NOVEL METHODS FOR NEAR-SURFACE HYDROGEOLOGICAL FEATURE ENHANCEMENT FROM HIGH-RESOLUTION AIRBORNE MAGNETIC DATA

Peter Milligan[1], Larysa Halas[2], Ken Lawrie[2], Andrew McPherson[2], Martin Smith[2], Chris Harris-Pascal[2], David Gibson[2] & KokPiang Tan[2]*

ENRiT[1], PRMilligan@bigpond.com, Geoscience Australia[2], Larysa.Halas@ga.gov.au, Ken.Lawrie@ga.gov.au, Andrew.McPherson@ga.gov.au, Chris.HarrisPascal@ga.gov.au, Martin.Smith@ga.gov.au, David.Gibson@ga.gov.au, KokPiang.Tan@ga.gov.au

The delineation of near-surface (0-300m) hydrostratigraphy and tectonic features is essential for successful characterisation of groundwater systems and subsequent hydrogeological modeling. While most remote sensing of such systems is commonly achieved using high-resolution airborne electromagnetic data, validated by drilling data, and complemented by the use of terrain and multispectral data, it is shown that there is also a useful role for high-resolution magnetic survey data. Various filtering of gridded magnetic data, when image-enhanced and interrogated with other datasets, reveal features such as faults, dykes and other structures which may influence the distribution and movement of groundwater. One of the most useful enhancements of magnetic data is tilt, in which the range of data from ±90° acts as an automatic gain control to highlight both strong and weak source responses. While it is difficult to obtain accurate depth information from magnetic data, useful relative depth estimates can be obtained by using, for example, the Tilt-depth method, in which half the width between the ±45° contours of the tilt grid is a measure of the depth to source. These depth estimates can be calibrated, where possible, by comparison with other data. Dip directions of source contacts can be estimated by using the attitudes of multiscale edges, derived from the maxima of total horizontal derivative data. Examples of the utility of high-resolution magnetic data, in its complementary role, are presented for two groundwater assessment project areas — the Menindee Lakes region in western NSW and the Keep River catchment in the Northern Territory.