

**THE APPLICATION OF GROUND BASED AND
AIRBORNE RADIOMETRIC METHODS TO AID
GEOLOGICAL MAPPING IN THE OLARY
PROVINCE, SOUTH AUSTRALIA**

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ABSTRACT

The Late Palaeoproterozoic Olary Domain, in the east of South Australia, has been extensively surveyed using airborne geophysical methods, including 256 channel radiometrics. This detailed data set over outcropping areas is potentially a valuable aid to geological mapping. Ground-based radiometric data was obtained along profiles through the eastern Weekeroo Inlier and Ninnerie Hill areas in order to relate radioelement concentrations to lithological units. The Weekeroo Inlier traverse sampled all stratigraphic units present in the Olary Domain. The Ninnerie Hill traverse sampled Early Mesoproterozoic granitoids, migmatites and host metasediments. Two acquisition styles were attempted when collecting the ground-based data, with continuous recording to provide results that better replicate the airborne data than discrete sampling. The discrete sampling method was found to be heavily influenced by single point anomalies and not representative of the lithological average.

Relative peaks and troughs on all three channels and total count data correspond well between the ground and airborne data. Correlation between the airborne data and the ground-based data was best for the K channel. For the Th channel the ground-based data was similar to the airborne data in wavelength and amplitude but was bulk shifted below the airborne data. The U channel data from the ground-based data detected the same anomalies as the airborne data but was an order of magnitude higher. The differences between the airborne and ground-based data could be due to errors in the calibration process that was performed for part of this project or due to the time difference in acquisition of the ground-based and airborne data.

Comparison of ground-based data with the geology of the survey areas revealed that radiometric data can provide useful lithological discrimination. Within the survey area some differences between metasediments, intrusive lithologies, and alteration types are determinable. The radiometric data can successfully differentiate between potassic and sodic granites. The low levels in all three measured radioelement channels can reflect occurrences of amphibolites. The data discriminates between pelites and psammites in that the pelites contain significantly higher levels of K, the difference between levels of Th and U are less extreme but are still discernable. As well as providing a mapping tool on the lithology scale, the interpretation of radiometric data can resolve sub-lithology scale variations.

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ABBREVIATIONS

MeV	million electron volts
PIRSA	Primary Industries and Resources South Australia
DGPS	Differential Global Positioning System
ppm	parts per million
U	uranium
Th	thorium
K	potassium
Bi	bismuth
BHEI	Broken Hill Exploration Initiative
RGB	red green blue multi component or ternary radiometric image
CSIRO	Commonwealth Scientific and Industrial Research Organisation
Ma	million years ago
m	metres
km	kilometres
s	seconds