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# Estimating the input of wastewater-born micropollutants in a rural karst catchment (Gallusquelle, Germany)

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The main focus of the AGRO research project is on the use of various micropollutants as indicators (e.g. for wastewater) in the catchment of the karst spring Gallusquelle, Swabian Alb. For modeling the micropollutants' fate in the subsurface and their occurrence in spring water, reliable estimates of the spatio-temporal input, i.e. input functions, are crucial. Therefore potential sources for wastewater-born substances are identified. These are the combined sewer system with a stormwater retention basin (untreated wastewater) and the river Fehla (treated wastewater). The micropollutants' concentrations and loads in the potentially infiltrating waters are estimated on the one hand by local water and substance consumption data and on the other hand by water sample analysis and stream gauging.

The spring's discharge varies from 0.2-2.0 $m^3/s$ with an average of 0.5 $m^3/s$. Treated spring water serves as drinking water for 45 000 people. The catchment area measures 45 $km^2$ and is rural in character with 55% forest, 27% grassland, 15% agriculture and 3% residential/industrial. Industrial activity is restricted to a few minor textile and metal works. There are around 4 000 inhabitants and except for a few farms, all households are connected to the public sewer system. The only surface water within the catchment is the stream Fehla, which forms a part of the catchment boundary. It was formerly identified as a sinking stream with an ephemeral part in the lower course. Connections to the Gallusquelle spring were proven by several tracer tests conducted in the 1960's, when the river started to become perennial over the whole course due to heavy colmatation.

During a one week campaign, samples of wastewater and river water were taken three times per day. Additionally, hourly samples were taken during a 24 h period. Water samples were analysed for major ions and 58 micropollutants, including pharmaceuticals, stimulants (as caffeine), the artificial sweeteners acesulfame and cyclamate, contrast media, corrosion inhibitors, pesticides and metabolites of several substances. For analysis of micropollutants, water samples were spiked with internal standards before solid-phase-extraction (SPE) and the analysis was conducted by high-performance liquid chromatographic separation with tandem mass spectrometric detection (HPLC/MS-MS). Quantification limits were in the range of 1-28 ng/l for river water and 200-650 ng/l for untreated wastewater.

Once the concentrations and loads of micropollutants in the infiltrating waters are known and compared to those in the spring water, one might distinguish and quantify the portions of water infiltrating from the different sources in the catchment area.