

Investigation of the Coompana negative magnetic anomaly in southwestern South Australia

Foss, Clive¹; Reed, Gary²; Heath, Philip²; Dutch, Rian² and Wise, Tom²

1) CSIRO Mineral Resources, Sydney, Australia

2) Geological Survey of South Australia, Department of State development, Adelaide, Australia,

The basement rocks beneath cover of the Eucla Basin in southwestern South Australia contain a substantial igneous component as revealed by the geophysical character of the region and existing drill hole constraints, which have intersected mafic volcanics and granites beneath the Officer and Eucla basins. Of particular interest are a number of large anomalies defined by their prominent and characteristic magnetic field expressions of dominant reverse remanent magnetisation. A recent 200m spaced aeromagnetic survey by the Geological Survey of South Australia has provided substantial improvement in definition of these anomalies. The circular 2000 nT amplitude, 50 kilometre diameter Coompana magnetic anomaly is the most prominent, with several superimposed and surrounding anomalies likely due to shallower sources. Drilling in the vicinity of these satellite anomalies has intersected mafic volcanics at depths of 300 to 400 metres. Recent geochronology indicates that these mafic volcanics are Neoproterozoic (c. 860 ma) in age, and likely correlated with widespread mafic magmatism at this time across southern and central Australia (e.g. the Gairdner and Amata dolerite suites). It is unclear if these volcanics are associated with the anomalies, or form a younger cover sequence over older basement units.

Sparse regional gravity data reveals a negative gravity anomaly coincident with the main Coompana magnetic anomaly, implying that the deep body might be of acidic to intermediate composition, and although at the limits of its resolution, also suggests that at least some of the shallow magnetic sources have local positive gravity expressions (consistent with higher density mafic material). The similar magnetisation directions of the deep and shallow sources, in conjunction with the implications of the gravity data, suggests that this is a large heterogeneous and possibly fractionated system, with encouraging possibilities for hosting various mineral systems.

Recent advances in interpretation of magnetic field expressions of remanent magnetisation, together with the improved resolution of the new GSSA survey, has provided new insights into the sources of these remarkable anomalies. Estimation of the direction of magnetisation was required to solve the spatial distribution of that magnetisation, in terms of horizontal position, shape, orientation and depth. Magnetisation directions were recovered from semi-automated methods, including Helbig Analysis, as well as by staged inversions.