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Geochemical and Nd, Sr, stable Ca isotopic study of komatiites from the Dharwar Craton, India

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Komatiites are unique ultramafic (MgO > 18 wt %) volcanic rocks occurring mostly in Archean greenstone belts. In this study, we present geochemical, and Sr, Nd and stable Ca isotope data, for komatiites from Sargur Group J.C.Pura, greenstone belt, western Dharwar Craton, India. The studied komatiites have suffered greenschist to lower amphibolite facies metamorphism. Spinifex to cumulate texture can be identified in the komatiite lavas while relict olivine crystals are observed in thin sections.

Geochemical measurements were performed using single collector quadrupole ICPMS (Thermo Scientific X-Series II). Radiogenic Sr ($^{87}Sr/^{86}Sr$) and Nd ($^{143}Nd/^{144}Nd$) were measured using TIMS (Thermo Scientific, Triton Plus), using internal normalization while stable Ca isotopes ($\delta^{44/40}Ca$, reported relative to NIST SRM 915a) were measured using a double spike (^{43}Ca-^{48}Ca) TIMS technique. Both geochemical and isotopic measurements were performed at the CEaS, IISc. All J.C.Pura komatiites display flat REE patterns expect two samples which show LREE enrichment. The LREE enrichment can be attributed to fluid induced alteration and (or) metamorphism. The komatiites display unperturbed and chondritic Y/Ho = 29.2 $\pm$ 1.66. The present day $^{143}Nd/^{144}Nd$ ratios range from 0.511307 – 0.514026 (n=10) and initial e_{Nd} (t = 3.38 Ga[1]) values suggest derivation primarily from a depleted mantle source. The Rb-Sr systematics have been perturbed by alteration and metamorphism with Rb/Sr ratio rising as high as 1 and present day $^{87}Sr/^{86}Sr$ = 0.704824 – 0.733213 (n=7). Komatiites form from high degree of partial melting of the deep mantle and hence, prove to be a unique archive to study the stable Ca isotopic composition of the Archean mantle. Additionally, the low K/Ca ratio of the komatiites (K/Ca = 0.003–0.015) makes it possible to measure $\delta^{44/40}Ca$ without correcting for radiogenic ingrowth of ^{40}Ca from radioactive decay of parent ^{40}K. Preliminary $\delta^{44/40}Ca$ values of the komatiites lie between 0.97‰ – 1.05‰ (n=4), which broadly overlaps with the $\delta^{44/40}Ca$ composition of the Bulk Silicate Earth (BSE, $\delta^{44/40}Ca_{BSE}$ = 0.94 $\pm$ 0.05 ‰) and consistent with earlier reported $\delta^{44/40}Ca$ values of komatiites[2].

[1]. Jayananda et al. (2008), *Precambrian Research*, *162*(1-2), pp.160-179. [2]. Amsellem et al. (2019), *Geochimica et Cosmochimica Acta*, *258*, pp.195-206.