

Carbon Cycling and Nutrient Storage in Supraglacial Environments on the western margin of the Greenland Ice sheet

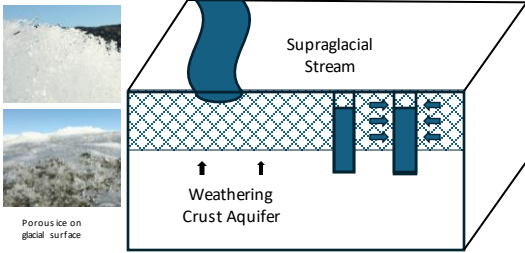
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The Weathering Crust Aquifer



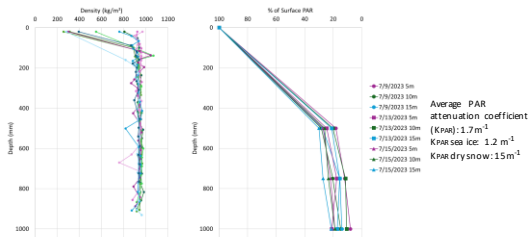
- Present in the ablation zone of glaciers and ice sheets to depths of ~1m
- Results from sunlight penetrating the surface of glaciers
- Stores meltwater during summer months

Sampling Overview

- Accessed by drilling boreholes and letting holes refill
- Completed geochemical and microbiological assessment of waters collected

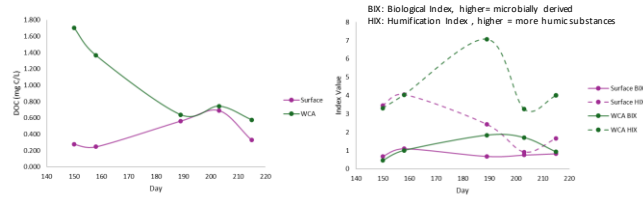


WCA Characterization

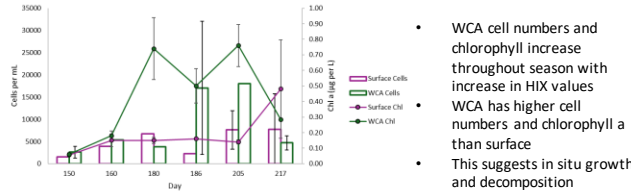


- WCA was ~20cm deep, based on density of shallow ice cores, during week-long sampling period in July 2023
- Light penetration varies due to water content of ice and ~10-25% of surface reaches to 0.5m beneath surface

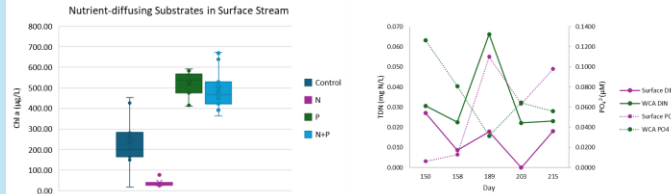
The WCA is geochemically distinct from surface stream



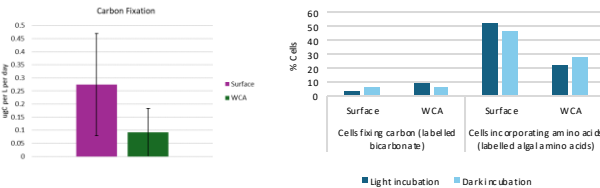
- DOC is consumed in WCA - with more labile, fresh material preferentially utilized
- There are higher amounts of microbially-derived organic matter and humic substances in the WCA mid-season



- WCA cell numbers and chlorophyll increase throughout season with increase in HIX values
- WCA has higher cell numbers and chlorophyll a than surface
- This suggests in situ growth and decomposition

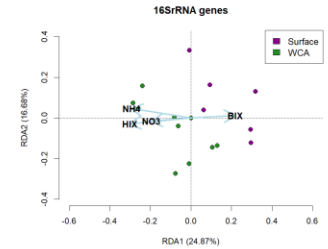


- In-stream phototrophic communities are shown to be phosphorus-limited
- DIN is consistently higher in WCA than surface waters and doesn't seem to be a limiting nutrient
- Phosphate is relatively high in WCA in the early season and high in the surface mid to late season

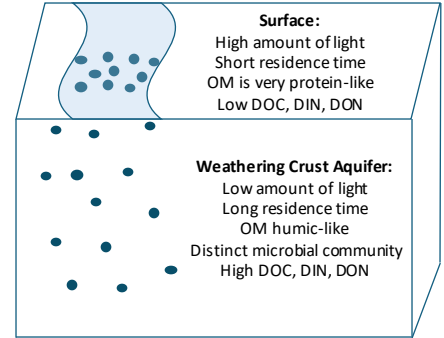


- Rates of photosynthesis in the WCA and surface streams are similar despite differences in light levels
- According to NanoSIMS analysis, 30% of WCA cells are active and 50% of surface cells are actively incorporating amino acids
- < 10% of cells are actively fixing carbon

Organic matter quality and inorganic nitrogen correlate to bacterial community shifts



Conclusions



- The WCA is distinct from surface streams
 - Microbial community composition
 - Geochemistry:
 - Organic matter quality
 - Organic carbon content
 - Inorganic nitrogen content
 - Cell numbers
 - Chlorophyll content
 - Active microbial fraction

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Questions or comments? Please feel free to contact me at qfaber@ufl.edu or connect with me on Twitter @quincy_faber