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Behaviour of Colloid-bound Uranium in Rivers draining Basaltic Terrains

P. Pogge von Strandmann (1), K. Burton (1), R. James (1), P. van Calsteren (1), S. Gislason (2)

(1) Department of Earth Sciences, The Open University, Milton Keynes, UK, (2) Institute of Earth Sciences, University of Iceland, Reykjavik, Iceland,
(p.a.e.pogge-von-strandmann@open.ac.uk / Fax: +44 (0)1908 655151 / Phone: +44 (0)1908 653023

Basalt weathering rates are much higher than for most other silicate rocks, and thus exert a strong control on atmospheric CO_2(Dessert et al, 2001). Variations in weathering and erosion in response to climatic or tectonic change affect chemical fluxes to the oceans, and U-series nuclides can give information on both weathering process and timescales. However, in the riverine environment U transport and removal rates may be strongly controlled by particle-reactive and colloid bound species (Riotte et al, 2003).

To better understand the behaviour of U during weathering of continental basalts, we have determined dissolved, particulate and colloidal U isotope and elemental data for rivers draining basaltic terrains in Iceland and Sao Miguel in the Azores archipelago. Variations in river chemistry can thus be linked to differences in the weathering environment, climate and vegetation, rather than to variations in rock type. The total concentration of U in the dissolved ($<$0.2 μm) load increases with distance downstream, with increasing total dissolved solids, and with decreasing δ^7Li. Colloids ($<$0.2μm, $>$10kD) account for between 3 and 26 % of the U content of the dissolved load; the relative amount of U in the colloidal phase seems to increase with decreasing pH, and is lowest in rivers affected by glacial runoff

(^{234}U/^{238}U) activity ratios in the bedload of both field areas are close to 1. The activity ratios of all other phases are always $>$1. Sao Miguel samples have activity ratios in the order suspended $<$ colloidal $<$ dissolved; values for the suspended and colloidal

fractions are close to 1, suggesting that U in the colloidal phase is associated with rock particles. Iceland samples have very variable colloid activity ratios (1.2 to 3.2) that may be affected by hydrothermal as well as glacial inputs to the river system.

This work suggests that the controls on U and its isotopes in river systems are variable and complex. Nevertheless, correlations with Li isotope variations and secondary mineral saturation state indicate that colloidal U uptake is at least partially controlled by degree of chemical weathering.