The complete Mo isotope balance of a small catchment; well almost ...

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Between 10/2009 and 6/2010 we collected c. 50 samples including stream water, through-fall, bedrocks, soils profiles and leaves in the Strengbach catchment (Observatoire Hydro- Géochimique de l'Environnement; http://ohge.unistra.fr/), France. The catchment extends over ca. 80 ha. Source rock lithology (Crd bearing granite, Sil gneiss, aplitic micro-granite) is rather homogeneous and thus less prone to obscure Mo cyling in surface processes than mixed lithologies. Average Strengbach stream water pH was 6.5 for the sampling period. The average acidity of the soils (pH = 4.53) results from both natural (podzolisation) and anthropogenic (acid rain) processes. Subsurface soil solutions (-5cm) are very acidic (pH = 3.9 4.0 during sampling period). In deeper samples the acidity is neutralized in exchange processes or mineral dissolution that result in a loss of the basic cations. These cations, particularly Ca, are exported from the basin implying nutrient depletion in soils and forest decline.

Stream waters show very low [Mo], << 1 nmol/L. The bedrocks are also strongly Mo depleted compared to average crustal rocks (<0.4 ppm vs. 1-2 ppm). However, catchment outcrop weathering cannot explain the aquatic $\delta^{98/95}$Mo because the median of stream and source waters is considerably heavier ($\delta^{98/95}Mo_W$= 1.13 ‰) than the meadian of bedrocks ($\delta^{98/95}Mo_G$ = 0.23 ‰). Two soil profiles showed median values of = 0.27 ‰ and 0.37 ‰) with the two topsoil sample giving 0.5 ‰). The latter value can be explained with the large content of biogenic material, as leaves ([Mo] = 0.05 ppm) gave values of 0.2 and 0.65 ‰, and a throughfall sample (rainwater collected under tree) is at 0.28 ‰, with [Mo] of 2.9 nmol/L. This points to biological excretion by stomatal exchanges at the leaf surfaces (as is the case for K, Rb and B). Together with the fact that [Mo] in deeper soil solution (60 or 70 cm depth) are lower than in throughfalls, it seem that a larger fraction of the Mo is cycled between liter/topsoil and vegetation. However none of theses isotope values is below the bedrock values. In order to explain the high stream water values either an additional, "heavy" input (e.g. anthropogenic aerosols) or a hidden sink for Mo light isotope compisition (e.g. the massive saprock) musst be assumed.