Stable Sr isotopic study of Himalayan leucogranites

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Strontium is a lithophile element with four stable isotopes: ^{84}Sr, ^{86}Sr, ^{87}Sr and ^{88}Sr. Conventional radiogenic Sr isotope measurements of $^{87}Sr/^{86}Sr$ (using TIMS or MC-ICP-MS) are corrected for instrumental mass fractionation by assuming a value for the $^{88}Sr/^{86}Sr$ ratio of 8.375209. This internal normalisation permits the measurement of $^{87}Sr/^{86}Sr$ ratios to a very high precision. However, the use of this fixed value assumes the ratio is invarient in nature. Thus, use of a fixed value for $^{88}Sr/^{86}Sr$ for internal normalisation not only obscures the signature of natural mass-dependent fractionation, but also precludes the direct comparison of $^{87}Sr/^{86}Sr$ ratios in materials with disparate $^{88}Sr/^{86}Sr$. Moynier *et al*. [1] and Charlier *et al*. [2] presented stable Sr data for a variety of terrestrial, and concluded that whilst the majority of samples lie within error of BSE ($\delta^{88/86}Sr = +0.29‰$), a range of more evolved rhyolite tuffs from unrelated volcanic centres recorded lower (lighter) values of $\delta^{88/86}Sr$, as low as -0.2‰. These findings demonstrated to a first order that there may be potential in $\delta^{88/86}Sr$ variations in igneous systems to track magmatic processes. Here, we present $\delta^{88/86}Sr$ and $\delta^{84/86}Sr$ data determined using double spike TIMS and Zr-doped MC-ICP-MS techniques to investigate a related suite of granitic rocks.

This study investigates Miocene leucogranites from Bhutan, in the eastern Himalaya. These rocks represent pure crustal melts formed during orogenesis from 30 to 10Ma. We find a range in $\delta^{88}Sr$ larger than any recorded thus far, with samples varying from -0.61‰ to +0.65‰ $\delta^{88/86}Sr$, deviating to both lighter and heavier Sr isotope compositions relative to BSE. These data will be presented along with major and trace element abundances in the same samples to determine the mechanisms for stable Sr fractionation. Our data clearly demonstrate that the stable Sr system has huge potential as a tracer of processes both in igneous and crustal systems.

[1] Moynier et al. (2010) *EPSL*, **300**, 359-366. [2] Charlier et al. (2012) *EPSL,* **329-330,** 31-40.