Goldschmidt 2021 Abstract
https://doi.org/10.7185/gold2021.6222

Phosphorus concentration/discharge hysteresis patterns during storm events in streams entering a eutrophic lake

XINGYU LIU[1], GABRIELE TROMMER[2], THILO BEHRENDS[3] AND STEFAN PEIFFER[4]

[1]University of Bayreuth
[2]Water Management Office Ansbach
[3]Utrecht University
[4]Department of Hydrology - University of Bayreuth
Presenting Author: xingyu.liu@uni-bayreuth.de

Reducing phosphorus loads into waterbodies is one of the main goals in maintaining and improving surface water quality. While P-input from point-sources such as sewage treatment effluents has been effectively reduced in recent years, diffuse sources from land-use activities are more challenging to identify and regulate. Phosphorus from catchments is transported through streams into lake system mostly during storm events. Measuring phosphorus concentrations in surface waters provides information on its P-status at a particular time, but does not necessarily imply the sources and transport pathways. Hence, characterizing hysteresis patterns generated from concentration and discharge data during storm events has become a valuable tool to provide insight into the dominant sources and transport mechanisms of phosphorus.

Our study aims to understand event-based phosphorus transport dynamics by characterizing hysteresis patterns of various forms of phosphorus from high-frequency concentration and discharge data. In specific, we are interested in the differences among hysteresis patterns of total phosphorus (TP), particulate phosphorus (PP), and soluble reactive phosphorus (SRP) impacted by various sources and transport pathways. We studied data from stream inlets in a catchment draining into a highly eutrophic shallow lake (Lake Altmühl) for a period from 2012 to 2014. Our first results indicate the importance of antecedent hydro-meteorological conditions and event characteristics in describing the C-Q relationship. The temporal variability in C-Q relationships in response to various event characteristics was pronounced among different events. Intensive events are more likely to generate clockwise patterns. Besides, we observed variations of hysteresis patterns between catchments and streams during events of similar hydrological conditions.

By unravelling the underlying influence factors such as rainfall characteristics, geomorphology and antecedent moisture conditions, this study further allows investigation of potential P sources and release pathways. This approach highlights the value of high-frequency data to support water quality monitoring and mitigation measures.