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Mobilisation of dissolved organic carbon from riparian peatlands – new insights from the Lehstenbach catchment in Germany

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Increasing concentrations of dissolved organic carbon (DOC) were observed in many surface waters on the Northern hemisphere since the mid 1990s. This process is relevant to water quality in many drinking water dams. Because of both the scale and the practical relevance of the observed DOC trends, many studies were published on this topic during the last two decades. From those published studies, it appears that decreasing atmospheric depositions may have caused DOC concentrations to increase. However, different mechanisms were discussed in the literature including mobilisation due to falling sulphate, nitrogen and chloride depositions. In this contribution we present our latest findings from the forested Lehstenbach catchment (approximately 800 m ASL) in Northern Bavaria, Germany. For this catchment, a long-term data set of selected water quality variables was analysed using Generalised Additive Modelling. From the data analysis, we interpreted (a) mobilisation mechanisms from the soils of the catchment as well as (b) transport processes to and within the stream, where DOC and the other water quality variables were actually measured. We found that DOC was mobilised during rainfall events from riparian peatland soils, where it was initially adsorbed to ferric iron minerals. This mobilisation likely happened because of declining nitrate concentrations in the riparian soils promoted by decreasing atmospheric nitrogen depositions. Iron reduction released the initially adsorbed DOC. But after reductive dissolution, ferrous iron was probably re-oxidised and hence DOC was transported as iron(III)complexes to and within the stream.