EXPLORING THROUGH COVER ON THE GAWLER CRATON: REDUCING RISK BY INTEGRATING THE INTERPRETATION OF GEOPHYSICAL AND GEOCHEMICAL DATA ON THE REGOLITH

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The Archaean to Meso-Proterozoic crystalline basement of the Gawler Craton is host to deposits of iron oxide Cu-Au, lode Au and metamorphosed Au. Exploration for these deposits is hampered by the extensive development of regolith. Companies working in this terrain have found that calcrete sampling is an effective means of locating regions of interest, but they have had mixed success in using calcrete sampling to target drilling. Geoscience Australia (GA), in collaboration with the Minerals Resources Group in the South Australian Department of Primary Industry and Resources (PIRSA) and the Co-operative Research Centre for Landscape Environments and Mineral Exploration (CRC LEME), has been working with industry to improve the effectiveness of calcrete sampling in the Gawler Craton by developing a ranking strategy for Au anomalies in calcrete.

Although regolith landform mapping provides valuable information about physical dispersion processes in the contemporary landscape, it provides little, if any, quantifiable information about the thickness of contemporary sedimentation, palaeo physical dispersion processes, and the distribution and thickness of palaeo-sediments. Airborne geophysics, especially airborne electromagnetics, provides a rapid and cost effective means of mapping the extent of transported materials within the regolith. This information may be used to establish a first-order ranking strategy for Au anomalies in calcrete.

This first order ranking strategy carries the assumption that Au anomalies in calcrete which has formed in *in-situ* regolith materials is associated with Au mineralisation at depth. However, this assumption ignores the possibility that Au is moving laterally through the regolith in groundwater. It has been established that groundwater is mobilising significant quantities of Au in areas of the central Gawler Craton. Au may be precipitated within the regolith when the chemical or physical conditions governing mobilisation change. This process could generate "false" Au anomalies.

It is clear that regolith geochemistry (surface and sub-surface) should be interpreted against the groundwater chemistry and an understanding of groundwater flow paths. Whereas groundwater chemistry can only be established by assaying samples from drillholes, groundwater flow paths can be mapped using a combination of geology and geophysics. The results can be used as vectors to primary mineralisation, thereby establishing a second order ranking strategy for Au in calcrete anomalies.

The collaborative research being undertaken by GA, PIRSA and CRC LEME has established that the risk attached to exploring for Au through cover in the Gawler Craton can be significantly reduced by integrating the interpretation of geochemical and geophysical data to generate an effective ranking strategy for Au anomalies in calcrete.

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