Zinc and Pb isotope signatures suggest change in lake sediment source in response to global warming

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The thawing of permafrost in response to global warming results in significant changes in the polar and subpolar eco-geosphere. One of the feedbacks is the fate of metals in soils under melting permafrost. The changing environment can significantly impact the cycling of metals by modifying the soil-water balance, vegetation types, aquatic productivity and land use.

This study focuses on the biogeochemical cycle of Zn and Pb within a thermokarst lake system in subarctic Quebec (Hudson Bay, Canada) where the isotope signatures of soil, vegetation, lake water, and sediment cores were studied.

We observed that 1) the Zn isotope signatures of the lake sediment, surrounding soils and leaves were similar ($\delta^{66/64}Zn_{Lyon}$, ~ 0.1 – 0.6‰); 2) lichens showed a heavier signature (up to ~0.9‰) while bottom lake waters were lighter (down to ~ –0.4‰). The Pb isotopes suggest that 3) the lake sediment cores' main sources originate from local bed rock and atmospheric deposition. However, 4) during the last few decades, the deposition rates of sediment have increased significantly, and 5) inputs from local soils and vegetation into the lake following permafrost thaw could have contributed more to the deposition.