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Surface-ground water connections: An integrated investigation at the catchment scale

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Sustainable water management on the catchment scale (>1000km2) is challenging due to both significant topographic, climatic, and land-use heterogeneities, as well as anthropogenically induced changes. Additionally, the interaction between ground and surface water is not fully understood, making the management of water resources uncertain. In Switzerland up to 80% of all drinking water is derived directly from groundwater sources, with 40% abstracted from alluvial aquifers, rendering the protection and management of aquifers a matter of great importance. This project focuses on determining catchment transformation trends based on historic data for water quality and quantity, and the development of monitoring schemes for surface and groundwater characteristics based on micro-pollutant and isotope results.

As the longest river in Switzerland without any natural or artificial barriers or reservoirs along the length of its course (∼130km), the Thur is well suited to the study of ground-surface water interactions in Switzerland. However, centuries of agricultural, and more recently urban and industrial developments, have altered the Thur's catchment considerably, affecting both spatial and temporal recharge rates and runoff. The Thur catchment (∼1700 km2) is characterized by variable morphological and climatic conditions, making the Thur a highly dynamic river system with a discharge extremes from 3 m3/s to 900 m3/s (mean ∼ 47 m3/s). During this project, some of the decisions of experimental fieldwork will be based on the results of a semi-distributed model (SUPERFLEX) that distinguishes areas of hydrological similarity (hydrologic response units). In conjunction with the model, we will investigate the processes occurring within river-floodplain-groundwater systems, and aim to characterise these processes in more detail. We will explicitly address the dependence of streamflow regimes on river-floodplain-groundwater dynamics, and consequently on climate, geomorphology, and land-use features. The results will contribute towards elucidating the dominant controls on hydrological responses within the intermediate catchment scale.