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Fresh Interpretation of PGE-Ni-Cu-Coo Mineralisation in the Northern Limb of the Bushveld Complex

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The Northern Limb of the Bushveld Complex, South Africa, is host to one of the Earth's largest resources of platinum-group elements (PGE), along with significant Ni, Cu and Co. The limb is best known for the world class Platreef deposit. Located in Critical Zone stratigraphy, the Platreef is a complex marginal style PGE-Cu-Ni-Co deposit, comprised of a series of pyroxenite sills resting upon variable Archean-Paleoproterozoic country rocks. Whilst substantial research has been undertaken on the near surface Platreef resources and its variability along strike, it is now possible to study the deeper Critical Zone. As mining and exploration activities advance to deeper levels, it is becoming evident mineralisation in the Critical Zone is not only restricted to the PGE rich Platreef that has been mined at surface. Base metal sulfide (BMS) enriched units, chrome units and multiple PGE units have been observed in the deeper Critical Zone, with deeper Critical Zone mineralisation flattening out and thickening in places, transposing into a more stratiform reef-style mineralisation with significant PGE grade.

It is well established that both magmatic and fluid processes have played a part in developing the highly variable mineralisation along strike of the Platreef, however these processes are poorly understood in the deeper Critical Zone's mineralisation history, as is the observed layering of PGE, BMS and chrome units. This ongoing study integrates mineralogical studies, PGM and sulfide studies, bulk rock geochemistry and S isotopes to further unravel the nature and genesis of what is one of the world's greatest ore deposits. Additionally, this will aid in assessing the different processes, magmatic (fractionation), contamination and hydrothermal, which are responsible for the variability of mineralisation and metal budget within the Critical Zone.