

## **A methodology study in determination of depth to basement by inversion of selected discrete magnetic field anomalies**

Magnetic field depth to basement studies are important for investigation of basin architecture in petroleum exploration, and to excise areas from mineral exploration where basement is too deep. Many methods are used to obtain estimates of depth to basement, including spectral analysis, Werner and Euler deconvolution, Naudy analysis and modelling. All methods require anomalies of limited overlap and high signal to noise, caused by discrete bodies of appropriate shape. Many magnetic field data sets contain only a few such suitable anomalies. Given this often sparse resource of suitable anomalies and the high computing speeds now available, it is feasible to replace these older, completely automated batch processes with interactive inversion of user-selected anomalies. Inversion of selected anomalies results in far fewer depth solutions, but each solution is of greater reliability and has more geological information, including estimates of source susceptibility, width, dip and depth extent. The modelling process is self-adaptive for each individual anomaly as opposed to the batch methods that rely on fixed source assumptions, such as structural indices. Furthermore in generating those solutions, the user comes to a better appreciation of the data and of the ambiguities of its interpretation.

Where depth to basement exceeds the spacing between survey lines, any smoothing during the gridding process has a negligible effect on depth estimation. In such cases it is often more convenient to generate magnetic depth estimates from grid data rather than the primary profile data. Examples of depth estimation by selective inversion of anomalies in TMI grids are presented from a study of the Ngalia Basin in the Northern Territory. These examples illustrate the issues involved, and the capabilities and limitations of the method.