Bioproductivity and trophic state of Greifensee

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Figure 2a: 0 - 4 m

Introduction

- Understanding natural dynamics is essential to understand and predict the responses of natural systems to human impact
- Multidisciplinary team-approach to reconstruct the past environment and condition of Greifensee
- This project aims to reconstruct the trophic state of Greifensee and identify key drivers of bioproductivity changes

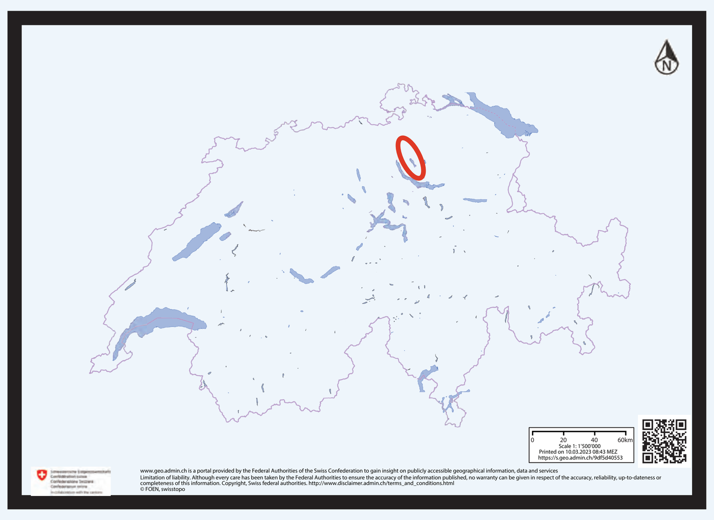
Figure 1: Map of Switzerland with location of Greifensee indicated by red ellipse

Site

- Small lake in the canton of Zurich, Switzerland (8.45 km² surface area)
- Formed after retreat of the Linth glacier after the LGM
- Coring Site far away from inflows
- Lake experienced major human-induced eutrophication in last century, visible as black sediment

Tools and Proxies:

Biogenic Silica
Diatoms are small primary producers utilizing silicon for growth of their frustules. Biogenic Silica (bSi) content in sediment can be used as a proxy for Diatom productivity and was measured using FTIRS

Silicon Isotopes in bSi
Diatoms preferentially incorporate the lighter Si isotopes. Their isotopic composition is a function of starting composition and availability of dissolved silicon and bioproductivity, reaching higher values as more dissolved Silicon is being used up and /or less is available.

Carbonate Content
Precipitation of carbonates is temperature dependent. Climatic signals of the Bølling-Allerød (warm) and Younger Dryas (cold) are visible in the lower part of this record

Pore water
Pore water compositions can provide information on past lake water compositions and post-depositional alteration of sediments

Radiocarbon dating
Core material was sieved and organic material (mostly leaves in the upper five meters) measured using AMS

Smear slides
Visual inspection of diatoms and carbonate crystal size

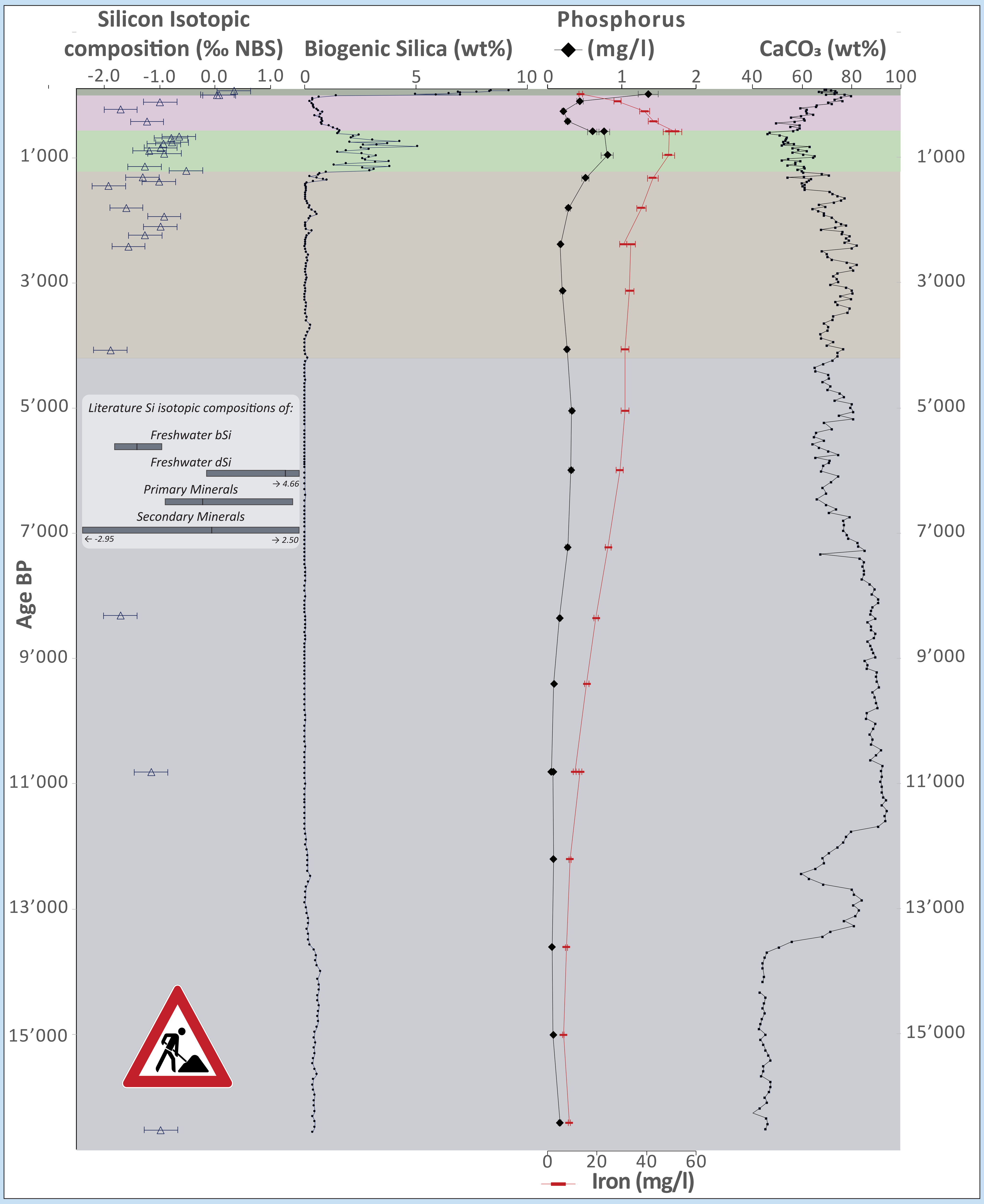

Figure 2b: 4 - 9 m

Preliminary Conclusions

- The trophic state of the lake has changed several times since its formation
- The recent eutrophication represents the most drastic change
- Silicon wasn't a limiting nutrient until this recent eutrophcation, as indicated by low to moderate isotope ratios
- A well-mixed lake during the Little Ice Age might have allowed the formation of iron-oxyhydroxides which scavenged phosphates from the water column and lowered the nutrient content, leading to a strong decrease in bioproductivity
- Diatoms are absent from the sediment prior to ~ 4'000 years BP and were probably not competitive before then, as other proxies (e.g Chlorophyll-A, see Poster Y. Nighojkar) indicate a slow rise of bioproductivity already starting at the end of the Younger Dryas

Figure 2a and b: Core Composite with composite depth and interpolated radiocarbon ages. Dated depths are indicated by the star symbol. Ages beyond 12'900 are extrapolated. The age at 14 years BP is based on warve counting on another surface core (Aquaplus 2004) and core-to core correlation to it

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