Chlorine isotope determination by SIMS: standard development and application to melt inclusions from subduction zone settings

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The effect of recycling crust and sediments, on the composition of the mantle wedge, in particular for volatiles, is still debated. Chlorine is an important fluid mobile element. Its stable isotopes have different concentrations in the terrestrial reservoirs [1] suggesting the use of $\delta^{37}Cl$ as tracer of slab-derived fluids [1]. Olivine-hosted melt inclusions (MI) provide a first order constraint on the $\delta^{37}Cl$ of primary magmas, since they were unaffected by near surface processes. $\delta^{37}Cl$ analyses were conducted with a CAMECA IMS 1280-HR. A series of Cl-bearing glass standards with variable $\delta^{37}Cl$, and composition from basaltic to rhyolitic, were synthesized and used.

We determined that SiO_2, Al_2O_3 and K_2O are primarily responsible for the instrumental mass fractionation. We obtain $\delta^{37}Cl$ measurements with a reproducibility better than 0.30‰, 2SD and an uncertainty of 0.40‰. Our first results show that MI from Lesser Antilles, Aeolian and Vanuatu arcs range from -1.9 to +0.6‰, -3.3 to -1.4‰ and -1.7 to +0.4‰, respectively. Combined with Cl/K_2O ratios, these data suggest that for the Lesser Antilles and Vanuata arc, Cl addition mainly comes from serpentinites, whereas Cl added in the mantle beneath the Aeolian islands may originate from marine pore water-like fluids.

[1] John *et al*. (2010) *EPSL* **298**, 175-182