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Petrogenesis of Paleoproterozoic Mafic Dykes from the contact of Bastar Craton and Eastern Ghat Mobile Belt (EGMB), India: Implications for source characterization and recycled crustal component

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Precambrian mafic dyke swarms from the cratonic regions of the world are significant to understand the crust-mantle interaction and evolution of the Earth's mantle. The Paleoproterozoic (~1.88 Ga) mafic dykes from the contact of the Bastar Craton and the Eastern Ghats Mobile Belt of the Indian Shield are characterized by the presence of 10-15 modal % primary hydrous phases like amphibole and mica indicative of their calc-alkaline affinity and a hydrous nature of the mantle source. Geochemically these dykes show a moderate enrichment of light rare earth elements and an enrichment of large ion lithophile elements over the high field strength elements. A conspicuous negative anomaly of Nb-Ta-Ti and Zr-Hf coupled with an enrichment of Pb on the primitive mantle normalized multi-element diagram indicates a recycled crustal component in the mantle sources of these rocks. Elevated Ba/Yb ratio and moderately unradiogenic εNd_t, εHf_t (2 to -5.01 and - 3.2 to -11.2), along with the positive $\gamma Os_{(t)}$ [192 to 727; high Re/Os ratio (3.3 to 34.1) are consistent with their enriched nature revealing a subduction-related metasomatized mantle source. The $^{206}Pb/^{204}Pb$ vs $^{207}Pb/^{204}Pb$ and $^{206}Pb/^{204}Pb$ vs $^{208}Pb/^{204}Pb$ variation follows a global orogenic trend and is similar to the continental crust composition, supporting a significant role of recycled crustal component in their origin. We propose that the ~1.88 Ga mafic dykes of the Bastar Craton have been derived from a long-lived enriched source tapping an EM-1 type reservoir formed as a result of hydration from subducted slab-derived fluids. The origin of the source and the emplacement of these dykes is likely associated with the Neoarchean accretional growth of Craton and plate reconstruction of the Columbia supercontinent.