

## Significant variation in stable Ca isotopic ( $\delta^{44/40}\text{Ca}$ ) composition of global carbonatites: role of mantle mineralogy and subducted carbonate

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Stable calcium isotopic composition ( $\delta^{44/40}\text{Ca}$ ) of silicate rock standards show limited variability [c.f., 1] although, fractionation between co-existing ortho- and clino-pyroxenes have been reported [2]. Variability in  $\delta^{44/40}\text{Ca}$  in Hawaiian shield stage tholeiites have been interpreted as evidence of subducted ancient marine carbonates, with very low  $\delta^{44/40}\text{Ca}$ , into the Hawaiian plume [3]. Carbonatites are unique mantle-derived carbonate-bearing igneous rocks with limited spatial but wide temporal occurrences. Few available measurements ( $n=5$ ) of  $\delta^{44/40}\text{Ca}$  in whole rock and leached carbonatites show a 0.2 ‰ range but broadly overlapping values with mantle-derived silicate rocks from different tectonic settings [1,4]. However, boron isotopic composition of global carbonatites suggest the contribution of subducted crustal component to the mantle source of relatively young carbonatites (<300 Ma old) [5], a signature which should potentially be traceable using Ca isotopes.

We report  $\delta^{44/40}\text{Ca}$  of global carbonatites ranging in age from Proterozoic to recent. The samples were analyzed using a  $^{43}\text{Ca}$ - $^{48}\text{Ca}$  double spike on a Thermo Fischer Triton Plus Thermal Ionization Mass Spectrometer (TIMS) at IISc.  $\delta^{44/40}\text{Ca}$  in the carbonatites ( $n = 11$ ) range from 0.47 - 0.97 ‰ (w.r.t. SRM 915a). Our external reproducibility, estimated from multiple analyses of NIST standards SRM 915a, SRM 915b and seawater (NASS6), is better than 0.1 ‰ (2SD).  $\delta^{44/40}\text{Ca}$  of the ~65 Ma old Ambadongar carbonatites of India, associated with eruption of the Deccan Traps, show correlations with Nb/Yb, K/Rb as well as with Sr/Nb, Sr/Zr. These variations suggest the role of phlogopite versus amphibole in the mantle source as well as subducted carbonates in controlling the  $\delta^{44/40}\text{Ca}$  of these carbonatites.

[1] Feng et al., 2016, *Geost. Geoanal. Res.* doi:10.1111/ggr.12131 [2] Huang et al., 2010, *Earth. Planet. Sci. Lett.*, 292, 337-344 [3] Huang et al., 2011, *Geochim. Cosmochim. Acta*, 75, 4987-4997; [4] Amini et al., 2009, *Geost. Geoanal. Res.*, 33, 231-247; [5] Hulett et al., 2016, *Nature Geosc.*, 9, 904-910