Neoarchaean arc-back- arc magmatism: geochemical fingerprints from the mafic intrusions of the Shimoga greenstone belt, western Dharwar Craton, India

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We report a new whole-rock geochemistry of metagabbros and metabasalts from the Koppa-Herambapura areas, southern Shimoga greenstone belt, western Dharwar Craton, India and addressed their petrogenesis and geodynamic setting. Mineral and whole-rock geochemical characteristics classify them as basaltic-basaltic andesite compositions with sub-alkaline tholeiitic in nature. Trace element characteristics of both the rock type has uniform depletion in HFSE relative to LILE-LREE enrichment, higher LILE/HFSE and LREE/HFSE ratios (La/Nb =1.30-8.07, Nb/Ta =11.58-16.19, Zr/Sm =10.24-29.77) and negative Nb-Ta, Zr-Hf and Ti anomalies in multielement patterns, suggesting signature of magmatic arc generated in an intraoceanic subduction environment. The Nb/Th (2-15), Zr/Sm (10-29) and Zr/Hf (44-233) ratios indicates a depleted to enriched mantle source. The metagabbros were derived from depleted and unmodified MORB-type mantle melting in an arc regime within spinel peridotite compositional domain, whereas metabasalts had a mantle source attributed to (i) development of juvenile back-arc rift close to a subduction zone (ii) upwelling of MORB-like mantle (iii) followed by its metasomatism through influx of hydrous fluids and sediments derived from subduction and (iv) flux-induced melting in the compositional domain of spinel-garnet peridotite stability field. Tectonic implications based on comparision with worldwide occurances suggest that the mafic magmatic rocks of the southern SGB represent one of the earliest Neoarchaean arc-back arc subduction systems in the western Dharwar Craton (WDC), similar to recently reported arc magmatism of Archaean and Phanerozoic subduction regimes.