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Spatial variation of storage capacity and winter recession in the alpine Poschiavino catchment / Switzerland

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Better understanding of the spatial variability of recession and storage dynamics in alpine catchments may improve low flow estimation. Especially in areas with little gauging information, mapping water storing sediments and rocks may help identifying areas responsible for sustaining baseflow during low flow periods. In alpine catchments, low flow occurs during winter, because groundwater recharge from precipitation or snowmelt is limited. This provides good opportunities for research on storage behavior.

We present a dataset of winter discharge measurements and water chemistry analyses in the alpine Poschiavino River, a 14km^2 watershed in southeast Switzerland with strongly contrasting subcatchments. To explore how low flow recession relates to the spatial organization of storage potential, geomorphology and sediment type were mapped. From 7 measurement campaigns throughout winter season 2013/14 we derived recession curves for various nested subcatchments. To identify different contributing sources, the discharge measurements were complemented with ion composition analyses of stream water and continuous hourly electric conductivity measurements. This dataset allowed identifying areas contributing during low flow periods and estimating the storage potential of different subcatchments.

We found substantial variation in the contribution of different subcatchments from 54mm to 200mm in four months. The spatial variation of discharge and different drainage time scales in the various subcatchments could be attributed to storage properties like thickness of the sediment deposits. Contribution from areas with thick sediment cover is significantly higher than from parts with less deep deposits. However the spatial resolution of research was limited because of complicated subsurface flow paths. Topographic catchment borders did not always correspond to the hydrological ones. This first study on the relation of low flow recession and storage potential represents an essential basis for developing and adopting storage-based low flow prediction models.