BOOK OF ABSTRACTS

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Glacier and rock glacier streams host microbial communities with distinct taxonomy, diversity, and seasonality.

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Abstract

Alpine headwaters are threatened by global warming which is accelerating glacier and permafrost thawing. Diversity and seasonal dynamics of aquatic communities are expected to shift in response to increased seasonal variability of temperature, hydrology, and chemical regime, with potentially great implications for future integrity and functionality of Alpine freshwaters. Despite the growing literature on the impacts of climate change on glacier hydrology and periglacial environments, the chemical and biological features of waters emerging from Alpine rock glaciers (RG) have been poorly investigated so far. In particular, microbial communities have remained largely unexplored until recently, despite the recognition that they can play a disproportionate role in driving Alpine stream biodiversity, hydrochemistry, and metabolism. From 2016 to 2018 we investigated the prokaryotic assemblages of epilithic and sediment biofilm in glacier- (kryal), rock glacier- and groundwater-fed streams (krenal) in four deglaciating catchments of the Central Italian Alps using metagenomic approach. The 2016 late summer survey outlined that RG-fed headwaters represent chemically and biologically unique ecosystems, as they are characterized by high solute concentrations, including trace elements, and by highly diverse bacterial assemblages that significantly differ from those of glacier-fed streams. The 2017-2018 seasonal investigation (June-September) outlined that the high prokaryotic biodiversity of RGs is characterized by intermediated seasonal variability in comparison with glacial and krenal streams, the latter being characterized by larger seasonal changes. Prokaryotic biodiversity appears to be related to the different physical and chemical settings of the three water types, although physical variables (e.g., water temperature, turbidity) and solute concentrations play a key role in all the surveyed water types. These findings suggest that the chemical, biological and seasonal characteristics of Alpine headwaters fed by thawing permafrost, may contribute to set the future microbial diversity of Alpine headwaters in combined with the progressive glacier retreat.