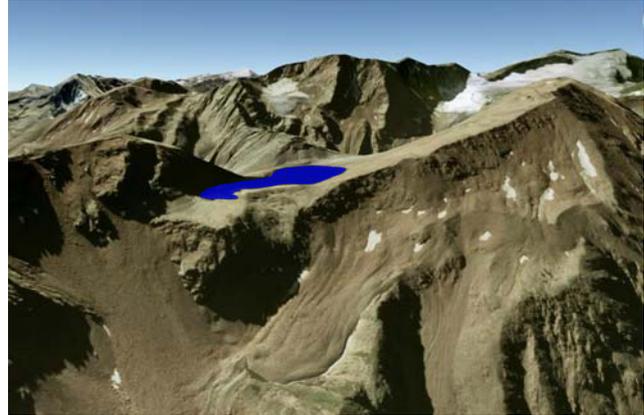


MELTING:

Impact of MELTING permafrost and rock glaciers on water quality and aquatic organisms in alpine lakes

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Study site Schwarzsee o.S. and rock glaciers on north-facing slopes (Google earth)

Summary

Recent warming has strongly affected the melting of permafrost in high alpine regions. The melt water of permafrost and rock glaciers caused unexpected changes in aquatic ecosystems, ranging from rapid increases in conductivity to toxic levels in metal concentrations that can exceed drinking water standards by more than an order of magnitude. The processes controlling the melt water composition, and especially metal concentrations, are not yet understood. It is, however, well known that high metal concentrations affect aquatic organisms, often causing deformations and changes in species composition. Here we propose to investigate aquatic organisms of different trophic levels, ranging from algae (diatoms) to worms (oligochaetes), insects (chironomids, trichoptera) and fish (char and minnows), in three lakes with permafrost in the catchment. We will obtain short sediment cores in order to capture the historic trends of metal increase and resulting changes in species composition and toxic effects. These sediment analyses will be compared with temperature records spanning the past 220 years and with trends of atmospheric deposition based on measurements, and data from peat bogs and ice cores.

Major Research Questions

- To what extent does melting permafrost affect water quality and aquatic organisms in alpine lakes? Do metals, especially nickel, released from permafrost accumulate in the food web and, if so, with what consequences?
- Is the current release of melt water from permafrost unprecedented, or do we see comparable and repeated increases in metal concentrations during warmer periods in the past?
- With ongoing warming, which hazards are to be expected for downstream ecosystems and drinking water supply when compared to the historic trends?

Related Projects

Here we focus on effects on recent aquatic organisms and short sediment records (200-500yrs) analysed with high resolution. We are currently applying for funding for the investigation of long sediment records (past 10000 yrs) in one lake affected by melting permafrost and another lake without permafrost influence.