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Spatial variability of streamwater chemistry and specific discharge during low flow periods - First results from snapshot sampling campaigns in thirteen Swiss catchments

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Catchments consist of different landscape elements that store and release water differently. Few studies looked at which landscape elements contribute to streamflow during extended dry periods and whether these elements are similar in different catchments.

We present a unique dataset from snapshot field campaigns in thirteen watersheds in Switzerland during low flow conditions in winter and summer 2016. The 10 to 110 km^2 catchments varied from predominantly agricultural to alpine environments. In each campaign streamflow was measured and stream water was collected at a high spatial resolution using a nested sampling approach. Streamflow during the campaigns was less than the 65^{th} percentile. We analyzed the water samples for the main ions and isotopic composition (Ca, Mg, SO_4, F, NO_3, Na, K, δ^{18}O and δ^2H) and compared the results with long-term datasets from the Swiss National Groundwater and River Monitoring Program (NAQUA and NADUF). For every sampling location, we calculated local and upslope catchment characteristics, including area, slope, flow length, topographic wetness index and elevation. Additionally, we determined land use, soil type and depth, geological and geomorphological characteristics from existing geodata for every sampling location.

First analyses show that the spatial variation in water chemistry, isotopic composition and specific discharge is very high: Neighboring sampling locations could differ significantly in their specific discharge and isotopic and ion composition (up to a factor of 10), indicating different contributing sources. Water at the outlet was a mixture of water from different parts of the catchment. These first results suggest that the combination of snapshot water sampling and discharge measurements provides a valuable tool for identifying the spatial variability of contributing sources to streamflow. This information can then later be used to better constrain hydrological models and predict available water resources during extended dry periods.