EGU2020-4625
https://doi.org/10.5194/egusphere-egu2020-4625
EGU General Assembly 2020

Major controls of base flow soluble reactive phosphorus losses in humid temperate headwater streams

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Long-term Soluble Reactive Phosphorus (SRP) monitoring in headwater streams in central Europe revealed a seasonal pattern of SRP concentrations during low flow periods, with highest concentrations in summer and lowest in winter. These seasonal concentration amplitudes often exceed the eutrophication threshold during the summer eutrophication-sensitive period. It is assumed that temperature dependent biogeochemical processes control the underlying P release mechanism, where redox processes may be responsible for this increase. Several studies have highlighted the crucial role of reactive zones such as riparian wetlands in controlling solute export regimes. Moreover especially in forest headwater streams, in-stream assimilatory uptake shows a distinct seasonal behaviour because of varying shading conditions. This can also lead to seasonal SRP amplitudes. Furthermore sorption and desorption processes are temperature dependent which may alter in-stream SRP release during the year.

Often SRP concentrations are higher in agricultural streams than in more pristine headwaters. It is not clear how land use (e.g. P status of soils) may impact the baseline SRP concentrations and which factors control the seasonal change in SRP stream concentration (riparian groundwater heads and redox processes, temperature, in-stream release and uptake processes). Therefore the objective of this study is to disentangle land use impacts from hydrological and biogeochemical controls of low flow SRP losses. A comparative study on seasonal SRP concentration patterns will be presented comprising around 53 long term monitored headwater catchments in humid temperate climate of northern Europe and the United States. Based on hydrological and SRP headwater signals and catchment properties, P release processes are discussed. The results of the study will allow to target SRP mitigation strategies based on knowledge of the dominating control of SRP loss from headwater streams.