

The discovery of the Ondurakorume carbonatite, Namibia: Insights on Exploration of Critical Metals (REE) in Australia

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The demand for rare earth elements (REE) is increasing along with green energy for high technology products. Exploring REE-related deposits has been prioritised as part of national and global critical elements strategies. Carbonatites are enriched in REE but are among the rarest lithologies on Earth with only ~530 globally identified.

This study reviewed and evaluated the dataset generated and used during the exploration of the Ondurakorume carbonatite, Namibia. As this region, like so many around the world, is characterised by extensive cover and intensely weathered bedrock, it can be used as a case study to identify which datasets are useful in the potential discovery carbonatites and to apply findings to develop a mineral exploration workflow for carbonatites in areas of cover (i.e. Australia, Brazil, and India).

When combined with published literature, the most useful exploration proxy for initial target definition of a carbonatite is its circular-like geometry detected in aerial photographs. However, the confirmed identification of the carbonatite was by visual on-ground inspection during field work and geochemical analysis. Fertilisation was the main proxy to target REE enrichment and estimate potential ore resources, and was used during the drill programs to target the REE ore. Geophysical datasets (magnetic, radiometric and gravity) were used to define the carbonatite complex extension at depth. Ondurakorume was initially explored for targets other than REE- notably phosphates. Exploration targets are linked to changing commodity needs and prices over time. This study proposes a workflow for carbonatite exploration at a tenement scale based on the above. Boots on the ground are always needed to confirm an exploration target is a carbonatite. While geochemistry was useful in indicating REEs associated with the carbonatite, weathering made metallurgical testing difficult. The Ondurakorume carbonatite exploration-discovery workflow-exploration vectors can be used globally in regions with similar landscapes and regolith contexts.

Figure 1. Simplified Geological Map of Ondurakorume, with lithology adapted from [1]. Background is from Google Earth satellite imagery.

[1] PRINS, P. 1981. The geochemical evolution of the alkaline and carbonatite complexes of the Damaraland igneous province, South West Africa. *Annale van die Universiteit van Stellenbosch*,

