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Mobilisation and transport of dissolved organic carbon and iron - insights from the Lehstenbach catchment in Germany using Generalised Additive Models

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The purpose of this conference contribution is to elucidate mobilisation and transport processes of dissolved organic carbon (DOC) and iron in catchments featuring riparian peatlands. Specifically, it was hypothesised that dissimilatory iron reduction in riparian peatland soils mobilises DOC initially adsorbed to iron minerals. During stormflow conditions, both DOC and iron will be discharged into the stream network. Ferrous iron may be reoxidised on its way to the stream and subsequently ferric iron could be transported together with DOC as complexes. To test these hypotheses, generalised additive models (GAM) were applied to 14 years of weekly time series of discharge and concentrations of selected solutes measured in a headwater stream called Lehstenbach. This stream is located in southern Germany and drains a 4.19 km^2 forested mountain catchment, one third of which is covered by riparian peatland soils. We inferred, using different types of GAM, that complexation of iron with DOC was the dominant process transporting both solutes to and within the steam. We assume that water table fluctuations within the uppermost wetland soil layer during the growing season caused changing nitrate levels, that is, nitrate release due to increased oxic mineralisation during dry conditions and denitrification upon rewetting of soil. Decreasing nitrate availability during wet periods could trigger iron reduction and thus the mobilisation of DOC. Our data analysis indicates (a) that iron reduction drives the mobilisation of DOC in peatland soils and (b) that both iron and DOC are transported as complexes after their joint mobilisation. Preferential loss of iron as ferric iron precipitates over DOC on the way to the stream may obscure signals from the actual mobilization mechanisms in the wetland. The influence of nitrate on the DOC mobilisation remains relatively uncertain. This influence could be further investigated using detailed measurements of the relevant species in riparian wetland soils and the adjacent stream network during the growing season.