The impact of waste waters in a small watershed: a view through Lithium isotopes

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The contribution of human activities such as industries, agriculture and various domestic inputs, becomes more and more significant in the chemical composition of the dissolved load of rivers. Human factors act as a supplementary key process. Therefore the mass-balance for the budget of catchments and river basins include anthropogenic disturbances. It is well known that Li has strategic importance for numerous industrial applications including its use in the production of batteries for both mobile devices (computers, tablets, smartphones, etc.) and electric vehicles, but also in pharmaceutical formulations.

In the present study, we investigate waste water releases by tracing its impact by the use of Li isotopes in a small river basin near Orléans in France (l'Egoutier, 15 km² and 5 km long). As case study, we decided to monitor this small watershed which is poorly urbanized in the Loire river basin. Its spring is located in a pristine area (forested area), while it is only impacted some kilometers further by the releases rich in metals coming from a hospital water treatment plant. A sampling of these liquid effluents as well as dissolved load and sediment from upstream to downstream was realized and their concentrations and isotopic data were determined.

Lithium isotopic compositions are rather homogeneous in river waters with δ^7Li values around -0.5‰ ± 1 along the main course of the stream (n=7). The waste water sample is very different from the natural background of the river basin with Li concentration being twice of the values without pollution and significant heavy lithium contribution (δ^7Li = +4‰). These preliminary results, combined with data for sediments, will be discussed in relation with factors controlling the distribution of Li and its isotopes in this specific system and compared with the release of other metals such as Pb or Zn.