Paper Number: 3206

Transported cover as an efficient medium to identify ore geochemical footprints: the DeGrussa landscape geochemical evolution

González-Álvarez, I.[1], Salama, W.[1], leGras, M.[1], Hilliard, P.[2], Beckley, R.[2]

[1]CSIRO, Mineral Resources, Discovery Program, Western Australia; Ignacio.gonzalez-alvarez@csiro.au
[2]Sandfire Resources Ltd., West Perth, 6005, Western Australia

---

The DeGrussa Cu- Au Volcanogenic massive sulfide (VMS) deposit (12.4Mt @ 4.7% Cu and 1.8 g/t Au) was discovered in 2009 in a deeply weathered landscape in Western Australia. The original sulphides were subjected to supergene enrichment. The ore is hosted in a Proterozoic volcano-sedimentary sequence (turbidites, basalts and dolerites) located in the Narracoota Formation in the Bryah Basin, on the margin of a Tertiary palaeochannel system. The in situ regolith to the west of the DeGrussa deposit is subdivided into ferruginous saprolite at depth, which vertically changes into kaolinitic saprolite, sporadically capped by a ferruginous or siliceous duricrust. This in situ regolith is overlain by a sedimentary package of weathered Tertiary palaeochannel clays, sands and magnetic gravels topped by Quaternary alluvium/colluvium that is partly silicified (Fig. 1).

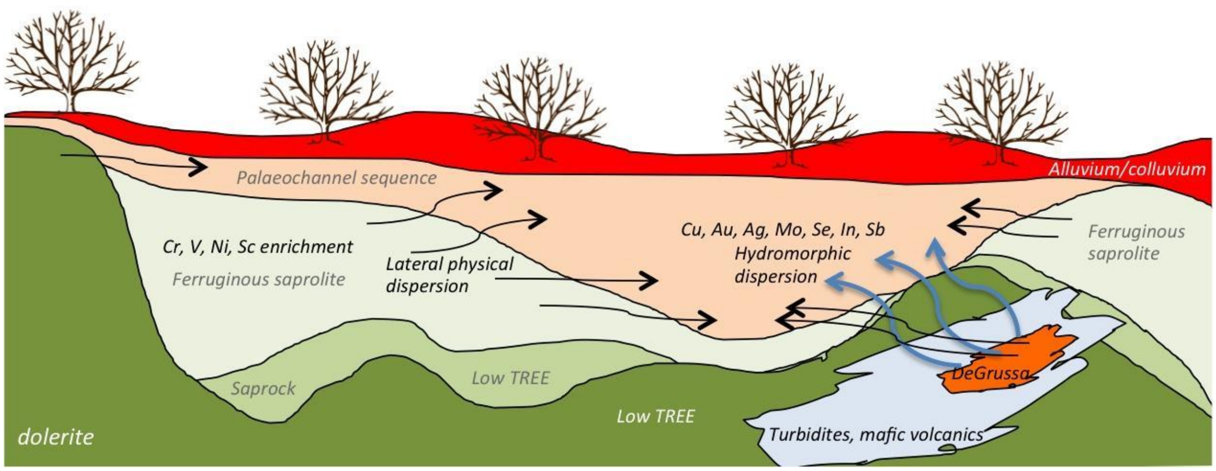

Figure 1: Suggested landscape geochemical evolution based on a main component on physical lateral geochemical dispersion of a main volumetric source of dolerite.

The geochemical footprint of the DeGrussa deposit is highlighted in the palaeochannel sedimentary package by elevated Cu, Zn, Au, and Ag concentrations, as well as significant enrichments in In, Mo, Se, Te, Bi, As, Cd and Co. Positive Cu, Au, Ag, Mo, Se, In and Sb anomalies are also present. Though, it remains uncertain where the anomalous signature is sourced from: if it is partially masked by the combination of similar geochemical features present in the basement rocks, the weathering intensity of the sediments or the cannibalistic nature of the sedimentary system. However, the Tertiary channel clays display strikingly depleted values of total REE (TREE) content, which can be used to help establish the source of the metal anomolies. Clay minerals are a more important host for REE than heavy minerals themselves. REE are carried as suspended load instead of being dissolved, and therefore REE are transferred in bulk from the source. During this process, clays are enriched in TREE. Average Post-

Archaean Australian shales have a TREE value of 183 ppm. The Quaternary alluvium/colluvium unit displays 115 ppm TREE average value whereas the mottled and channel clay units present TREE average values of ~60 and 90 ppm respectively. This TREE value is difficult to explain with precursor sources such as: turbidites (~110 ppm TREE), siltstones (~185 ppm), mafic volcanics (~175 ppm), gabbro (~130 ppm) and black shales (~280 ppm TREE). Conversely, the dolerite TREE average value is ~35 ppm. Though, this would be explained if the palaeochannel clay units were mostly derived from weathering of proximal dolerite with no exposure to transport and mixing with other weathering products (Fig. 1). This implies that the metal geochemical footprint observed in the palaeochannel is related to DeGrussa mineralisation. Therefore, the transported cover is an effective medium to detect geochemical signatures of mineral deposits in this type of landscape context.