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Instrumentation Strategy for the Assessment of River-Groundwater Interactions in the Context of River Restoration

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River restoration projects have been launched over the last two decades to improve the ecological status and water quality of declined rivers. As most restoration projects are not monitored at all, we can hardly predict consequences of restoration projects, nor can we analyze why they fail or why they are successful. To overcome this lack of data, efficient field assessment strategies have to be implemented, for example, by employing sensor networks that continuously measure physical parameters at high spatial and temporal resolution. Without detailed environmental process understanding, predictions on revitalisation remain speculations.

We focus on the design and implementation of an instrumentation strategy for monitoring changes in bank filtration, groundwater quality, hydrological connectivity and travel time due to river restoration. We specifically designed and instrumented a network of monitoring wells at the Swiss River Thur (NE Switzerland), which is partly restored and mainly channelized since more than 100 years. Our results show that bank filtration – especially in restored sections with changing river bed morphology – is variable in time and space. Consequently, monitoring networks sensing physical and sampling chemical water quality parameters have to be adapted in response to that variability. To predict consequences of river restoration for groundwater quality, long-term measurements – ideally initialized before and continued for a long time after restoration – are fundamental. As a result, process-based models can be adapted and evaluated using these types of high resolution data sets.