

## Natural or anthropogenic CONTROL of NICKEL increase in alpine head-waters?



Lake Rasass and catchment (Martin Hartmann, Sept. 2008)

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### Summary

Over the last twenty years an increase in nickel concentrations has been observed in several alpine springs and lakes (see Krainer, Mayr, Thies, Nickus, and others). Concentrations reach very high, even toxic concentrations but the process controlling this increase is still not understood. Within this project we study long, Holocene sediment records in order to investigate whether this metal increase is mainly caused by the recent, pronounced warming or whether similar process can also be observed during warm periods in the past. We will carry out a multi-proxy study, combining geochemical, mineralogical and biological analyses. We assume that if nickel originates from natural sources, we should observe a similar increase during warm periods in the past, in particular if they follow very cold periods. On the other hand, if nickel is derived from atmospheric pollutants, we should see no increase in core sections older than ca. 250 years (with the exception of historic local mining activities). We will compare the age-dated records of one lake that is strongly, one that is slightly, and one that is unaffected by permafrost in the catchment. We aim to disentangle sources, driving forces, duration, and effects of nickel increase.

### Key questions

- What is the source of the enormous nickel increase in alpine water: natural processes or anthropogenic impacts?
- Is air temperature the major driving force for the release of nickel?
- Are headwaters in the vicinity of permafrost and rock glaciers the only ecosystems affected by nickel?
- Is the nickel increase a short lasting pulse or a long-term process?
- Is the current release of metals unprecedented or can we observe similar increases during comparable warm periods in the past?
- Which impacts have to be expected during further warming, especially downstream, and for drinking water supply?