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Impacts of beaver ecosystem engineering on dissolved organic matter cycling in headwater streams

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Beavers are ecosystem engineers that modify the structure of river reaches and their hydrological functioning. By building dams, they modify the travel time of running waters and can lead to the flooding of surrounding soils and terrestrial vegetation, with potentially significant impact on biogeochemical cycles. Contradictory effects of beaver ponds on dissolved organic matter (DOM) concentration and composition have however been reported, and the underlying reasons are still unclear. In this study, we aimed to investigate the role of the landscape morphology as an important driver determining how a beaver population can affect stream DOM cycling. Four streams localized in Switzerland and Germany were visited during different seasons (spring, summer, winter) and monitored at upstream and downstream locations of beaver ponds across a hydrological cycle. The sites differed in terms of river channel morphology, presence or absence of floodplain, and vegetation cover. DOM composition was investigated through absorbance and fluorescence measurements coupled with parallel factor analysis (PARAFAC) along with stream water quality (nutrients, pH, dissolved oxygen and water temperature). The results show that the effects of beaver dams were variable, and emphasizes the importance of the geomorphological context.