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DOM transformations in stream biofilms shown by fluorescence spectroscopy

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Alpine streams are hotspots of biogeochemical activity, where dissolved organic matter (DOM) is mineralised and transformed by heterotrophic microorganisms while travelling downstream. The chemical composition of DOM strongly affects the rate and type of transformations that occur, and a portion of the DOM is thought to be chemically resistant to decomposition by biofilm microorganisms. In soil studies, interactions between decomposition rates of recalcitrant soil organic matter (SOM) and labile rhizodeposits have often been described as 'priming effects'. Labile substrate additions have been observed both to stimulate and to suppress mineralisation of recalcitrant substrates under different conditions, due to substrate co-metabolism or microbial community dynamics. Although the same principles are likely to apply to decomposition of recalcitrant DOM and labile algal exudates, few studies so far have investigated priming effects in an aquatic context.

In this presentation, we describe results from a microcosm experiment. Streamwater with added recalcitrant DOM was passed through bioreactors mimicking streambed heterotrophic biofilms. Three potential priming treatments were applied; glucose (G), glucose with nitrate and phosphate (GNP) or an algal extract with nitrate and phosphate (ANP).

We used fluorescence emission-excitation matrices (EEM) and UV spectroscopy on the DOM input to and output from the bioreactors to unravel potential interactions between recalcitrant and labile DOM during priming in biofilms.