The Effects of Ice Sheet Retreat on Vegetation Variation and Elemental Compositions of Watersheds along a Deglaciated Transect in western Greenland

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1. INTRODUCTION

- Polar amplification of global warning results in large scale of ice across landscapes in the Arctic.
- This results in major vegetation shifts in the region which impacts on associated plants-mediated biogenic weathering of exposed substrates.
- Mineral elements solubilized from rocks during weathering often end up as run-offs in adjoining streams.
- The connections between climate change induced vegetation shift and nutrient enrichment in Arctic streams is not fully understood.

2. MATERIALS & METHODS

- Study location on a ~10.6-6.to 6..8 kya deglaciation gradient from Sisimiut (coast) to Kangerlussuaq (Ice Sheet),150 km apart (Fig 1).

Fig. 1. Study location in western Greenland.

- Plant distribution and abundance surveyed using a combined Floristic Habitat Sampling and Point-Quarter method.
- Water samples were collected over sondes with a daily calibrated multimeter meter (Martin *et al.,*2020).
- The dissolved concentrations of Li, Al, Fe, V, Cr, Co, Mn, Ni, Mg, Ca, & P. were measured according to prescribed method for each element (Martin *et al,* 2020; Oberhelman, *et al,* 2023).

3. RESULTS

- A total of 72 Plant groups were recorded in the survey (Fig. 3)
- The NMDS (Fig.4) plot indicates distinct plant communities in each of the watersheds.
- The PCA plot indicates that Ni & Si covary with all the elements across locations while Mn covary with al the other elements except Si (Fig.5).
- The Mantel test indicates a significant interaction between the plant communities and the concentration of dissolved elements detected in the adjoining watersheds (0.0043).

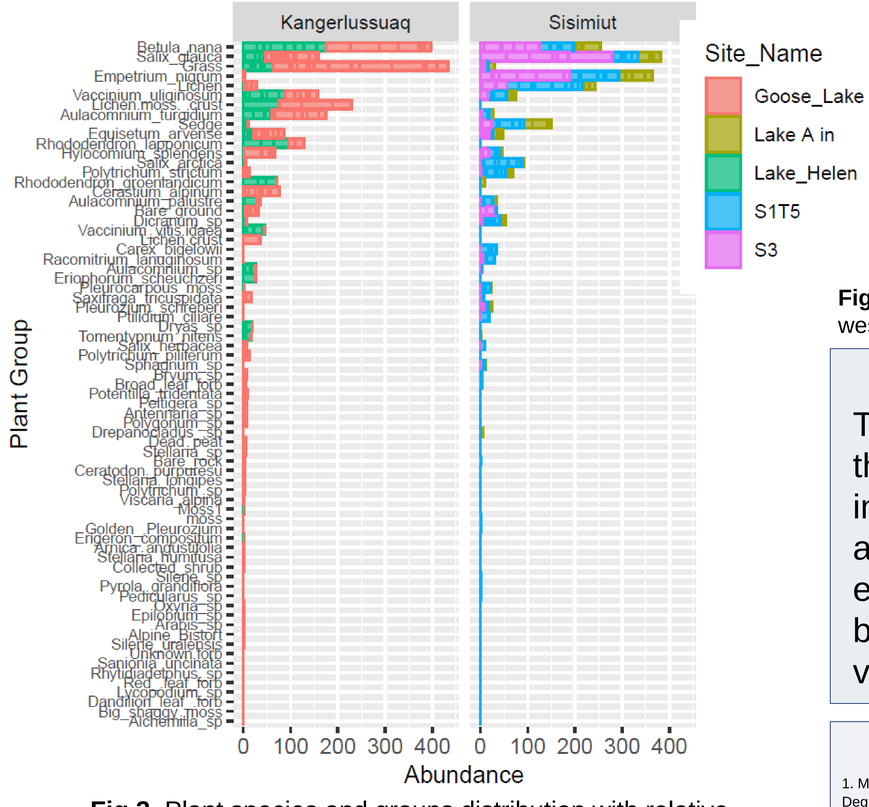

Fig.3. Plant species and groups distribution with relative abundance >10% across sites in western Greenland

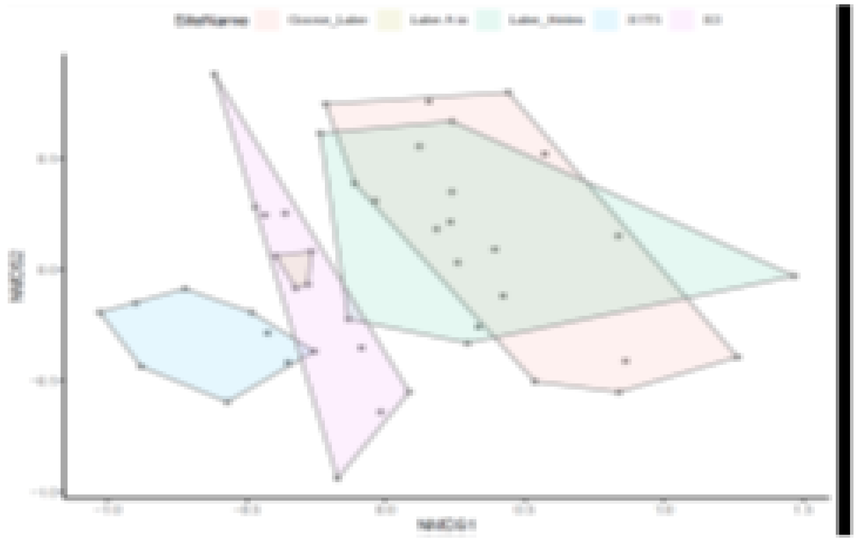

Fig.4. NMDS plot of plant species abundance and distribution in western Greenland. ***k =3, distance = bray-curtis, stress score =0.15)***

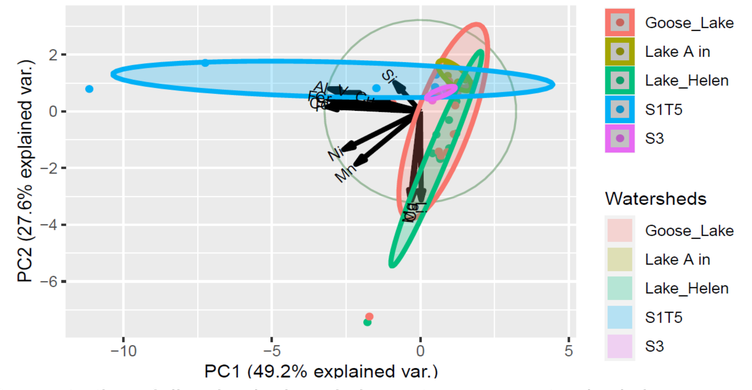

Fig.5. Concentration of dissolved mineral elements across watersheds in western Greenland.

4. DISCUSSION & CONCLUSIONS

The correlation between the two matrices suggests that plants and nutrients may be responding to other intervening environmental variables. To this end, we are currently conducting mesocosm weathering experiments to investigate likely factors mediating between nutrient elements dissolved in streams and vegetation across locations.

5. REFERENCES

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3. Scribner, C. A., Martin, E. E., Martin, J. B., Deuerling, K. M., Collazo, D. F. and Marshall, A. T. 2015. Exposure age and climate controls on weathering in deglaciated watersheds of western Greenland. *Geochimica et Cosmochimica Acta* 170: 157-172.