

Zn sources in the Seine River watershed: information from XAS and isotopic analyses

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In 2000, the European Union established the Water Framework Directive requiring its members a good ecosystem status of all the water bodies for 2015. One of the aspects addressed by this directive is the anthropogenic impact on metal concentrations in rivers. Since urban and industrial sources yields major anthropogenic inputs to the Seine River, this element is used as a marker of metal pollution in this watershed. However the origin of the variability of the dissolved and particulate Zn fluxes in the Seine River are still poorly understood.

Zn isotopic measurements provide information on metal sources (natural versus anthropogenic) in the watershed [1]. However, Zn isotopic fingerprint alone will hardly unravel the processes acting in the water column (biogeochemical processes [2,3,4] versus sources mixing). As a result, complementary knowledge of Zn speciation with the help of X-ray absorption spectroscopy (XAS) is needed.

Two sampling campaigns have been conducted on the whole Seine River watershed during two contrasted hydrological regimes. This wide sampling scheme offers the opportunity to estimate the impacts of the environmental conditions, especially water-flow, on the Zn signal, and to help locating the potential metal sources in the watershed. The changes in isotopic compositions are discussed together with the solid-state speciation obtained by XAS. Distinct types of speciation can be related to the nature of the geochemical background and soil use, and may be associated with specific isotopic signatures in some cases. In addition, both XAS and isotopic data yield evidences for a significant effect of hydrological conditions on the relative contributions from different Zn sources.

[1] Chen *et al* (2008), *ES&T* **42**, 6494-6501 [2] Gélabert *et al* (2006), *GCA* **70**, 839-857 [3] Jouvin *et al* (2009), *ES&T* **43**, 5747-5754 [4] Juillot *et al* (2008), *GCA* **72**, 4886-4900