Title:
Biogeochemistry, land use, and microbial communities in Swiss peatlands

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Abstract (300 words maximum): :
While peatlands cover less than 1% of Switzerland's total land area, they store over 30 Mt of soil organic carbon (Wüst-Galley et al. 2015, 2020). In their natural state, they are waterlogged and dominated by peat moss, creating acidic conditions that enable anaerobic microorganisms to slowly decompose organic material, producing methane as the end product. Most Swiss peatlands have been degraded due to anthropogenic impacts, yet their protection and restoration is now a growing priority in Switzerland and worldwide. In this work, we are examining the microbial communities and biogeochemistry of six peatlands with varied land use and history across the pre-Alps region of Switzerland. The first biogeochemical measurements revealed significant differences in pH, ranging between 4.1 – 8.2, and ion concentrations across depth and sites. At several sites surrounded by agriculture and pasturelands, we found exceptionally high levels of terminal electron acceptors (Fe, Mn, SO42-, NO3-). These likely impact the microbial community composition and activities, e.g., suppressing methane production by methanogenic archaea and potentially promoting the anaerobic oxidation of methane. Interestingly, we also found elevated levels of trace metals including arsenic and zinc at several sites, which likely impacts the microbial communities and therefore nutrient cycling and greenhouse gas emissions. Thus, we have identified both distinct and shared biogeochemical parameters across six peatland sites. Currently, we are investigating the microbial composition to better understand to what extent it is defined by biogeochemical factors. With this approach, we aim to provide a comprehensive understanding of microbial communities and their implications for peatland health and broader environmental concerns.