

Radiogenic Sr isotope behavior during tropical basalt weathering

SHIVAM SAHU¹, SATINDER PAL SINGH¹ AND KUMAR BATUK JOSHI²

¹Indian Institute of Science Education and Research Bhopal

²National Centre for Earth Science Studies

Inverse coupling of radiogenic Sr-Nd isotopes is widely used for sediment provenance. Preferential release of radiogenic Sr owing to rapid biotite weathering of granitic materials has been reported previously [1]. This study explores the weathering sensitivity of radiogenic Sr isotopes from a basaltic lithology devoid of biotite. For this purpose, CIA and $^{87}\text{Sr}/^{86}\text{Sr}$ have been determined in the bedrock ($n = 3$) and fine lithic materials of 3 different grain-sized fractions ($<20\text{ }\mu\text{m}$, $<5\text{ }\mu\text{m}$, and $<2\text{ }\mu\text{m}$) separated from the soil ($n = 5$) and saprolite ($n = 10$) samples. The samples were collected from a small basaltic watershed of Dhoni Lake in Raigad (Maharashtra). The vertical profiles (2–8 m) of CIA and $^{87}\text{Sr}/^{86}\text{Sr}$ in respective grain sizes (55–93 and 0.70684–0.71174 in $<20\text{ }\mu\text{m}$, 67–94 and 0.70721–0.72539 in $<5\text{ }\mu\text{m}$, and 78–97 and 0.70954–0.73614 in $<2\text{ }\mu\text{m}$) show dramatically covarying distributions. $^{87}\text{Sr}/^{86}\text{Sr}$ shows significant deviations from the bedrock composition (0.70659–0.70766) in the finer fractions ($<5\text{ }\mu\text{m}$ and $<2\text{ }\mu\text{m}$ in the soil and $<2\text{ }\mu\text{m}$ in saprolite samples). This study highlights weathering-controlled grain-size effects on radiogenic Sr isotopes since UCC contribution of $<6\%$ in finer fractions is revealed based on radiogenic Pb and Nd isotopes.

Reference:

[1] Blum, J.D., Erel, Y., 1997. Rb-Sr isotope systematics of a granitic soil chronosequence: The importance of biotite weathering. *Geochim. Cosmochim. Acta* 61, 3193–3204.