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Recognition of similarities between the Critical Zone and deep Platreef (Bushveld Complex)

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Reef-style PGE sulfide mineralization is a typical constituent of layering in the ore-bearing intrusions. Reefs are laterally persistent thin layers that are highly enriched with PGE relatively to the underlying and overlying rocks. This type of mineralization contrasts to zone of dissemination, veins and massive sulfide bodies which occurrence is structurally controlled and mostly unconformable to igneous layering. The Critical zone of the western and eastern limb carries the reef style mineralization that contrasts to the Platreef that contains all these different types. The Merensky reef in all its diversity is believed to form as a result of several major influxes [1] that were enriched in PGE by a different degree and deposited layers of different compositions with common erosional contacts with their footwalls and roofs. The most convincing evidence on multiple injections came from the northern limb. The northern limb is a cross-cutting elongated body that strikes north and steeply dips west gradually becoming flatter at depth. The Platreef is composed by coalescing multiple intrusions, which themselves might be complex multiple sills or magmatic conduits, locally separated by contact-metamorphosed sedimentary autholiths [2]. The composite structure of the Platreef determines that its PGE reef horizons cannot be accumulated from above or concentrated from beneath as they are localized in relatively thin intrusions unconformable with the overlying and underlying sequences.

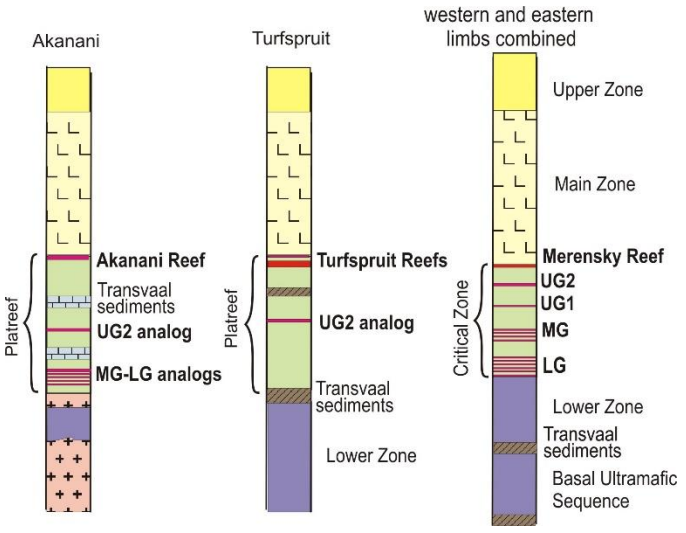

Figure 1. Schematic comparison of the stratigraphy of the Critical Zone and the deep Platreef at Turfspruit and Akanani

Here, we provide petrographic, geochemical and isotope evidence on the deep Platreef in Turfspruit and Akanani proving that the deeper undisturbed sections have much more in common with the Critical Zone than with the shallow Platreef as seen from Sandsloot to Overysel. The cyclicity of the deep Platreef closely corresponds to the cyclicity of the Critical Zone with the PGE reefs, located near the boundary with the Main Zone, and being the thickest among known in Bushveld. The zonal distribution of platinum group elements and minerals in the main platinum reef of the flat Platreef supports its orthomagmatic crystallization in situ whereas an additional PGE reef in the uppermost cyclic unit is characterized by unusual geochemical characteristics with an elevated proportion of gold. PGE tenor of sulfides and PGE content in major sulfides in the deep Platreef are within the same range of the typical Merensky values suggesting that the same enrichment process

controls their formation. A key feature that marks a conversion of the Platreef-style mineralization into the Merensky style is an appearance of regular chromite seams, which became more persistent with a depth where degree of contamination decreases.

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References:

Naldrett A J et al. (2009) J Petrology 50:625-659

Kinnaird J A (2005) Appl Earth Sci 114: 225–242