Evidence for tungsten mobility during alteration of the oceanic crust

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A better understanding of the global W cycle between the geochemical reservoirs on Earth is of great importance for many petrological and geochemical models, e.g., for correctly interpreting the ^{182}Hf-^{182}W age of core formation. So far, the geochemical behaviour of tungsten in different tectonic settings, such as in the continental crust or subduction zones has already been studied. However, it is still uncertain, whether all processes have already been fully identified that have the potential to affect the tungsten geochmical cycle, i.e., fractionating W/Th, W/U and W/Ta ratios in the different geochemical reservoirs. Due to similar incompatibiliy of the elements involved, these element ratios have long been regarded as being constant in most silicate reservoirs.

In contrast to this long standing view, W enrichments relative to Th and Ta in many arc lavas have been recently found and were explained by fluid-controlled W-enrichment in the subarc mantle wedge [1]. However, very little is known, as to whether hydrothermal alteration of the oceanic crust could already trigger W redistribution and enrichment of W in distinct portions of the oceanic crust. This can be tested by measuring W together with similarly incompatible elements like U, Th or Ta in sections from the oceanic crust.

Here, we present high-precision W-Th-U-Ta data obtained for samples from the oceanic crust by isotope dilution, using the Thermo Neptune MC-ICPMS at Cologne-Bonn. Our sample suite covers well characterised samples covering all major alteration styles within the upper as well as the upermost part of the lower oceanic crust, drilled during several IODP/ODP campaigns at IODP Hole 1256D. This IODP hole is the first in-situ borehole comprising a complete intact section of upper oceanic crust down to gabbros [2].

Our first results indicate that systematic fractionation of W from Th, U and Ta within the alterated oceanic crust is clearly resolvable, pointing towards a progressive enrichment of W in the Lava and Sheeted Dike Complex sections of Hole 1256D.

[1] König *et al.* (2008) *Earth and Planetary Science Letters*, **274**(1-2), 82 – 92

[2] Wilson *et al.* (2006) *Science*, **312**, 1016 – 1020