Re-evaluating the sulfur isotope characteristics of the Iceland hotspot

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A considerable range in $\delta^{34}S$ values has been reported for Icelandic lavas, of -2.0 to +4.2‰ [1]. No simple relationship was, however, evident between chemical characteristics, sulfur content and isotopic composition of the studied lavas, although the highest $\delta^{34}S$ values were confined to intermediate and rhyolitic rocks. Additionally, due to a potential flaw in older sulfur extraction methods (i.e., KIBA), the reliability of this dataset is questionable [2].

We have undertaken a systematic study, aimed at verifying the suitability of the KIBA method versus a newly proposed method using HF [2], to evaluate the sulfur isotope characteristics of a suite of well-characterized Icelandic subglacial basalts (n=51), with highly variable sulfur contents (50 to 1905 ppm). Replicate measurements (n=3-7 per/sample) of three selected samples, reveal a positive shift of 0.2 to 0.6‰ using KIBA, relative to values obtained from HF-extraction. Following homogeneity tests using HF-extractions only, the same suite was measured for $\delta^{34}S$ values by SIMS, using the most homogeneous sample (A35) as standard. Our preliminary data, indicated that the $\delta^{34}S$ values for the basaltic glass suite are in the range of -2.2 to -0.3‰ and -2.5 to -0.1‰ for SIMS and IRMS, respectively. No resolvable anomalies in $\Delta^{33}S$ and $\Delta^{36}S$ are observed.

Therefore, these preliminary results suggest that the KIBA method yields positively shifted isotope values, most likely due to incomplete digestion as evidenced by poor recovery during KIBA-extractions (generally ~50%). In comparison, recovery during HF-extraction, was typically 90-100%. The HF method was, however, also shown to be sensitive to incomplete recovery. Extractions with HF are therefore favored over KIBA-extractions.

[1] Torssander, P. (1989), CMP *102*(1), 18–23. [2] Labidi, J., et al. (2012). CG, *334*, 189–198.