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Robust River load estimation of micropollutants: Method validation on an extended micropollutants dataset

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Many anthropogenic sources discharge thousands of micropollutants into surface waters, which can pose a risk to human health and the environment. Monitoring provides a better understanding of the occurrence and transport dynamics of these pollutants and is the basis for mitigation measures as well as valuable validation loads for pollution transport models. As conventional monitoring methods do not provide the full picture in terms of transport dynamics (Weber, 2023), there is a need for more specific monitoring methods.

To prove this statement, a one-year monitoring program was established at two Austrian rivers, namely the Wulka and one of its tributaries. The locations are strategically located to capture different catchment properties. This monitoring program consists of monitoring stations at each river equipped with automatic samplers and online measurements of flow, turbidity, and conductivity. The monitoring is carried out by a one-year sampling program to cover the variability of micropollutants over a whole year by taking both volume-proportional composites and grab samples at a biweekly interval. The samples are then analyzed in labs and for total suspended solids (TSS) and various micropollutants from the group of heavy metal, pharmaceuticals, pesticides and PFAS.

Turbidity events are an important transport factor for many micropollutants and therefor need to be considered for annual load calculation (Weber, 2023). We therefor integrated online turbidity data with the pollutant measurements to enhance accuracy of current load calculation methods. Those calculated annual load were validated on the monitoring data from the monitoring campaign to ensure robust results. The biweekly resolution of the monitoring data allowed for detailed analysis to reveal patterns, trends and anomalies that could impacted the load estimation. This led to a comparison of the methods and suggestions to improve their robustness.

This research helps to understand river transport dynamics of TSS and micropollutants towards robust estimation of annual micropollutant loads in rivers to improve future monitoring campaigns and annual load calculation for pollution transport model validation.