ADVANCES IN REGOLITH RESEARCH

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Recent research by CRC LEME from an Australian mineral exploration perspective, has focussed on regolith architecture and mechanisms of geochemical anomaly formation, within transported regolith.

Methods have been developed for the rapid production of regolith-landform maps which is the starting point for understanding regolith architecture in the third dimension. Methods for development of 3D regolith models are less well advanced, and require integration of all available geological and geophysical datasets, but still with a heavy reliance on drill-hole information. The base of the transported regolith – the unconformity – remains the most important regolith boundary for geochemical sampling in transported regolith terrains.

A new generation portable spectral logger, employing a broader spectrum can interpret important features from drill chips within the regolith. This allows internal architecture, redox fronts and the all-important interface to be objectively identified. Transported lateritic components can provide vectors to mineralisation in depositional regimes. Palaeomagnetic and new radiometric methods which date individual phases of the regolith provide evidence of different episodes, each characterised by different geochemical dispersion patterns in transported regolith.

Along with lateritic residuum, calcrete is prime sampling medium. Calcrete is probably enriched in gold through physical and biological processes, rather than straight chemical processes. In South Australia, the lowermost calcrete layer buried within the depositional regime, especially where it lies directly over the silcrete layer at the buried interface, is the desired sampling medium.

Certain gum trees, with deep roots in transported regolith have been shown to record anomalous values of gold and basemetals in leaves, twigs and bark. Anomalous metals in acid-sulfate soil seeps can also provide a window through sedimentary cover in respect of mineralisation in the basement.

A number of Yilgarn occurrences of gold anomalies in transported cover, strongly infer hydromorphic and biological mobilisation of gold. This inference is supported by micro-analyses of regolith mineral hosts in hardpans and mottled sediments, which show gold and pathfinder elements prefer to reside in goethite and specific types of clay minerals. This creates anomalies in specific mineral phases. However the inference that that these are sites of mobile or labile metal ions remains enigmatic. Similarly there is inconclusive evidence that selective extractions will provide an anomaly not otherwise detected by conventional total dissolution methods.

Hydrogeochemistry is a promising exploration tool for basemetal exploration.

The importance of microbes in both the dissolution and precipitation of gold in the Australian regolith is demonstrated. We are on the verge of identifying the functional gene sequence of individual active microbes. A consideration of possible mechanisms for creating anomalies in soils above transported regolith, presents difficulties in facilitating upward movement of ions from the watertable to the surface. Perhaps the best avenues of research lies with surrogate soil gases, and biotic transfers.