

33-O Perspective for an integrated understanding of tropical and temperate high-mountain lakes.*Jordi Catalan*¹ - *John Donato*²*CREAF, CSIC, Bellaterra, Spain*¹ - *Departamento De Biología, Universidad Nacional de Colombia, Bogotá, Colombia*²

High mountain lakes are extreme freshwater ecosystems and excellent sentinels of current global change. The largest contrast occurs between lakes in temperate and tropical areas. The main difference arises from the seasonal patterns of heat exchange and the external loadings (carbon, phosphorus, metals). The consequence is a water column structure based on temperature, in temperate lakes, and oxygen, in tropical lakes. This essential difference implies that in tropical lakes one can expect a more sustained productivity throughout the year; a higher nutrient internal loading based on the mineralization of external organic matter; higher nitrification-denitrification potential related to the oxyclines; and larger metal mobilization due to the permanently reduced bottom layer. Quantifying and linking these and other biogeochemical pathways to particular groups of organisms is in the current agenda of high-mountain limnology. On the other hand, the intrinsic difficulties of the taxonomic study of many of the organisms inhabiting these systems can be nowadays overcome with the use of molecular techniques. These techniques will not only provide a much less ambiguous taxonomic knowledge of the microscopic world but also will unveil new biogeochemical pathways that are difficult to measure chemically and will solve biogeographical puzzles of the distribution of some macroscopic organism, tracing the relationship with other world areas. We propose that limnological studies at tropical and temperate high mountain lakes should adhere to a common general paradigm. In which biogeochemical processes are framed by the airshed-to-sediment continuum concept and the biogeographical processes in the functional lake district concept. The solid understanding of the fundamental limnological processes will facilitate stronger contributions to the assessment of the impacts of the on-going global change in remote areas.

33-O When glaciers melt: consequences for lake diversity and function. *Ruben Sommaruga,**Hannes Peter**Institute of Ecology, University of Innsbruck, Innsbruck, Austria*

Global climate change is causing a rapid wastage of glaciers and threatening biodiversity in glacier-fed ecosystems. The high turbidity typically found in those ecosystems, which is caused by inorganic particles and result of the erosive activity of glaciers is a key environmental factor influencing temperature and light availability, as well as other factors in the water column. Once these lakes lose hydrological connectivity to glaciers and turn clear, the accompanying environmental changes could represent a potential bottleneck for the established local diversity with yet unknown functional consequences. Here, we study three lakes situated along a turbidity gradient as well as one clear unconnected lake and evaluate seasonal changes in their bacterial community composition and diversity. Further, we assess potential consequences for community functioning. Glacier runoff represented a diverse source community for the lakes and several taxa were able to colonize downstream turbid habitats, although they were not found in the clear lake. Operational taxonomic unit-based alpha diversity and phylogenetic diversity decreased along the turbidity gradient, but metabolic functional diversity was negatively related to turbidity. No evidence for multifunctional redundancy, which may allow communities to maintain functioning upon alterations in diversity, was found. Our study gives a first view on how glacier-fed lake bacterial communities are affected by the melting of glaciers and indicates that diversity and community composition significantly change when hydrological connectivity to the glacier is lost and lakes turn clear.

33-O Long-term changes in the ionic composition of Italian alpine lakes, in relation with climate change.*Aldo Marchetto*¹ - *Michela Rogora*¹ - *Lyudmila Kamburska*¹ - *Rosario Mosello*¹ - *Gabriele A. Tartari*¹ - *Luca Paro*²*Institute of Ecosystem Study, ISE CNR, Verbania, Italy*¹ - *Arpa Piemonte, Dipartimento Tematico Geologia e Dissesto S.s. Monitoraggi e Studi Geologici, Torino, Italy*²

To estimate the effects of climate change on the ionic composition of Alpine lakes, we compared the analysis performed in the 1980's and in the second decade of the 21st century on 47 high mountain lakes located in the Western and Central Alps, Italy.

In spite of a high lake-to-lake variability, a general increasing trend in conductivity and in most ionic concentrations was detected, particularly evident in the lakes with a higher solute content. An increase in the contribution of sulfate to the total ionic content was also found.

Changes in the ionic composition were more marked in lakes having rock glaciers and/or retreating glaciers in their catchments: present concentrations of major ions generally resulted more than twice the values of the 1980s in the formers, and up to 4 times in the latters.

To test the hypothesis that changes in snow and glacial cover in lake catchments were more important than temperature alone in affecting lake chemistry, we also analyzed the relationship between year-to-year variability in lake water chemical composition and selected meteorological variables in 4 lakes in Ossola Valley (Central Alps), sampled almost every year from 1978 to 2015.

Finally, a spring originating from a rock glacier and feeding one of these lakes was also studied in detail, to identify the effects of short-term meteorological variability on water chemistry.

33-O Permafrost thaw makes subarctic lakes more terrestrial. *Maxime Wauthy, Milla Rautio*

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Permafrost occupies a great proportion of the subarctic landscape. With climate change, this permafrost is thawing at an accelerated rate, promoting the formation of shallow ponds, the thermokarst (or thaw) ponds. These ponds have become increasingly abundant in subarctic areas, representing up to 90% of all lakes in some regions. Unlike the classical ultraoligotrophic freshwater systems found at high-latitudes, the thaw ponds are characterised with high turbidity, high nutrient content and high inputs of organic matter from the watershed and thawing permafrost. Therefore, the dissolved and particulate organic matter (DOM and POM) in thermokarstic ponds are expected to be mainly derived from terrestrial sources and be more allochthonous compared to the oligotrophic freshwater lakes. The aim of this study is to explore the impact of thawing permafrost on the DOM and POM composition of subarctic lakes. We hypothesise that allochthonous/autochthonous carbon ratio is higher in thermokarstic ponds in comparison to lakes that are not influenced directly by thawing permafrost. Field work was performed in subarctic shrub tundra on the eastern coast of Hudson Bay, near Kuujuarapik-Whapmagoostui (Quebec, Canada) in August 2014 and 2015. We compared the origin of DOM and POM in six oligotrophic lakes (rocky and tundra ponds) and six thaw ponds through carbon (d13C) and deuterium (d2H) stable isotope analyses. We also investigated the source of DOM using the coloured dissolved organic matter (CDOM) fluorescence components. Preliminary results indicate that DOM and POM have d13C and d2H signatures closer to terrestrial sources in thaw ponds compared to lakes that are not influenced directly by thawing permafrost. CDOM analyses show the same profile, indicating a larger contribution from terrestrial humic substances in thermokarstic pond DOM. This study demonstrates the importance of thawing permafrost on terrestrial inputs in subarctic lakes. The increasing number of thermokarstic ponds also suggests that warming Arctic temperatures induce more allochthony in the northern freshwater ecosystems.

33-O An experimental test to assess the effects of treeline shift on bacterial community composition and function in a subarctic lake. *Carina Rofner¹ - Hannes Peter² - Núria Catálan³ - Fabian Drewes¹ - Ruben Sommaruga¹ - María Teresa Pérez¹*

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Lakes are excellent sentinels of climate change and can act as indicators of climate driven changes in the surrounding landscape and atmosphere. The expansion of terrestrial vegetation towards higher latitudes and altitudes entails long-term changes in soil development and composition and thus in the inputs of allochthonous carbon and nutrients to lakes. Those might in turn trigger shifts in aquatic microbial community structure and consequently in ecosystem functioning. Here, we studied the short-term response (72 h) of the bacterial community of an oligotrophic subarctic lake to climate driven changes in the catchment by simulating soil runoff with soil extracts of different origin. We determined bacterial community composition and diversity using catalysed-reporter-deposition fluorescence-*in-situ*-hybridization and 16S rRNA sequencing (Illumina), respectively, and measured bulk community and taxon-specific