Suspended sediment and its potential impact on dissolved metal stable isotope ratios

R. HINDSHAW[1]

[1]Department of Earth and Environmental Sciences, University of St. Andrews, UK

Suspended sediment is present in all rivers, yet discussions focussing on stable metal isotope fractionation in the dissolved load of rivers tend to overlook the potential for interactions between the dissolved and the particulate load. Indeed, suspended sediment concentrations are often not reported together with other standard hydrological parameters such as pH and discharge.

Recent work[1,2] from Iceland has revealed that stable Ca isotope values (δ^{44}Ca) are greater than those reported in the local basaltic bedrock. This has lead to two alternative, but not mutually exclusive, interpretations. There could be mixing with hydrothermal calcite[2] or Ca could be precipitating in secondary phases[1]. A further study[3] from New Zealand also pointed to the importance of mixing with carbonates in order to explain the observed stable Ca isotope values. However, in both these localities it was observed that in rivers draining glaciated catchments, δ^{44}Ca values were positively correlated with suspended sediment concentrations (SSC) raising the possibility that the lighter Ca isotopes could be preferentially adsorbed onto sediment surfaces.

The observed correlations between SSC and δ^{44}Ca values could simply reflect the fact that in glaciated catchments high SSC are associated with high discharge and at high discharge more carbonate may be expected to weather. However, if this were the case then no correlation would be expected between δ^{7}Li and SSC since δ^{7}Li is not expected to be affected by carbonate weathering. In fact, δ^{7}Li is correlated with both SSC and δ^{44}Ca in Icelandic glaciated catchments, suggesting that the dissolved load isotopic composition could be modulated, at least in part, by the particulate load. Distinguishing between these two alternative scenarios is important in order to determine the key processes controlling global riverine stable isotope fluxes to the ocean.

[1] Hindshaw et al. (2013), *EPSL* **374**, 173-184 [2] Jacobson et al. (2015), *EPSL* **416**, 132-142 [3] Moore et al. (2013) *Chem. Geol.* **341**, 110-127.