

Barberton type meta-komatiites from Singhbhum craton, India: A window into Paleoproterozoic mantle

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Geochemistry of new finds of Barberton-like, Paleoproterozoic meta-komatiites from the Badampahar-Gorumahisani belt (Iron Ore Group, IOG), eastern Singhbhum craton, India is reported here. Constrained by age of intrusive granites, Badampahar IOG is >3.4 Ga old. Karanjharan occurrence, one of the oldest spinifex textured komatiites, is marked by 10 cm to 1.4 m thick subvertical flows of komatiite, stacked one above other to a 50 m thick pile, constituting the lower IOG greenstone succession. Individual, thicker flows show a thin granular massive base (cumulate) grading through a zone of very coarse, bladed skeletal olivine crystals to fine spinifex textured komatiite in the middle to upper part and topped by a thin fine-grained chilled margin. The Karanjharan komatiites are largely serpentinized and in some outcrops, the komatiite flows grade to high-Mg pillow basalt indicating submarine eruption. The analysed komatiites show high MgO (25 – 35%), and significantly high concentrations of compatible elements— Ni: 1300–2210 ppm; Cr: 1140–1650 ppm. The granular massive varieties in individual flows are consistently more magnesian compared to the top spinifex textured part. With high Mg concentration, $\text{CaO}/\text{Al}_2\text{O}_3 \sim 2.3\text{--}7.3$, $(\text{Gd}/\text{Yb})_{\text{N}} = 1.94\text{--}2.83$, subchondritic $\text{Al}_2\text{O}_3/\text{TiO}_2 \sim 4\text{--}6$, nearly flat LREE, and slightly fractionated and relatively depleted HREE, Karanjharan samples are comparable to Paleoproterozoic Al-depleted (ADK) Barberton komatiite. Given the unusually high melting temperatures of ADK komatiites, the source for Karanjharan komatiites was probably deep mantle with garnet residue. Emplacement of plume-related peridotitic komatiite lava heralded supracrustal basin formation in TTG dominated crust of the Hadean to Paleoproterozoic Singhbhum cratonic nucleus.