

# Simultaneous determination of chemical composition and stable isotope ratios of weathered mineral phases by fs-laser ablation

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Determining simultaneously the chemical composition and isotope ratios of solids at  $\mu\text{m}$  spatial resolution using fs-laser ablation (fs-LA) has the potential to significantly advance our understanding of novel stable isotope systems (e.g. Mg, Si, Fe). We employ this combination as process tracer of weathering at the Earth's surface.

Several studies at soil profile and catchment scale demonstrate that the Si isotope composition of soils, plants and riverine dissolved Si is a tracer for abiotic and/or biotic weathering processes [1]. Weathering and subsequent secondary mineral formation occurs at the nm to  $\mu\text{m}$  scale at the fluid-solid interface and produces large and variable Si isotope fractionation [2]. The isotope fractionation of Si depends on the kinetics of the reaction, the chemical composition and the structure of the reaction product [1]. Therefore, combined micro-analytical methods for *in-situ* isotope ratio and compositional analysis offer a detailed view into the processes of weathering and secondary mineral phase formation. Here we combine *in-situ* Si stable isotope ratio determination by fs-LA-MC-ICP-MS with either mass spectrometry (MS) or optical emission spectrometry (OES) for simultaneous isotope ratio and element concentration measurements.

There are two feasible possibilities: (i) LA split stream [3] where part of the aerosol is simultaneously introduced into a single collector ICP-MS (or ICP-OES) and a MC-ICP-MS or (ii) direct observation of the analytical plasma of the MC-ICP-MS using simultaneous, radial OES [4].

We are presenting and comparing both (i) LA split stream ICP-MS/OES and (ii) coupling of an optical emission spectrometer with an MC-ICP-MS.

[1] Opfergelt & Delmelle (2012), *C. R. Geoscience* **344** 723–738. [2] Schuessler & von Blanckenburg (2014), *Spectrochim. Acta Part B At. Spectrosc.* **98**, 1–18. [3] Yuan, *et al.* (2008), *Chem. Geol.* **247**, 100–118. [4] Kaczmarek, Horn, Nehrke & Bijma (2014), *Chem. Geol.* **392**, 32–42.