Vectoring to mineralisation in areas of transported cover

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Transported regolith cover presents significant challenges to conventional geochemical exploration methods. Studies have documented the development of secondary geochemical dispersion haloes and mineralogical changes within transported regolith, including alluvium, gravels, volcanic ash and glacial sediments, overlying various deposit types [1]. A number of dispersion mechanisms for metals through transported cover have been proposed, including development of natural electrochemical cells, the action of biota and various mass transport processes such as dilatancy pumping and gas transport [2, 3].

Based on such dispersion models, new exploration methods are being developed and tested with a focus on two major aspects – (i) refinement in sampling media and alternate approaches to analysis, including use of selective extractions designed to physically isolate geochemical patterns that can be related to the effects of underlying mineralisation and (ii) new approaches in numerical methods designed to isolate such patterns which move beyond the historical definition of "anomalous" as being samples containing one or more variables whose values are simply higher or lower than the assumed "background" population.

The effectiveness of such methods will be considered through a number of case studies representing different regolith and mineral deposits types. This will include (i) the Cu-Au-Mo Mandamah deposit in central NSW is covered by ~50m of alluvium and the top 2 m of cover displays variable geochemical and shallow EM responses to underlying mineralisation [4] and (ii) the Osborne Cu-Au deposit in western Queensland which is covered by 30 m of Mesozoic sedimentary basin cover and where trace element dispersion from mineralisation is partly controlled by zones of ferruginisation in the cover sequence that reflect changing water table levels, along with evidence of gaseous transport of a range of materials [5]. Other example will be drawn from areas with transported cover in Chile and Canada.

[1] Cohen & Bowell (2014) *Elsevier Treatise Geochem* V.13. [2] Cameron *et al*. (2002) *Geology* **30**, 1007–1010. [3] Hamilton *et al*. (2004) *GEEA* **4**, 45–58. [4] Mokhtari *et al*. (2009) *GEEA* **9**, 227-236. [5] Rutherford *et al*. (2006). *Regolith Expressions of Australian Ore Deposits*.