

CRC LEME OPEN FILE REPORT 216

SUMMARY

The principal objective of the Cooperative Research Centre for Landscape Evolution and Mineral Exploration (CRC LEME) Shields Program and the Primary Industry and Resources of South Australia (PIRSA) Regolith Terranes Group in South Australia is to develop technically efficient procedures for mineral exploration in the major Cratons. This is to be achieved through a comprehensive understanding of the processes of regolith development and landscape evolution and their effects on the surface expression of concealed mineralization.

The specific objectives are to:

1. Establish broad spatial relationships between regolith, landforms and bedrock lithotypes;
2. Establish mineralogical and geochemical characteristics of regoliths in different geological, geomorphological and climatic environments;
3. Characterize the surface and sub-surface geochemical expression of major ore systems in the regolith;
4. Establish relationships between geochemical dispersion patterns, weathering processes and evolutionary stages of regolith and landform development;
5. Develop appropriate exploration procedures for different landscape situations for each of the Cratons.

This particular research report contributes to all of the above objectives. The study consisted of detailed sampling of the Quaternary units and uppermost Adelaidian sedimentary units in order to identify potential sampling media for Au and Cu mineralization using the techniques of selective extraction and total element content analyses. The study area is located at Mt Gunson where the thickness of Quaternary transported material is variable (3 m to 15 m). The depth to mineralization (beneath weakly mineralized or barren sedimentary units) is about 30 m at the Cattlegrid deposit and 70 m at Windabout prospect.

The major findings for this study are summarized below:

1. Manganese and Fe oxides and oxyhydroxides appear to accumulate base and heavy metals such as Cu, Pb, Zn, and Co and need to be considered using data normalization procedures if exploring for these metals using the upper regolith; the difficulty in recognising these materials in drill hole cuttings probably negates their specific use as sampling media.
2. The concentration of Au is generally <2 ppb and is a contributing factor as to why the distribution of Au is highly variable in the upper regolith and does not show a strong association with calcrete. Nevertheless, because of its success in other parts of the Gawler Craton, calcrete sampling is recommended for Au exploration; the use of a power auger to collect the top metre composite is further recommended since this will maximize the probability of collecting carbonate. Care should be taken if attempting to remove wind blown sand by sieving as this process may remove much of the fine carbonate.

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