A Comparison of Regolith Developed in the Yilgarn and Capricorn Regions of Western Australia and Implications for Mineral Exploration

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Regolith can present a number of exploration problems but through mechanical and chemical dispersion it can potentially yield larger exploration targets than the mineralization itself. A detailed understating of the regolith is therefore necessary to increase exploration success. The Capricorn region of Western Australia is relatively underexplored and the regolith formation and evolution on a regional scale have received comparatively little research attention. As part of the Uncover Initiative, this study aims to establish models for landform development in the Capricorn. This builds on many years worth of understanding of regolith development from the Yilgarn Craton. These models combined with regional transects and detailed deposit case studies help define the exploration sample media best suited to different regolith environments. The comparison between the relatively well studied Yilgarn Craton and the Capricorn region highlights the major variations in regolith and landforms and indicates why different sample media must be considered optimal for each region.

The initial results from the Capricorn study have shown that the major landforms are composed of colluvial and alluvial plains, large areas of exposed sedimentary basin rocks and heavily dissected regions where calcretes (caliches) are commonly exposed. The major landforms of the Yilgarn are dominated by deeply weathered profiles, paleochannels, colluvial and alluvial plains and some exposed, highly weathered bedrock. Deep weathering in the Yilgarn Craton has affected most of the geological provinces that make up the region and the weathering mantle can be up to 150 m deep. The regolith profiles of the Capricorn region are in the main, thinner and less well developed than the Yilgarn Craton. Weathering is less extensive, leading to a decrease in the dispersion of geochemical signatures representing mineral deposits. Targets are therefore smaller and the media used for exploration will vary, with soil sampling (<54 μm size fraction), the best choice for geochemical sampling in many regions except where erosion rates are high.

Ferruginisation is common within the Yilgarn regolith and is developed in residual and transported materials, these oxides are associated with elements such as Cu, Cr, W, Ni, As, Cd and therefore when in situ are used as a sample medium. The northern Capricorn lithologies are dominated by sediments and therefore ferruginisation is much less common in this area. Iron oxide bearing regolith is therefore not as prevalent and its use as an exploration tool is limited. Secondary manganese oxides are however, much more common in the Capricorn region and may provide an alternative to iron oxides in some areas.

There is much still to learn about the evolution of the regolith of the Capricorn region but a comparison of regolith development with the Yilgarn highlights the major differences already established and how these effect mineral exploration strategies.