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Solute concentration-discharge relationships in stream water in a nested catchment set-up (Attert River basin, Luxembourg)

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Hydrochemical signatures in stream water vary as a result of alternating water flow paths through the critical zone and its interactions with subsurface compartments. It will be the composition and reactivity of these compartments, but also the water flow paths, mixing and contact times that will ultimately determine the chemical load in the receiving stream water. Solute concentration-discharge relations have been studied for decades to decipher hydrological processes taking place in the subsurface, which is often seen as a 'black box' (Chorover et al., 2017). Here, we aim at slightly opening the box and mechanistically assess how the critical zone's structures (i.e. topography, land use, subsurface porosity and geochemical composition) affect stream water chemistry-discharge relationships. This will ultimately lead to a better understanding of how different catchment compartments interact and generate streamflow at different hydrological states. To this end, we will take advantage of a 10 years' worth of precipitation, discharge and fortnightly hydrochemical data collected in a set of 8 nested catchments in the Attert River basin (NW Luxembourg; 290 km2 at Bissen). The catchments have different rock types (i.e. schist, marls, sandstone and alluvial deposits) and are exposed to a relatively homogenous climate forcing. This work follows up on the investigations conducted by Pfister et al. (2017) in the Attert basin - suggesting a strong control of bedrock geology on stream flow regime, catchment storage and isotope response.

References

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