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An inter-comparison exercise of the Si isotope composition of soils and plant reference materials

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The use of silicon (Si) isotopes has recently led to major advances in our understanding of the mechanisms and processes that constrain the cycling of Si in modern and past environments, resulting in a significant expansion in the number of studies using Si isotopes. To date only a few inter-laboratory standards have been calibrated: a few pure SiO_2 standards and two seawater samples. In addition, a large number of published data on a few rock reference materials (especially BHVO-2 basalt) provide a good estimate of δ^{30}Si compositions for solid samples with a more complex matrix. However, the use of these standards cannot account for samples with organic matter, known to induce isotopic bias, motivating this study using soil and plant reference materials.

This inter-laboratory comparison exercise was conducted to ensure reproducibility between international laboratories investigating natural Si isotope variations in solid environmental samples. Seven laboratories from five countries analyzed four soil reference materials (GBW-07401, GBW-07404, GBW-07407, TILL-1) and one plant reference material (ERM-CD281, rye grass). The selected soils cover a wide range of SiO_2 content (33-63%) and C_{org}content (0.6-1.8%). The rye grass contains 1.3 wt% Si. All laboratories used slightly different chemical preparation methods (e.g., different procedures to destroy organic matter) or analytical conditions (e.g., with or without Mg doping) but all analysis were performed by MC-ICP-MS (Thermo Scientific™ Neptune™ or Neptune *Plus*™). The well characterized reference material BHVO-2 was also analyzed for quality control. Irrespective of the chemical preparation method, the results have similar precisions and agree well among laboratories. The average δ^{30}Si (relative to NBS-28) for TILL-1, GBW-07401, GBW-07404, GBW-07407 are - 0.15±0.08‰ - 0.28±0.10‰ - 0.75±0.14‰ and - 1.82±0.14‰ respectively, with uncertainties expressed as 2SD. The average δ^{30}Si for ERM-CD281 is - 0.35±0.12‰