EGU2020-19842
https://doi.org/10.5194/egusphere-egu2020-19842
EGU General Assembly 2020

Combining Ecohydrological Catchment Modelling and Water Quality Monitoring to Assess Surface Water Pollution in the Swist River Basin

Alexander Ahring[1,3], Marvin Kothe[1], Christian Gattke[1], Ekkehard Christoffels[2], and Bernd Diekkrüger[3]

[1]Erftverband, River Basin Management, Germany (alexander.ahring@erftverband.de)
[2]IBC Ingenieurtechnische Beratung Christoffels, Vettweiß, Germany
[3]Department of Geography, University of Bonn, Germany

Inland surface waters like rivers, streams, lakes and reservoirs are subject to anthropogenic pollutant emissions from various sources. These emissions can have severe negative impacts on surface water ecology, as well as human health when surface waters are used for recreational activities, irrigation of cropland or drinking water production. In order to protect aquatic ecosystems and freshwater resources, the European Water Framework Directive (WFD) sets specific quality requirements which the EU member states must meet until 2027 for every water body.

Implementing effective measures and emission control strategies requires knowledge about the important emission pathways in a given river basin. However, due to the abundance of pollution sources and the heterogeneity of emission pathways in time and space, it is not feasible to gain this knowledge via water quality monitoring alone. In our study, we aim to combine SWAT ecohydrological modelling and long term water quality monitoring data to establish a spatially differentiated nitrogen emission inventory on the sub-catchment scale. SWAT (short for Soil and Water Assessment Tool) is a semi-distributed, dynamic and process-driven watershed model capable of simulating long term hydrology as well as nutrient fluxes on a daily time step.

The study area is the Swist river basin in North Rhine-Westphalia (Germany). Belonging to the Rhine river system, the Swist is the largest tributary of the Erft River and drains a basin area of approximately 290 km². As part of its legal obligations and research activities, the Erftverband local waterboard collects a large variety of long term monitoring data in the Swist river catchment, which is available for this study. This includes operational data from the wastewater treatment plants in the watershed, discharge data from four stream gauging stations, river water quality data from continuous and discontinuous monitoring, groundwater quality data as well as quality data from surface, sub-surface and tile drainage runoff from various land uses.

Our contribution will be made up of two equal parts: First, we will present our water quality monitoring activities in the catchment and the related data pool outlined above, with special

emphasis on recent monitoring results from agricultural tile drainages. Apart from nutrients and other pollutants, the data suggests considerable inputs of herbicide transformation products like Chloridazon-Desphenyl (maximum concentration measured: 15 µg/l) via this pathway. Second, we will explain how we integrate the monitoring data into the SWAT simulations and how we tackle related challenges like parameter equifinality (meaning that multiple parameter sets can yield similar or identical model outputs). The overall goal is to take all possible emission pathways into consideration, including those often neglected in past SWAT studies, like tile drainages and combined sewer overflows (CSO). As the Swist catchment is affected by groundwater extraction due to lignite mining in the Lower Rhine Bay area, we will discuss how this is considered during SWAT model setup and calibration, and will present first simulation results concerning catchment hydrology.