Sulfur isotope systematics in carbonatites from Sevattur and Samalpatti, S India

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We report preliminary data for sulfur isotopes from two spatially related Neoproterozoic carbonatite complexes in Tamil Nadu, S India, with the aim of getting further insights into their magmatic and/or post-emplacement histories [1]. The major sulfide phase in these rocks is pyrite, with minor chalcopyrite, whereas sulfate occurs as barite. A bimodal distribution of $\delta^{34}S_{sulfide}$ is found for Samalpatti (13.5 to 14.0‰), and Sevattur (−2.1 to 1.4‰) carbonatites. A significantly larger range of $\delta^{34}S_{sulfide}$ values is found for the associated Samalpatti silicate rocks (−5.2 to 7.4‰) relative to Sevattur pyroxenites and gabbros (−1.1 to 2.1‰). High $\delta^{34}S_{sulfide}$ values for Samalpatti carbonatites are unsual [2,3] but could reflect hydrothermal post-emplacement modification [1] of S isotopes. The low $\delta^{34}S_{sulfide}$ values for Sevattur may represent a mantle source signature. The $\delta^{34}S_{sulfate}$ is uniformly positive for both complexes, with most data falling in a narrow range (5.7 to 7.8‰) and one datum for a pyroxenite yielding more positive $\delta^{34}S_{sulfate}$ = 13.3‰.

Data for $\Delta^{33}S$ varies outside of analytical uncertainty (−0.07 to 0.04‰), indicating contribution from a source with a surface-derrived component. The small range of $\Delta^{33}S$ values does not allow us to determine whether these sources contain S fractionated by biogeochemical (mass-dependent) or photochemical (mass-independent, pre GOE) processes. Data for $\Delta^{36}S$ is positive, and varies within uncertainty (0.28 ± 0.15‰). Variations of this magnitude have been observed in other localities, and are not diagnostic of any unique source or process.

The sulfur isotope data imply addition of crustal sulfur to Samalpatti. In contrast, sulfur from Sevattur has a mantle-like $\delta^{34}S$ but $\Delta^{33}S$ with anomalous character. These observations support the idea of a different evolutionary story for these complexes, possibly more complex than previously thought.

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[1] Ackerman et al. (2017) Lithos, in press. [2] Farrell et al. (2010) Min Pet 98, 209-226. [3] Gomide et al. (2013) ChG 341, 38-49.