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# Cu-Zn-Pb multi isotopic characterization of a small watershed (Loire river basin, France)

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## Abstract

Combating metal pollution in surface water is a major environmental, public health and economic issue. Knowledge of the behavior of metals, such as copper (Cu), zinc (Zn) and lead (Pb) in sediments and dissolved load, is a key factor to improve the management of rivers. The goal of this study is to use the Cu-Zn-Pb multi-isotopic signature to track the pollutions in surface water, and to understand the complex processes causing the metals mobilization and transport in environment. As case study, we chose a small watershed, poorly urbanized in the Loire river basin. Its spring is in a pristine area, while it is only impacted some kilometers further by the releases rich in metals coming from hospital Plant Treatment Waste Water (PTWW). A sampling of these liquid effluents as well as dissolved load and sediments from upstream to downstream was realized since 2014 during several campaigns. For dissolved load, a grab sampling and an integrated sampling using passive samplers DGT were carried. Isotopic ratios were measured using a MC-ICPMS at the BRGM, after a protocol of purification. Lead isotopic compositions are rather homogenous in river sediment with values close to geologic background. For Zn, the sediments with high concentrations and depleted isotopic compositions, typical of an anthropic pollution, are strongly impacted. Giving the discontinuity of hospital releases, for dissolved load the Zn isotopic compositions are more or less impacted according to the type of sampling (grab vs. integrated sampling). However, as for sediments the enrichment of Zn contents followed by the depletion of isotopic signatures have been observed. The analyses of Cu isotopes in sediments showed the impact of PTWW, but also isotopic fractionations due to redox processes. To better understand these processes controlling the release of metals in water, sequential extractions on sediments are in progress under laboratory conditions.

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