B-Li isotope characterization to design a frame of hydrogeological functioning of a wetland system (Massif Central, France)

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Over the last decades, increasing efforts have been made regarding wetlands. However, engaging actions to restore and preserve wetlands requires an in-depth knowledge of the water cycle in the system. We used chemical and multi-isotopic (Li, Sr, O, H) effectiveness approaches, combined with hydrological tools, for tracing the water and dissolved-element fluxes in a peatland in Central France. The main results are that at least three strong groundwater fluxes with distinct chemical and isotopic signatures supply water to the peatland (Sr) and water volume flowing out is almost negligible. Li contents fluctuate significantly and δ^7Li (‰) are extremely variable reaching values up to +1226‰, value being explained by an external input due to Ca-amendment, used in local agriculture.

In the present study, we applied B isotopes. The δ^{11}B (‰) shows values increasing from river draining basalts (around 0‰) up to springs bordering the peatland (> 25‰). Peatland groundwaters have intermediate δ^{11}B values from 7.8 to 19.4‰. This range is accompanied by an increase in the Ca contents between the river draining basalts (around 100-200μmol/l Ca) and water in the peatland (300-1150μmol/l Ca). Regarding the δ^{11}B vs. the Cl contents, the isotope ratio decrease with no variation in the Cl content from rain water to river draining basalts (as indicator of water rock interaction), then increase with slight increase in the Cl content in the groundwater in the peatland and end with large increase in δ^{11}B and Cl contents (as indicators of fertilizer inputs). Reported as δ^{11}B *vs.* 1/B contents, the data highlight the role of water rock interaction and present day fertilizer inputs (as Sr isotopes). However, if cross interpretation of δ^{11}B and δ^7Li confirms the role of water rock interaction and present day fertilizer inputs in the river draining basalts and in the springs bordering the peatland, the extremely enriched ^{7}Li signature of the groundwaters in the peatland cannot be explained by an input due to present day Ca-amendment, used in local agriculture and thus this study opened a new field for B-Li isotope investigations in hydro-systems and their potential utility as tracers of present-day-past activities.