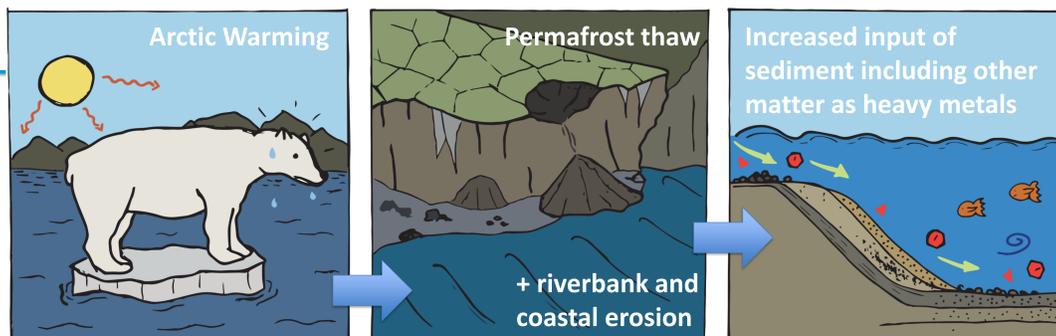


MERCURY IN DEEP ICE-RICH PERMAFROST DEPOSITS OF SIBERIA

Background

Mercury (Hg) is a natural element from Earth's lithosphere with geogen and anthropogen driven emission and has harmful consequences to neural networks along food chain. Schuster et al. (2018) found a significant amount of Hg in Arctic soils of Alaska ($43 \pm 30 \mu\text{g kg}^{-1}$) but a significant data gap for Siberian deposits exists.

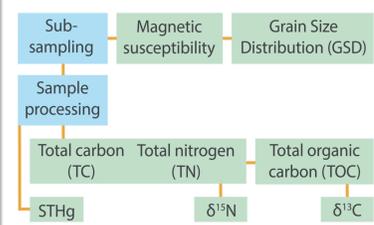
This study aims to address this gap and to start quantifying the Hg amount in deep ice rich permafrost of north-eastern Siberia.



Research questions

1. Which difference in soil total mercury (STHg) concentration in deep permafrost soils of the Yedoma domain exists compared to shallow permafrost soil levels?
2. How is STHg correlated with grain size, (organic) carbon, nitrogen and magnetic susceptibility?
3. How can distinct permafrost landscape features (Pleistocene vs. Holocene, unfrozen zones in the permafrost area vs. deposits of water flooded lagoons) be clearly distinguished in terms of their mercury enrichment?

Methods

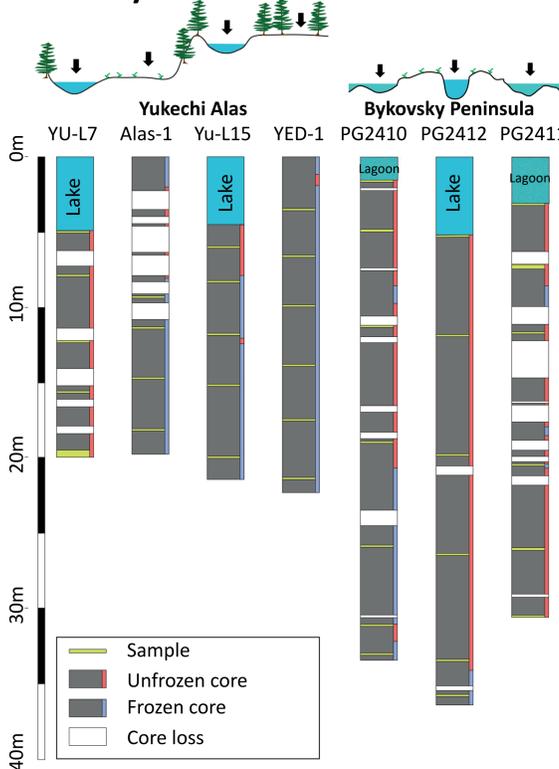


Results and discussion

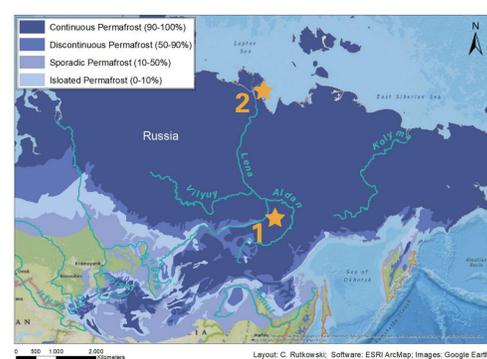
- Mean STHg concentration from 0.86 to 34.52 $\mu\text{g kg}^{-1}$, predominately inorganic (Hg^{2+})

- Higher amount of STHg on Bykovsky (1.82 to 34.52 $\mu\text{g kg}^{-1}$) than in the Yukechi Alas (0.86 to 17.55 $\mu\text{g kg}^{-1}$)
- GSD in deposits general coarser on Bykovsky than in the Yukechi Alas, but also more polymodal and unsorted (also higher clay contents)
- Correlation between TOC and STHg might derive from chelation and other interactions between dissolved organic matter (DOM) and metals.

Study area



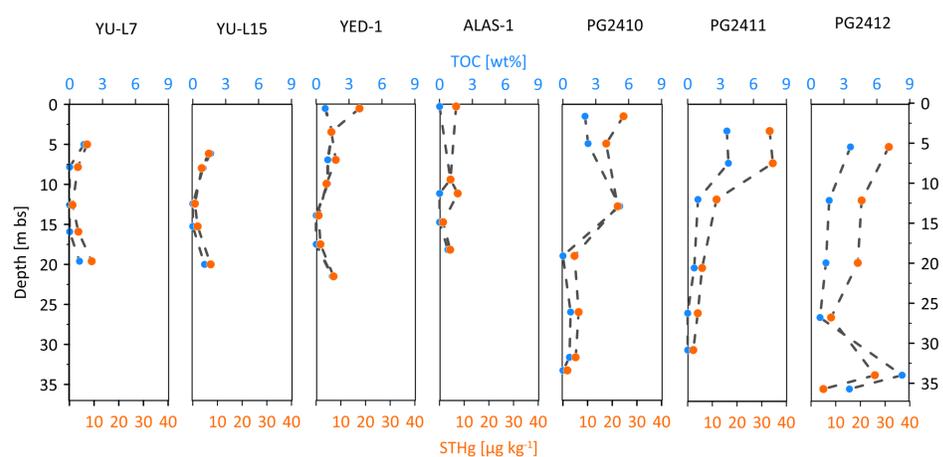
1 Yukechi Alas, Central Yakutia



2 Bykovsky Peninsula, Laptev Sea coast



STHg and TOC concentration per core



Conclusions

1. Deep Siberian permafrost deposits (up to 36 m below surface) contain 9.92 $\mu\text{g Hg kg}^{-1}$ soil in average that might re-enter the global cycle with ongoing thawing, but the amount is not alarming and less than found e.g. in Schuster et al. (2018). EU threshold for contaminated soils is 1.0 - 1.5 mg kg^{-1} .
2. The enrichment of STHg is predominantly correlated with GSD, TN and TOC content as well as magnetic susceptibility in this study. There is no correlation between STHg concentration and bulk density, carbon age or organic matter origin.
3. The difference in STHg concentration between different permafrost landscape features is not significant but is remarkable between both study areas. This might be well explained by proximity to the ocean and different sedimentation regimes.