Geophysical Research Abstracts
Vol. 20, EGU2018-7465, 2018
EGU General Assembly 2018

Sources, composition and role of suspended material and attached phosphorus in small agricultural areas

Sara Sandström (1), Faruk Djodjic (1), Katarina Kyllmar (2), Martyn Futter (1), and Kevin Bishop (1)

(1) Swedish University of Agricultural Sciences, Aquatic Sciences and Assessment, Uppsala, Sweden (sara.sandstrom@slu.se), (2) Swedish University of Agricultural Sciences, Soil and Environment, Uppsala, Sweden

Elevated phosphorus (P) concentrations are a known contributor to eutrophication and degradation of surface water quality. Diffuse losses from agriculture are one of the main P-sources. A large fraction of agricultural diffuse source P is transported in particulate form associated with suspended sediments in streams and rivers. However, the sources, composition and role of suspended sediment and attached P are less investigated. In this project, we aim at increasing the understanding of these issues, in particular in small agricultural streams, by improving both the modeling and understanding of the processes governing exchange of P between sediment and water phase and the identification of critical source areas (CSAs) for P-transport using distributed high-resolution erosion models. Earlier studies have found strong positive linear correlations between concentrations of suspended material and particulate P in stream water, but with highly variable slopes of the correlation line between sites. Our hypothesis is that this variability in the slope of the relationship between suspended material and particulate P can be further clarified by inclusion of catchment properties, e.g. soil type and catchment soil P content. For investigation of the composition of P in suspended sediment, time integrated Philippe's samplers will be installed in four different agricultural streams to collect suspended material during approximately 6 months, from autumn to spring, the season with highest P-transport in these areas. The four catchments are all in the Swedish Environmental Monitoring program and have long time-series data on water flow as well as nutrient and suspended sediment concentrations. The samplers will be emptied and reinstalled once a month and the collected material analyzed using P-fractionation, 31P-NMR and XANES-analysis to get a better picture of amounts and forms of P bound to the suspended material. Sediment cores from the bed sediment will also be analyzed. Based on this new knowledge regarding the different forms of P in suspended sediment, we will further develop models of P exchange between solid and water phase. Finally, since earlier studies of erosion modeling based on high-resolution elevation maps have shown high agreement between predicted and observed CSAs we will use this approach with a focus on dynamic modeling for hypothesis testing and quantification of transport of P and suspended material from CSAs in agricultural catchments.

Keywords: Suspended sediment, phosphorus, agricultural streams, modeling, erosion