

Influence of thermokarst formation on manganese-organic carbon interactions in ice-rich permafrost

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Abrupt permafrost thaw leads to changing redox conditions (Figure 1), thereby affecting manganese forms and their potential role in organic carbon stabilization. We analyzed four sediment cores from Central Yakutia (Russia) representing progressive thermokarst processes, from continuously frozen Yedoma deposits (Windirsch et al., 2020) to an Alas lake in a Holocene thermokarst basin that underwent multiple lake generations (Jongejans et al, 2021). We analyzed total manganese concentrations and manganese selectively extracted with dithionite-citrate-bicarbonate (DCB), oxalate and pyrophosphate. In addition, we analyzed organic carbon selectively extracted by oxalate and pyrophosphate. We also determined the main crystalline minerals by X-ray diffraction analyses.

We found that i) selective extractions by DCB, oxalate and pyrophosphate are valid for quantifying manganese phases, and ii) thermokarst processes influence interactions between manganese and organic carbon in ice-rich permafrost.

References

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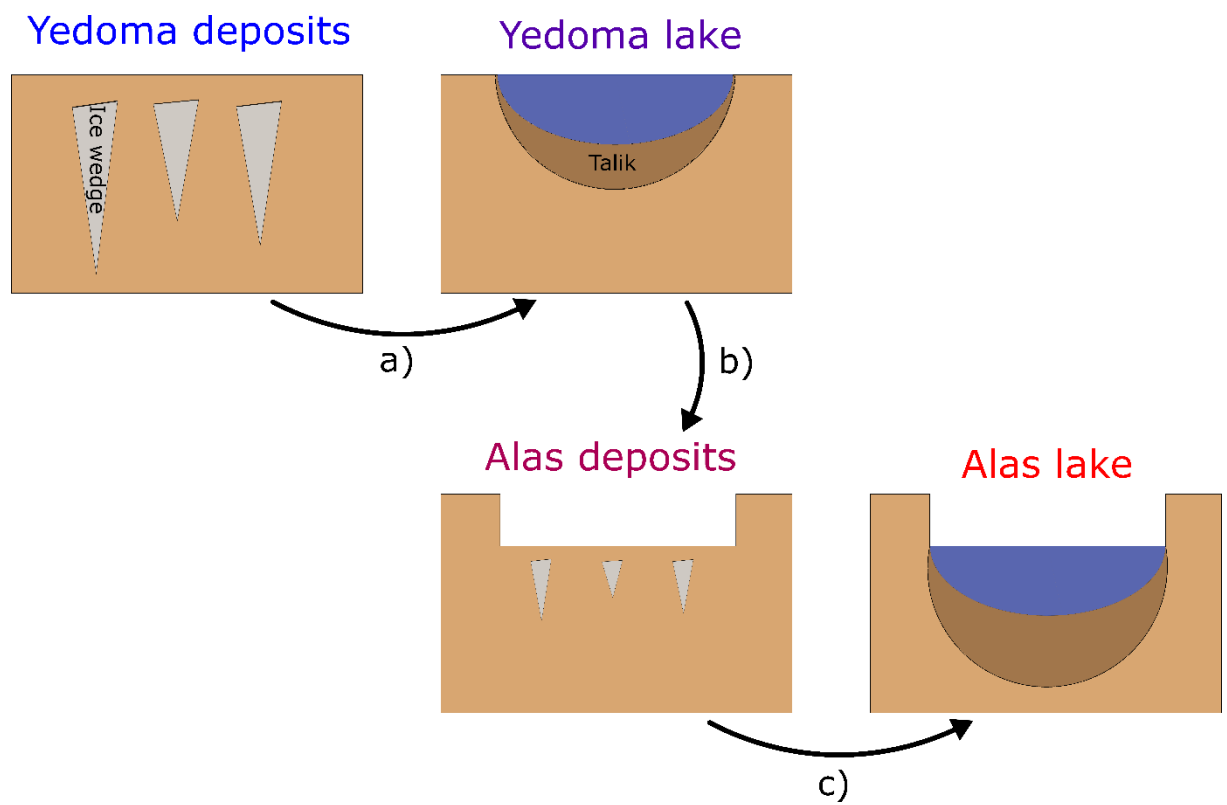


Figure 1: Evolution of redox conditions in response to progressive thermokarst processes:
a) Surface subsidence and thaw lake development b) Lake drainage and sediment refreezing c)
Second generation surface subsidence and thaw lake development.