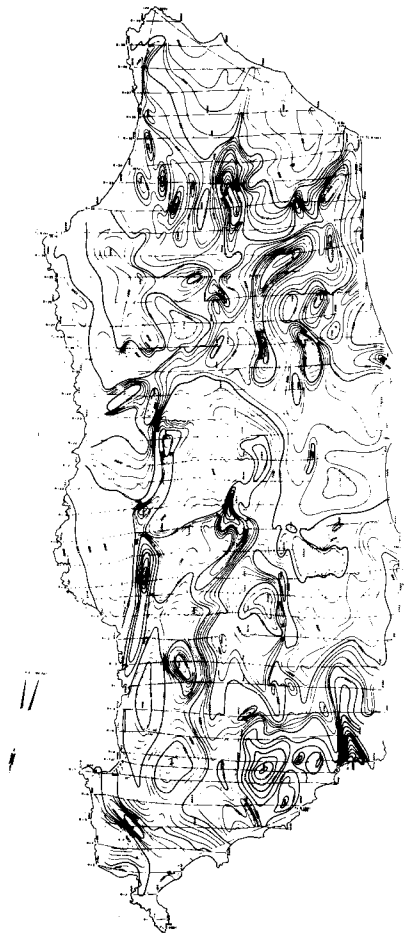

FIGURE 3

Aeromagnetic map of King Island, Bass Strait. Light contour interval is 10 nT, heavy contour interval is 50 nT. Map reproduced by courtesy of Geopeko, Sydney.

References

Beattie, R. D. (1978), 'A compilation and interpretation of aeromagnetic data from Bass Strait and Tasmania', C.S.I.R.O. Mineral Research Labs, Investigation Report 124.

Finney, W. A. & Shelley, E. P. (1967), 'Tasmanian aeromagnetic survey 1966, unpubl. Rec. Bur. Miner. Resour. Geol. Geophys. Aust. 1967/19.

Johnson B. D. (1972), 'Crustal structure studies in Tasmania', PhD thesis, University of Tasmania, Hobart.

Leaman, D. E., Richardson, R. G. & Shirley, J. E. (1980), 'Tasmania-the gravity field and its interpretation', unpubl. Rep. Dep. Mines Tasmania 1980/36.

(Received 4 February 1982; revised 22 April 1982)