indicate the nature of any correction required to the AGRF secular variation, possibly a spline function with coefficients varying smoothly spatially. For the main field, a merge between the 1980 BMR model over most of the area, with the 1980 IGRF to extend this outside its area of applicability, is proposed. There may be some advantages in using a co-ordinate system with one axis aligned along average magnetic north for the region, particularly if total intensity data are to be incorporated at a later stage.

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Processing of satellite magnetometer data

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The magnetic field observed at distances ranging from 350 to 500 km above the earth is a combination of fields due to several different sources. Electrical currents flowing in the outer core of the earth cause the main magnetic field of the earth, which varies in amplitude from 30 000 to 50 000 nT. The main field has time variations of the order of hundreds to thousands of years and spatial variations of the order of hundreds to thousands of km.

Electrical currents in the ionosphere cause magnetic field disturbances ranging from ten to thousands of nT in amplitude. These ionospheric disturbances have time variations ranging from ms to days and spatial variations varying from metres to hundreds of km. The ionospheric disturbances are particularly large in the auroral zones near to the north and south magnetic poles.

Electrical currents in the magnetosphere form a ring current system around the earth, at a distance equivalent to several earth radii, which gives rise to magnetic field disturbances typically up to 50 nT in amplitude. These magnetospheric disturbances have time variations of the order of a day and spatial variations of several thousands of km.

After removal of the main magnetic field and the ionospheric and magnetospheric disturbances, the residual magnetic field is due to variations in the magnetization of rocks within the crust of the earth. This crustal component of the magnetic field is a few tens of nT in amplitude at satellite altitudes, and has spatial variations of hundreds to thousands of km. The crustal component has essentially no time variations and therefore is separable, in theory, from the other components in spite of its relatively low amplitude. In practice, the data distribution in space and time does not permit complete modelling of the time varying disturbances. In addition, there is an overlap between the spatial frequencies of the core and crustal field components.

A map of the crustal-source magnetic field for Australia, obtained from satellite data (Johnson & Mayhew 1985), is given in Fig. 1.

Reference

Johnson B. D. & Mayhew M. A. (1985), 'Interpretation of satellite magnetometer data', *Explor. Geophys.* **16**, 238–240.

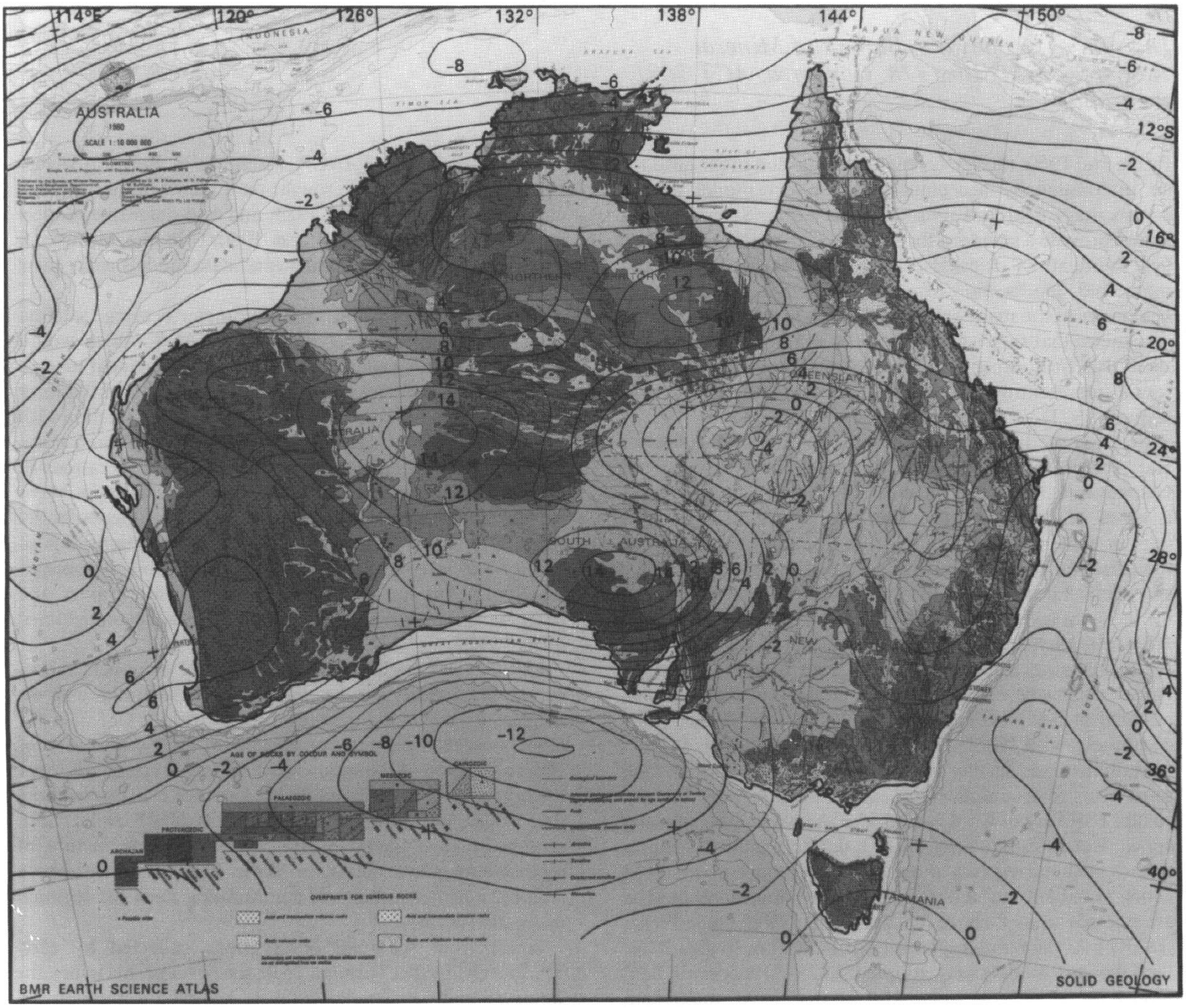

Fig 1 Map of the crustal-source magnetic field for Australia, from Johnson and Mayhew (1985)