



## Spatiotemporal patterns of soil water stable isotope composition in forested headwater catchment

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The vadose zone is a key component of the critical zone (CZ) and the interface of the atmosphere and the subsurface. A better understanding of critical zone hydrological processes is key for improving hydrological models and sustainable resource management. Isotopes of Hydrogen ( $^2\text{H}$ ) and Oxygen ( $^{18}\text{O}$ ) are a common tool to decipher hydrological processes in the CZ. However, there is still lack in understanding the spatiotemporal distribution of the soil water stable isotope composition ( $^2\text{H}$  and  $^{18}\text{O}$ ) at catchment scale. Until today, only a few studies evaluated long-term variability and spatial patterns. Here we present results of bi-weekly measurements of the soil water stable isotope over nine months. SWI composition were measured using direct vapour equilibration and accounted for different landscape elements (eight locations per campaign) in the forested Weierbach ( $\sim 0.42 \text{ km}^2$ ) experimental catchment in Luxembourg.

Preliminary results show that a strong similarity of  $\delta^{18}\text{O}$  depth profiles between different landscape elements at the same sampling date. However, after a snowmelt event we observed a much higher variability throughout the catchment likely from different melt, fractionation, and infiltration processes. The  $\delta^{18}\text{O}$  profiles throughout the landscape change consistently with time driven by a combination of rainfall and evaporation. Lc-excess data showed that soil water was experiencing kinetic evaporative fractionation in the top 30 cm of the soil throughout the year. The presented high frequent data on isotopic composition of soil pore water are useful to analyse spatial difference in vadose zone processes for better understanding soil-atmosphere interaction and flow processes. Eventually such data can be used for constraining spatially distributed hydrological models.