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Dissolved organic matter (DOM) biogeochemistry in streams

PhD thesis

Streams and rivers are major contributors to carbon cycling and account for large dissolved organic matter (DOM) export fluxes from the terrigenous environment to downstream ecosystems. Climatically and anthropogenically induced changes may impact the amount, composition and fluxes of DOM, with possible consequences for the delivery of DOM and carbon processing in streams.

This thesis investigates the role of streams for carbon cycling, spanning ecosystems predicted to be particularly susceptible to climate change such as Alpine Glaciers and Alpine streams. Results highlight the diversity of glacial DOM and the role of these low-DOC ecosystems for carbon cycling and suggest a metabolic link between ancient terrestrial DOM stored in Alpine glaciers and carbon cycling in pro-glacial streams. The degradation of terrestrial DOM in brownwater streams was further shown to potentially contribute to CO_2 evasion to the atmosphere underscoring the role of the coupling of DOM composition and microbial metabolism for in-stream carbon cycling. Furthermore this thesis illuminates how hydrology and seasonally regulated processes, such as photosynthetic active radiation (PAR) and streamwater temperature – both of which are subject to climate change – influence the coupling of streamwater and hyporheic DOM as well as the temporal dynamics of DOM composition and fluxes at different scales in an Alpine stream.

The findings highlight the need for long-term studies on DOM composition and dynamics in order to gain a deeper understanding on how climatic changes may affect carbon cycling in fluvial ecosystems.