Zinc and Copper isotope fate in Amazonian mixing zone

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Metallic trace elements like Zn and Cu are mobilized during weathering at the rock-water interface and transported through soils and rivers. Modification of their speciation and bioavailability are expected in contrasted zones such as river confluences. In the Amazonian basin, mixing between the white mineral waters of Rio Solimões and the black organic waters of Rio Negro is a judicious place to study the processes that control the distribution of Zn and Cu in the water column and between particulate and dissolved phases.

Waters were collected in low water period, in each tributary and 80 km downstream the confluence. Five vertical profiles were sampled for each river section. Water velocity variability is observed, mainly in the Amazon River section, with a gradient front between the banks. To accurately determine element fluxes and tributary's impact in the mixing, we developed a box model from ADCP measurements with a weighing of sampling points relative to their velocity. A diffusive gradient is modeled at the boundary of each box.

Zn and Cu concentrations in the water sections appear heterogenous, with enriched Cu and depleted Zn in the dissolved load of Solimoes compared to Rio Negro. Zn and Cu partition coefficients (Kd) between suspended sediments (SPM) and dissolved phases increase with depth in most profiles. Zn is mainly carried by SPM (clays or Particulate Organic Mater i.e. POM) whereas Cu has a high affinity for dissovel organic matter and its abundance in the Amazon is clearly controlled by the organic matter inputs from the Rio Negro. Exchange processes (soprtion/desorption, redox…) during mixing of the two water masses are possibly constrained by Cu and Zn isotope ratio measurements (δ^{66}Zn and δ^{63}Cu) in SPM. Chemical composition of SPM (POM, oxides and clays) and previous experimental studies [1, 2] predict a shift toward higher δ^{66}Zn in SPM after the confluence, caused by preferential binding of heavier isotopes on solids, and variable along the diffusive mixing water front.

[1] Jouvin *et al ES&T* **43**, 5747-5754. [2] Juillot *et al GCA* **72**, 4886-4900.