Goldschmidt 2025 Abstract
https://doi.org/10.7185/gold2025.27207

Paleo-Mesoarchean depleted mantle slivers from the Holenarsipur Greenstone Belt, Western Dharwar Craton, South India

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The Dharwar Craton in South India is a classic Archean terrain that preserves a comprehensive record of Paleo-Mesoarchean geological processes. However, the sparse preservation of Archean ultramafic rocks due to extensive erosion, burial, or recycling into the mantle poses a challenge in tracing the depleted Archean mantle remnants. The study presents the complex evolutionary history of one such well-preserved harzburgite from the cratonic core of the Western Dharwar Craton (WDC) namely the Holenarsipur Greenstone Belt (HGB).

The ultramafic rocks from the HGB are serpentinized harzburgites, where the primary mineralogy has been extensively replaced by serpentine polymorphs. The absence of cumulate texture, mantle-like composition of relict olivine (Fo = Fo_{91}–Fo_{95}), and whole-rock geochemical characteristics (Ni = avg. 1156 ppm; Cr = avg. 1839 ppm; Mg/Si >1.2; Al/Si <0.1; Ce/Sm_N >1), indicate that these harzburgites represent remnants of the Archean mantle rather than crustal cumulates. The gently sloping to flat REE pattern of harzburgite (La/Sm_{cn}=0.53-2.88; Gd/Yb_{cn}=0.69-1.99) suggests a slightly depleted, less fractionated mantle source. The whole-rock and neodymium isotopic compositions with positive $\varepsilon Nd_{(t=3300Ma)}$ values (+0.32 to +8.39) further affirm the depleted mantle characteristics.

The highly depleted εNd_t values indicate that the HGB harzburgite represents vestiges of a depleted mantle reservoir beneath the cratonic core of the Western Dharwar Craton (WDC) dating back to the Paleo- to Mesoarchean offering vital insights into early mantle evolution.