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Regolith Geochemical Studies in Kimberlitic Terrain: A Case Study from Lattavaram Kimberlite Cluster, Eastern Dharwar Craton, Southern India

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Utility of geochemistry in mineral exploration is known since more than half-a-century. In reconnaissance diamond exploration, regolith geochemistry is a well known tool worldwide and helps in distinguishing bedrock geology in hard rock terrains. More than 100 kimberlite pipes were discovered so far in the Eastern Dharwar Craton (EDC) of South India by various public and private organizations. Within the EDC, majority of diamondiferous pipe clusters occur in Anantapur District of Andhra Pradesh state in India. Lattavaram kimberlite cluster (LKC) is one among them in this district and four pipes in this cluster are reported to be diamondiferous along with two kimberlite bodies at Muligiripalli. The kimberlite pipes at Lattavaram occur in semi-circular shape whereas a kimberlite body exposed at Muligiripalli village occurs as a dyke within the granitoid country. The pipe 4 at Lattavaram exhibits conspicuous difference in the soil color and texture i.e., greenish color and mottled texture when compared with the reddish brown compact residual soils of granitic country rock. In the Indian context, soil regolith geochemistry is not a popular subject in search of kimberlites. It is observed that little or no

literature is available on the utility of regolith geochemistry applied to kimberlite or diamond exploration in India. An attempt is made in this study, to demonstrate and understand the spatial surface geochemical signatures using residual soil geochemistry on known kimberlite pipes viz., 3 and 4 of LKC. Spatial and statistical analysis of trace and rare earth elements revealed that certain elements show predominance in the vicinity of the kimberlite pipes which can act as an exploration guide in distinguishing kimberlitic rocks within a granitoid country. These elements show distinct variation in their dispersion in the soil which can be attributed to basement lithology. It is observed that elements like Cr, Ni, Co, Cu, Nb, Zr, Ti, Ba and rare earth elements (REE) are significantly enriched in the mottled zone and calcretized duricrust relative to the country rock granitoids. A suite of trace elements comprising those associated with ultramafic rocks (Cr, Co & Ni) and felsic rocks (Nb, La, Sm and P) can readily distinguish the ultramafic/kimberlitic regolith from that derived from granitoid or felsic rocks which can be used as an exploration path finder.

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