Silicon isotope fractionation during soil development on basalt in tropical China

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Silicon (Si) is a link of earth surface systems. Soil system is suggested to be a key player of Si^{28}, balancing the enriched Si^{30} in ocean water and sediments [1]. However, which soil components really function is to be determined.

We studied a chronosequence consisting of six basalt-derived pedons in Hainan Island of tropical China, with age ranging from 10Ka to 1.8Ma. We analyzed the biogenic silicon (BSi) content and other related properties of soils, and detected the silicon isotope features of main silicon fractions.

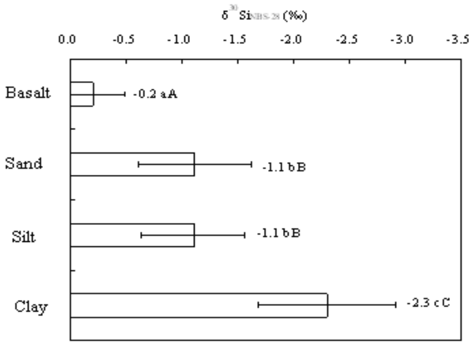

Figure 1: $\delta^{30}Si$ values of soil fractions vs. basalt rock.

The results show that from the weathering basalt to the formation of soils, Si-isotopic fractionation takes place as Si moves to secondary minerals. $\delta^{30}Si_{NBS-28}$ values of different particle size of soils are significantly lower than that in basalt, showing a sequential enrichment of Si^{28} in the finer fractions. Furthermore, by comparing soils of different ages, it is found that with increasing weathering intensity and soil age, weathering and biogenic processes favor ^{28}Si entering into the secondary minerals. Our study illustrates that secondary soil clay minerals contain more Si^{28}, than that of origin rock, which therefore can balance the preferential loss of Si^{30} to the ocean.

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[1] Basile-Doelsch *et al*. (2005) *Nature* **433**, 399–402.

Zr-in-rutile thermometry in HP/UHP eclogites from Western China

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Four Zr-in-rutile thermometry calibrations areapplied to eclogites from Western China. Here, we show that if rutile grows in equilibrium with Qtz and Zrn, and is isolated inside garnet, it preserves its Zr composition and does not undergo compositional change due to cation exchange with the host garnet. It thus preserves the composition for the P–T conditions of its formation and the growth zoning of the host garnet. For the HP/UHP metamorphic temperature, the Tomkins *et al*. [1] calibration yields temperatures that agree well with previous studies, whereas the other three calibrations [2-4], which do not include a pressure correction, give systematically lower temperatures. Zr contents of rutile inclusions within garnet show systematic decrease from garnet core to rim. The rutile inclusions in garnet rims contain the lowest Zr content, similar to that in the matrix. Analyses confirm that the pressure plays a significant role in modifying the primary temperature dependence of the Zr content of rutile. Rutiles trapped in garnets are unable to re-equilibrate easily during retrogression, but those in the matrix can do so, providing retrograde P–T path information.

[1] Tomkins *et al*. (2007) *J. Metamorph. Geol*. **25**, 703–713. [2] Zack *et al*. (2004) *Contrib. Mineral. Petrol*. **148**, 471–488. [3] Watson *et al*. (2006) *Contrib. Mineral. Petrol*. **151**, 413–433. [4] Ferry & Watson (2007) *Contrib. Mineral. Petrol*. **154**, 429–437.