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Lithium isotopes as a probe of anthropogenic activities: Dommel River

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Lithium (Li) contents and isotopes were studied in the Dommel catchment, a small riverine system in northern Belgium and the southern part of the Netherlands discharging into the Meuse River downstream of Eindhoven. This covered surface and groundwaters developed onto sand and gravel in the catchment. The integrated investigation aimed at evaluating the potential of Li isotopes as effective tracers of anthropogenic activities in addition to efficiently trace water/rock interaction processes within a sandy environment. The d^7Li values and Li concentrations were measured following standard chemical purification of Li using the cationic exchange resin protocol in a clean lab. Lithium-isotope compositions were measured with a Neptune MC-ICP-MS and Li concentrations by ICP-MS.

Dissolved lithium concentrations in the Dommel catchment span one order of magnitude ranging from 1.55 to 39.20 µg/L, with a mean concentration of 6.58 µg/L higher than the worldwide riverine average of 1.9 µg/L. The dissolved d^7Li displays a large range of variation from +5.4‰ to +27.8‰. Part of the catchment can be impacted by smelter effluents with Li concentrations in the range 91 – 526 µg/L (mean value 288.36 µg/L) and a d^7Li of around +25.6‰ and then dilution along the flowpath of the river basin.

To go further into the interpretation of the dataset in terms of using Li isotopes as a probe of anthropogenic activities, we first applied an atmospheric-input correction to waters both for Li concentration and d^7Li as rainfall constitutes an important fraction of dissolved elements in the Dommel waters (8 to 100% of Li in waters is derived from atmosphere). Secondly, we determined and quantified the anthropogenic influence using δ^7Li and mixing equations in the impacted parts of the catchment.