Nickel Isotopic Fractionation and the role of Hyperaccumulating plants

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Even though it is widely assumed that biogeochemical cycle of metals is influenced by biotic processes, only few data have been published on the role of biological organisms on Ni isotopic fractionation. The discrimination of stable isotopes of Ni in plants through accumulation processes has just started during a preliminary study so far (*1*, *2*). Little is known about the replenishment of available Ni pools in soils by mineral dissolution of biogeochemical recycling. However, the contribution of vegetation on Ni isotopic composition in the upper soil horizon and its influence on Ni exported towards aqueous compartment is certainly recognized (*2*), particularly for hyperaccumulating plants (HA). To investigate this phenomenon, we simulated litter decomposition by performing 30 day leaching experiment on the hyperaccumulator *Rinorea Bengalensis* (up to 5 % wt Ni in leaves). During the first 10 days, leaves released more than 80% of the total Ni content, and the corresponding Ni isotopic composition was clearly enriched in heavy isotopes, $\Delta^{60}Ni_{\text{leached 10days-leached 30 days}}$= 0.20 ‰. This value is rather close to $\Delta^{60}Ni$ measured after the complexation reaction of Ni with carboxylic acids ($\Delta^{60}Ni_{\text{citrate-free}} = 0.16 \pm 0.07$ ‰). Moreover, literature data reported an isotopic composition of Ni in litter lighter than in fresh plant leaves (*2*), confirming that during litter decay, heavy isotopes are released first.

Interestingly, some preliminary data shown a Ni isotopic fractionation between leaves and roots of *R. Bengalensis,* $\Delta^{60}Ni_{\text{leaves-roots}}=0.32 \pm 0.05$ ‰. Thanks to the relatively high contribution of HA to the litter, the decomposition of HA plant leaves can result, therefore, in major input of available Ni to the soil with a heavy isotopic signature.

1. T.-H.-B. Deng *et al.*, *Environ. Sci. Technol.* **48**, 11926–11933 (2014).
2. N. Estrade *et al.*, *Earth Planet. Sci. Lett.* **423**, 24–35 (2015).