Co-variations of δ^{30}Si and δ^{18}O during contact metamorphism.

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We present Si isotope data for silicate minerals from the Mid-Proterozoic Adirondack Mountains of the Grenville Province in northern New York, USA. These samples allow examination of Si isotope variation caused by fluid interaction during contact metamorphism. To constrain the end-member Si isotope composition we analysed separated silicate mineral samples from the Marcy anorthosite massif and the marble country rock. In addition, silicate samples from contact skarns near Willsboro and Oak Hills were investigated for Si isotope mixing between the two source components. The relative Si isotope compositions were measured using a high-resolution MC-ICP-MS (NuPlasma 1700 at ETH Zürich) and are reported in δ^{30}Si notation relative to NBS28.

Si isotope analyses reveal distinct compositions for the two end-members: δ^{30}Si values of –0.15‰ for the anorthosite body and δ^{30}Si of +0.8‰ for the marble. This relation is, in part, mirrored by δ^{18}O, giving an end-member with high δ^{18}O around +20.4‰, typical for silicates in metamorphosed limestones and an igneous end-member with an average δ^{18}O of +8.1‰ *(Valley and O'Neil 1984)*. Calc-silicates of the skarns display intermediate δ^{30}Si with and increase with distance from the igneous contact. However, the calc-silicates have low δ^{18}O values (around +2.7‰) indicating the presence of mixed meteoric and magmatic waters *(Valley and O'Neil 1982)*.

Our data provide powerful evidence that aqueous infiltration of marbles drove decarbonation reactions and formed calc-silicate minerals in wollastonite skarn by transfer of silicon from the anorthosite to the marble during contact metamorphism.

References

[1] Valley & O’Neil (1982) *Nature* **300,** 497-500
[2] Valley & O’Neil (1984) Contrib. Min. Pet **85,** 158-173.