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Combining trace elements and water stable isotopes to assess water mixing processes and flow paths in a small forested catchment

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The chemical composition of water that infiltrates in a regolith is controlled by a combination of specific bio-geo-physico-chemical processes. These processes relate to the hydrological functions, biological activity, mineral weathering and organic matter mineralization, which take place in the different compartments that constitute the regolith and where the water can flow or store. In order to properly assess stable end-members and mixing dynamics we need to understand what triggers the spatial and temporal dynamics of the composition of the drainage and stored waters. Stable isotopes of water are widely used as indicator of water transit and residence time at catchment scale. However, they present certain limitation to evaluate water mixing processes and a complementary information is required to characterize the origin of the water components. Trace elements are known to be powerful and precise geochemical tracers of environmental processes. Parallel to standard major element concentration and O-H isotopes, we propose to consider the geochemical signatures derived from trace elements to improve the description of water origin and flow paths at catchment scale. Such multi-tracer approach has been applied on the waters of a winter flood event in the Weierbach experimental catchment (Luxembourg). The preliminary results show the potential of trace elements as suitable spatial tracers for water mixing processes.