Combining isotopic and speciation signatures to study Zn behavior in rivers.

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The fate of the metal contaminated materials in the sediments and the dynamics of their resuspension need to be better understood for a better management of our water resources. Widely used in industry and urban areas, Zn is ubiquitous in continental waterbodies, with highly variable contents in sediments and suspended particulate matter (SPM) from few dozens to several thousands $mg.kg^{-1}$ [1-3]. In this context of metal contamination and global climate change, we aimed at identifying the resuspended contaminated sediments using several markers including Zn speciation and Zn isotopic fingerprinting.

Sediments and SPM were collected in different rivers of the Moselle watershed, in France, including rivers impacted by past steelmaking activities. Sediments were collected as cores, subdivided in 2 cm thick layers in order to decipher recent and old settled materials. SPM were collected at high and low water discharges using field centrifugation of River waters (1-2 m^3) and with high frequency sampling during several flood events. Besides elemental composition and mineralogy, Zn speciation in river materials was unraveled using TEM and X-ray absorption spectroscopy at the Zn K-edge. Contaminated sediments were characterized by the predominance of Zn-sulfides while SPM and recent sediments display Zn mainly bound to clay minerals and to a lesser extent to iron oxyhydroxides and carbonates. Concerning isotopic signature, $\delta^{66}Zn_{IMC}$ values were shown to range from 0.10 to 1.66 ‰ and 0.05 to 0.48 ‰, for sediments and SPM respectively. Results provided by spectroscopic and isotopic tools revealed the contributions of distinct sources of Zn during flood events, as a function of the water discharge.

[1] Le Meur et al. (2016) J Soils Sediments **16**, 1625–1642. [2] Montarges-Pelletier et al. (2007) Envir. Geol. **53, 1**, 85-102. [3] Kanbar et al. (2017) Sci. Total Environ. **599–600**, 540–553.