ASEG-PESA 2015
Geophysics and Geology together for Discovery
24th International Geophysical Conference and Exhibition
15–18 February 2015 Perth, Western Australia

Structure and Stratigraphy from Aeromagnetic Data within Sedimentary Basins

Minerals keynote paper

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SUMMARY

Sedimentary rocks commonly contain sufficient magnetic mineral to yield coherent signal in modern aeromagnetic surveys. Careful acquisition procedures and astute application of conventional processing methodology allow the signal from the sedimentary section to be recognised and isolated from that of 'basement', facilitating focused interpretations of each these geological domains.

Spectral separation filtering underpins this process, providing imagery of magnetic sources that lie at differing depths. The integration and interpretation of the resulting 'spectral depth windows' follows the steps used to integrate aeromagnetics with geology in 'hard-rock' domains. A substantial phase of basic observations on the aeromagnetic imagery is the fundamental first step, and commitment to the integration of the best available geology to yield lithostratigraphic and structural framework interpretations completes the initial task. Forward and inverse modelling constrains the qualitative geological interpretation, and enables hypotheses formed during that interpretation to be tested.

The two examples presented show the virtues of separation filtering and the style of geological interpretation that can be derived using the aeromagnetic data as the driver. The Amadeus Basin example presents a 'feast' of shallow magnetic rock units, many of which are probably magnetic stratigraphic marker horizons. These yield a thought-provoking interpretation of structure and stratigraphy in the upper sedimentary section. The discordance between the geometries of the shallow and deep magnetic rock units raises the likelihood of a major detachment structure between the two geological domains.

The aeromagnetic data from the second example, in the Galmoy Pb-Zb district in Ireland, presents major challenges. Separation filtering yields a set of very low amplitude but strongly coherent spectral depth windows which, when interpreted, provide a range of structural and stratigraphic features that relate directly to the mineralised environment. The successful application of aeromagnetics in this erstwhile 'non-magnetic' geological domain is testimony to the value of the technique in most, if not all sedimentary basins.