

Paleoarchean (~3.3 Ga) crustal evolution of eastern Iron Ore Group greenstone metavolcanics, Singhbhum craton, India: constraints from trace element, Sr and Sm-Nd isotopes

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Archean greenstone belts in Singhbhum craton remain controversial regarding their time of formation and petrogenesis [1]. Trace element, Sr and Sm-Nd isotopic analyses of metavolcanics from the hitherto undated eastern Iron Ore Group (IOG) were carried out to provide constraints on magma source and timing of eruption. Sampled metavolcanics include dominant basalt and minor basaltic andesite, interbedded with komatiite. Immobile trace element plots indicate tholeiitic nature of metabasalt ($[La/Yb]_{CN} = 1.45-1.96$, $Eu/Eu^* = 0.88-0.90$, $Nb/Nb^* = 0.64-0.84$, $Zr/Zr^* = 0.70-1.0$) and calc-alkaline affinity of the basaltic andesite ($[La/Yb]_{CN} = 1.16-1.60$, $Eu/Eu^* = 0.66-0.74$, $Nb/Nb^* = 0.76-0.93$, $Zr/Zr^* = 0.98-1.23$). Interestingly, two of the analyzed komatiite rocks are alumina undepleted (AUK, $[La/Yb]_{CN} = 0.97-10.99$, $Eu/Eu^* = 0.58-1.65$, $Nb/Nb^* = 0.91-1.66$, $Zr/Zr^* = 1.85-14.53$) whereas the third is alumina depleted (ADK, $[La/Yb]_{CN} = 2.49$, $Eu/Eu^* = 0.87$, $Nb/Nb^* = 0.37$, $Zr/Zr^* = 1.42$). Metavolcanic $^{143}Nd/^{144}Nd$ ratios range between 0.510566 and 0.512619 and $^{147}Sm/^{144}Nd$ vary between 0.0956 and 0.1894. A whole rock Sm-Nd isochron regressing these metavolcanics, yielded an age of 3292 ± 92 Ma (2σ) with $Nd_i = 0.50848 \pm 0.00010$, $MSWD = 2.2$ ($n=7$), $\epsilon_{Nd(t)} = +2.4$ and depleted mantle model ages between 3.15 Ga and 3.54 Ga. Their measured $^{87}Sr/^{86}Sr$ ratios vary from 0.70180 to 0.70978. A single, zoned magmatic, detrital zircon extracted from intercalated carbonaceous chert has a ^{207}Pb - ^{206}Pb age of 3466 ± 21 Ma, indistinguishable from such U-Pb zircon crystallization ages reported from the earliest phase of the Singhbhum granitoid and that of the Older Metamorphic Tonalitic Gneiss [2]. A volcanic arc affinity of these tholeiitic to calc-alkaline metavolcanic rocks from the eastern IOG greenstone, therefore, supports Paleoproterozoic formation in an arc tectonic setting proximal to pre-existing felsic crust.

[1] Majumdar et al. (2012) *Geol. Soc., London*, **365**, (31-49)

[2] Upadhyay et al. (2014) *Precamb. Res.*, **252**, (180-190)