

Strontium isotope stratigraphy of the Platreef: a tool for correlation with the rest of the Bushveld Igneous Complex

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The Bushveld Igneous Complex (BIC), South Africa, hosts several PGE-rich units namely the Merensky Reef, the UG2 chromitite and the Platreef. The stratigraphy that includes the Merensky Reef and the UG2 chromitite has been widely used in the Eastern and Western Limbs of the BIC. In contrast, the Platreef, which is located in the Northern Limb of the BIC, is included within a different stratigraphy and correlation to the Eastern and Western Limbs is not well established. This alternative stratigraphy was created to accommodate the difference in mineralization of the Platreef, which is significantly thicker than the Merensky Reef (e.g., 10-400 m compared to 0.5-1 m) and is typically in contact with host rocks. Owing to its closer proximity to the footwall rocks, some models suggest that the mineralization in the Platreef formed by different processes than those responsible for the mineralization in the Eastern and Western Limbs. Despite the differences in mineralization processes, there is geological evidence to suggest that the Platreef may be a stratigraphic continuation of the Merensky Reef. Several studies in the Eastern and Western Limbs have shown that initial strontium isotopes (i.e., $^{87}\text{Sr}/^{86}\text{Sr}_i$) have distinct shifts across the stratigraphic profile. This includes a gradual shift through the Merensky Reef from $^{87}\text{Sr}/^{86}\text{Sr}_i = 0.7065$ roughly at its base, to $^{87}\text{Sr}/^{86}\text{Sr}_i = 0.7077$ above the Merensky Reef. The shift in $^{87}\text{Sr}/^{86}\text{Sr}_i$ is presumably linked to pulses of magma with variably assimilated material during ascent through the crust before entering the magma chamber, thus, having a different initial strontium isotope ratio. However, these shifts in $^{87}\text{Sr}/^{86}\text{Sr}_i$ have also been linked to in-situ contamination of the magma by the wall-rock or a combination of these processes. Regardless of the process, the shift in initial strontium isotopes is a potential tool to assess the possible correlation between the Platreef and the Merensky Reef. Previous studies have been inconclusive because of the lack of data on samples below the Platreef. Ivanplats' deep drilling in the Northern Limb, away from the footwall, provided suitable samples because they retrieved igneous stratigraphy extending a few hundred meters below the Platreef. This means that testing the possible correlation of the Platreef with the Merensky Reef using strontium isotope stratigraphy is now possible.