Assessing Change in Summer Arctic Moisture Source and Aridity over the Past 7,000 Years Using Leaf Wax δ²H in Baffin Island Lake Sediment
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Background and Research Questions

In lakes with short residence times, terrestrial plant wax δ²H reflects summer precipitation plus evaporation; aquatic plant wax δ²H reflects summer precipitation.

How does summer aridity in southern Baffin Island change over the past 6 ka? Do changes in plant community impact the plant wax chain length distribution or δ²H values?

Between 6.3 ka and the modern day:

1. δ¹³C, BSi and aDNA records suggest that aquatic plants are abundant in the record before 6.3 ka, but summer moisture source is relatively stable at Lake QPT.
2. Summer precipitation is sourced from warm, local origins in lakes with short residence times.
3. Colonization of Betula sp. is synchronous with peak aridity.

Plant Community Changes at QPT

1. δ¹³C, BSI and sedaDNA records suggest that aquatic plants are abundant in the record before 6.3 ka, but plant wax δ²H and relative wax abundance records suggest terrestrial plants dominate during this time.
2. Concentrations of n-alkanoic acids in sediment is not sensitive to the dominant plant species.

Modern Climate at Lake Qaapat (QPT)

Temperature (°C) in Lake QPT (156 cm; MBT'5Me)

Calibrated ¹⁴C Age Model

QPT-2A QPT-2A MD (1 cm/700 yr)

60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210°C

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Aquatic and Terrestrial Plant Wax δ²H

δ²H Cambrian of terrestrial plants reflect summer precip δ²H evaporation
Photos by Sarah Crump

δ²H Cambrian of aquatic plants reflect summer precip δ²H evaporation

Proxies

Branched GDGTs

Ia + Ib + Ic + IIa + IIb + IIc + IIIa + IIc' + IIIb + IIIc' + IVa + IVb + V

εterr-aq = (Ia + Ib + Ic + IIa + IIb + IIc + IIIa + IIc' + IIIb + IIIc' + IVa + IVb + V) / (Ia + Ib + Ic + IIa + IIb + IIc + IIIa + IIc' + IIIb + IIIc' + IVa + IVb + V)

47°-50°N, 68°-71°W

Future Research Questions

1. Do species specific effect of postglacial warming effects bias plant wax δ²H during times of low species diversity?
2. What are the chain length distributions of modern plants in the QPT catchment, and how are they represented in lake sediment?
3. How does species diversity change through time at QPT?
4. How does Holocene precipitation source vary across a latitudinal transect of Baffin Island and Northern Labrador?

Acknowledgments

This research is funded by NSF ARCSS #1737716. ET's lab is supported by NSF EAR-IF #1652274. We thank photos by Sarah Crump.

References


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