Title:
Experimental evidence on the impact of climate-induced hydrological and thermal variations on glacier-fed stream biofilms.

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Abstract (300 words maximum): :
Glacier-fed streams harbour a diverse microbial life dominated by benthic biofilms. These biofilms play key roles in nutrient and carbon cycling, and form the basis of food webs in stream ecosystems. Glacier-fed streams are expected to face an intensification of environmental variations due to climate change; however, our knowledge on how climate-induced variations, such as warming and altered flow regimes, affect GFS biofilm microbial composition and diversity remains limited.

In this study, we operated streamside flume mesocosms in the Swiss Alps, where benthic biofilms were grown under treatments replicating natural stream conditions or simulating climate change. These treatments comprised of four flow (natural, intermittent, stochastic, and constant) and two temperature (ambient streamwater and warming of +2 ºC) regimes. Over a three-month period, we monitored the biofilm's bacterial and eukaryotic biomass, diversity, community composition, and metabolic diversity. We found that microbial community composition was largely influenced by successional dynamics independent of the treatments, and that droughts induced a pronounced shift in community composition, selecting for drought tolerant bacterial taxa. Surprisingly, stochastic and constant flow regimes did not significantly affect community composition, suggesting that biofilm microbial communities are adapted to inherent glacier-fed stream flow variations, but not to flow intermittency. Moreover, streamwater warming of +2 ºC also modified community composition, decreased algal biomass and enhanced carbon metabolism. Our study provides experimental evidence toward potential and poorly considered impacts of climate change on benthic biofilms in glacier-fed streams.