THAWING PERMAFROST INDUCES MORE ALLOCHTHONY IN SUBARCTIC PONDS

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INTRODUCTION

- Permafrost = one of the Earth’s largest pools of organic carbon
- Global warming ⇒ permafrost thawing ⇒ carbon release ⇒ ending up in arctic and subarctic freshwater systems ⇒ assimilated in aquatic food chain
- Greenhouse gas emission ⇒ Global warming
- Dissolved Organic Matter (DOM) ⇒ complex mixture of degraded terrestrial and aquatic dissolved material
- Expected to be mainly derived from terrestrial sources in ponds impacted by thawing permafrost
- Linked to the thawing permafrost

Objective:
Explore the impact of thawing permafrost on the DOM composition of subarctic and arctic lakes

Hypotheses:
1. DOM is more terrestrial in thaw ponds than subarctic and arctic ponds not influenced by thawing permafrost
2. Climate warming and permafrost thaw will contribute to make northern freshwaters more terrestrial in the future

RESULTS

Optical Analyses

![Figure 1. Distribution of CDOM and CDL signatures of DOM inside a polygon of potential sources + SD in non thaw (A) and thaw (B) ponds](image)

Stable Isotope Analyses (only Kuujjuarapik region)

![Figure 2. Biplot of SUVA254 where ponds impacted and not impacted by thawing permafrost](image)

![Figure 3. Biplot of SUVA352, where ponds impacted and not impacted by thawing permafrost](image)

![Figure 4. Fractional contribution of potential sources to DOM based on Bayesian mixing model in non thaw (A) and three (B) ponds](image)

INTERPRETATIONS

Optical Analyses

- SUVA254 higher in thaw ponds (Three-way ANOVA, p<0.01**)
- More aromaticity in thaw ponds
- Indicator of terrestriality
- SUVA352 lower in thaw ponds (Three-way ANOVA, p<0.05’)
- Less algal derived C in thaw ponds
- Less aquatic origin

Stable Isotope Analyses

- Important contribution from terrestrial source and benthic bulk in non thaw ponds
- Suggest imports from watershed and diffusion from sediments
- Terrestrial source is the major contributor of DOM in thaw ponds
- DOM terrestrial in thaw ponds

TAKE-AWAY MESSAGE

1. Importance of thawing permafrost
2. DOM is more terrestrial in thaw ponds than in ponds not directly influenced by thawing permafrost
3. Climate warming and permafrost thaw will contribute to make subarctic and arctic lakes more terrestrial in the future

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