Triple oxygen analysis of sulfate samples from the Atacama Desert, Chile

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In the hyperarid Atacama Desert (N.-Chile) sulfate is one of the major salts accumulating. The controlling sulfate sources are local sediment weathering, sea spray, volcanism, and atmospheric deposition. Sulfate deposition from these sources is distributed heterogeneously [1]. The triple oxygen isotopic composition of sulfate ($\Delta^{17}O_{SO4}$) provides insights into the relative contribution of atmospheric sources. Elevated $\Delta^{17}O_{SO4}$ is generally interpreted to reflect atmospheric oxidation of SO_2 by ozone and H_2O_2.

We have analyzed sulfate samples following the method of [2] with a few modifications. O_2 is generated by pyrolytic decomposition and measured by continuous flow IRMS. After removing residual quantities of H_2O vapor we obtain an external precision for $\Delta^{17}O_{SO4}$ of 0.05 ‰.

A remeasured soil profile (Yungay: 24°6’6.1’’S 70°1’5.8’’W) [3] confirms only limited variability of 0.15‰ in $\Delta^{17}O_{SO4}$, but shows an offset that is yet unexplained. The low variability implies a consistency in sulfate sources and in atmospheric SO_2 oxidation over the timespan of soil formation.

We are presently investigating the triple oxygen isotope composition of sulfates in surface samples from three E-W transects in the Atacama Desert - Pisaqua and Quebrada Aroma (19.3°S), Salar Grande (21.0°S) and Antofagasta (24.0°S). We observe a larger variability in $\Delta^{17}O_{SO4}$ in the surface samples, which suggests a changing atmospheric sulfate contribution.

[1] Rech et al. (2002) *Geochim. Cosmochim. Acta* **67**, 575-586 [2] Schauer et al. (2012) *Rapid Commun. Mass Spectrom.* 26, 2151-2157 [3] Ewing et al. (2008) *Geochim. Cosmochim. Acta* **72**, 1096-1110