Reconstructing and modelling lake mixing regimes in southern Finland and quantifying their future impact on the global carbon cycle

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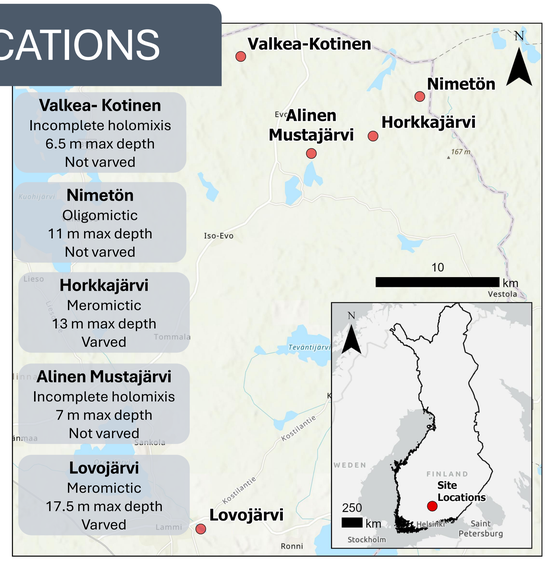
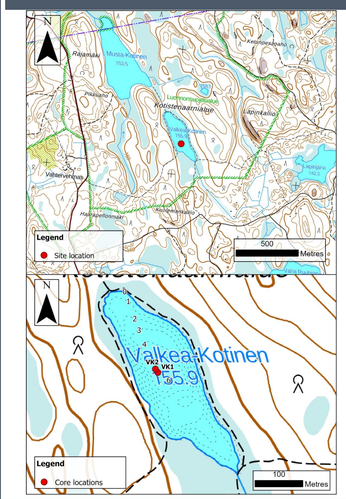
PROJECT AIM

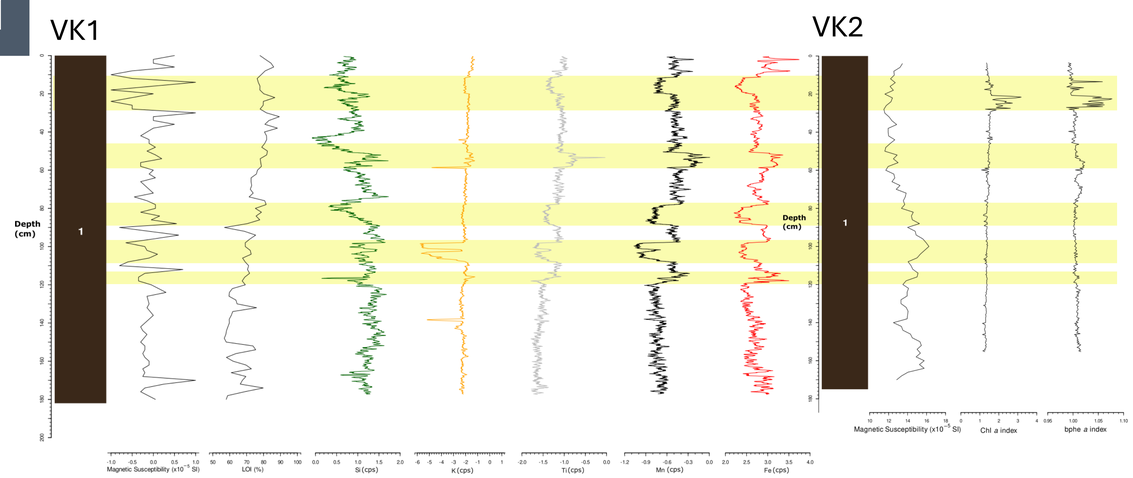
Climate change is one of the greatest threats to lakes, with even small changes in lake temperature profoundly altering key physical and biological processes (Adrian et al., 2009; Woolway et al., 2020). It is predicted that one consequence of climate warming is that by 2100 AD, ~16% of lakes worldwide will mix less frequently and become permanently stratified because warmer low-density surface waters will resist mixing more strongly (Woolway and Merchant, 2019). In Arctic and boreal latitudes, where increases in surface air temperature are expected to be amplified, mixing regime changes may well be magnified (Serreze and Francis, 2006). This project aims to integrate palaeo and contemporary data with model simulations, in order to better understand climatic drivers of lake mixing regimes and understand how lakes will respond to future climatic change, and their likely future contribution to greenhouse gas emissions. Here we present preliminary results of palaeo-mixing reconstructions.

LOCATIONS



VALKEA- KOTINEN





Lithology Unit 1: Very dark brown, highly organic and highly saturated Gyttja. Ld2, As2, Dl+

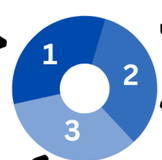
SUMMARY

- Five regions of interest have been identified across the two cores taken at lake Valkea-Kotinen.
- Fe and Mn shifts are seen throughout the core.
- The top-most identified region shows the most profound increase in both Chl *a* and bphe *a*. The response of Chl *a* and bphe *a* is not seen as clearly in the other identified regions of interest.

APPROACH

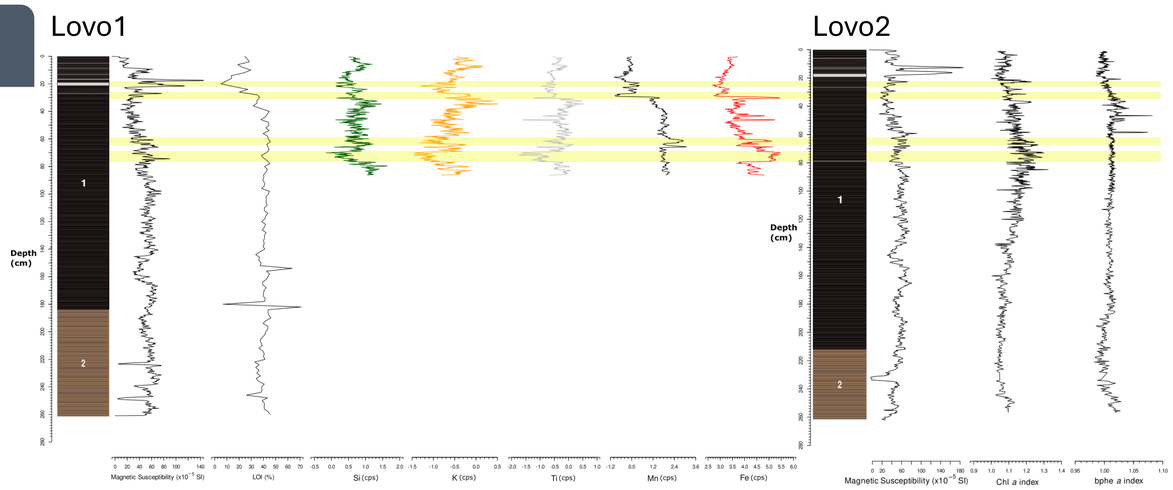
Using **palaeo-mixing** proxies to reconstruct past mixing regimes. This is the main focus of this poster.

Using the **General lake model** (GLM) to understand current and future mixing regimes



Integrating **contemporary oxygen and GHG gas concentrations** with GLM and AED to project future lake emissions.

LOVOJÄRVI



Lithology Unit 1: Varved black gyttja. Ld3, As1 Unit 2: very dark brown varved gyttja. Ld2, As2

SUMMARY

- Micro-XRF data spans approximately the past 500 years.
- Four regions of interest have been highlighted based mostly of micro-XRF data.
- ~32cm a decreasing shift is seen in both Mn and Fe that do not recover.
- bhpe *a* only seen to increase from 60cm onwards.

REFERENCES

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