**Suspended Sediment Concentration Sampling of Glacial Rivers in Northwestern Greenland**

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Abstract:

The Greenland Ice Sheet is Earth's second-largest ice mass and is rapidly changing due to global warming. While the ice sheet itself is extensively studied, little is known about suspended sediment concentrations (SSC) in the rivers and streams that flow from it. Glacial sediment carries minerals that lead to healthy, nutrient-rich seawater, productive algal blooms, and ocean carbon sinking. Over the course of this project, SSC samples were taken across a 400-mile stretch of the western edge of the Greenland Ice Sheet, with 54 samples coming from rivers with no prior publicly available SSC data. The samples will be analyzed by Professor Evan Dethier and samples fitting specific criteria will be used to ground truth satellite imagery.

Project Objectives:

The goal of this project was to gather high quality SSC samples from rivers in northwestern Greenland. Once back in the United States, these samples will be analyzed as part of a large-scale NASA funded satellite ground truthing project titled "Satellite Monitoring of Rivers: A Distributed-Sampling Approach to Improve Satellite Estimates of River Water Quality on a Global Scale" led by Professor Evan Dethier. Currently, a single proglacial river in this region of Greenland has publicly available SSC data and as part of this project, all samples will be added to a public database. Additionally suitable samples will be used for ground truthing satellite imagery.

Methodology:

The methodology of this research followed that which Professor Dethier will use for the "Satellite Monitoring of Rivers…" project and is described below.

- Collection
  - Lower sampler bottle into flow.
  - Rinse bottle three times in flow.
  - Lower sampler as much as 3 m below the surface.
  - Retrieve bottle and cap until filtration.
- Photographs
  - Sampler bottle in the foreground, river in the background.
  - Looking down at river.
  - Looking upstream.
  - Looking perpendicular to flow.
  - Looking downstream.
  - Record GPS coordinates.
- Filtration
  - Agitate sampler bottle to mix sediment.
  - Subsample 30 mL using the syringe.
  - Filter this subsample, saving the first 25ml of filtrate.
  - Continue filtering until the filter reaches the point of refusal.
  - Air dry the filter and store in a cool, dry place.

Results Obtained:

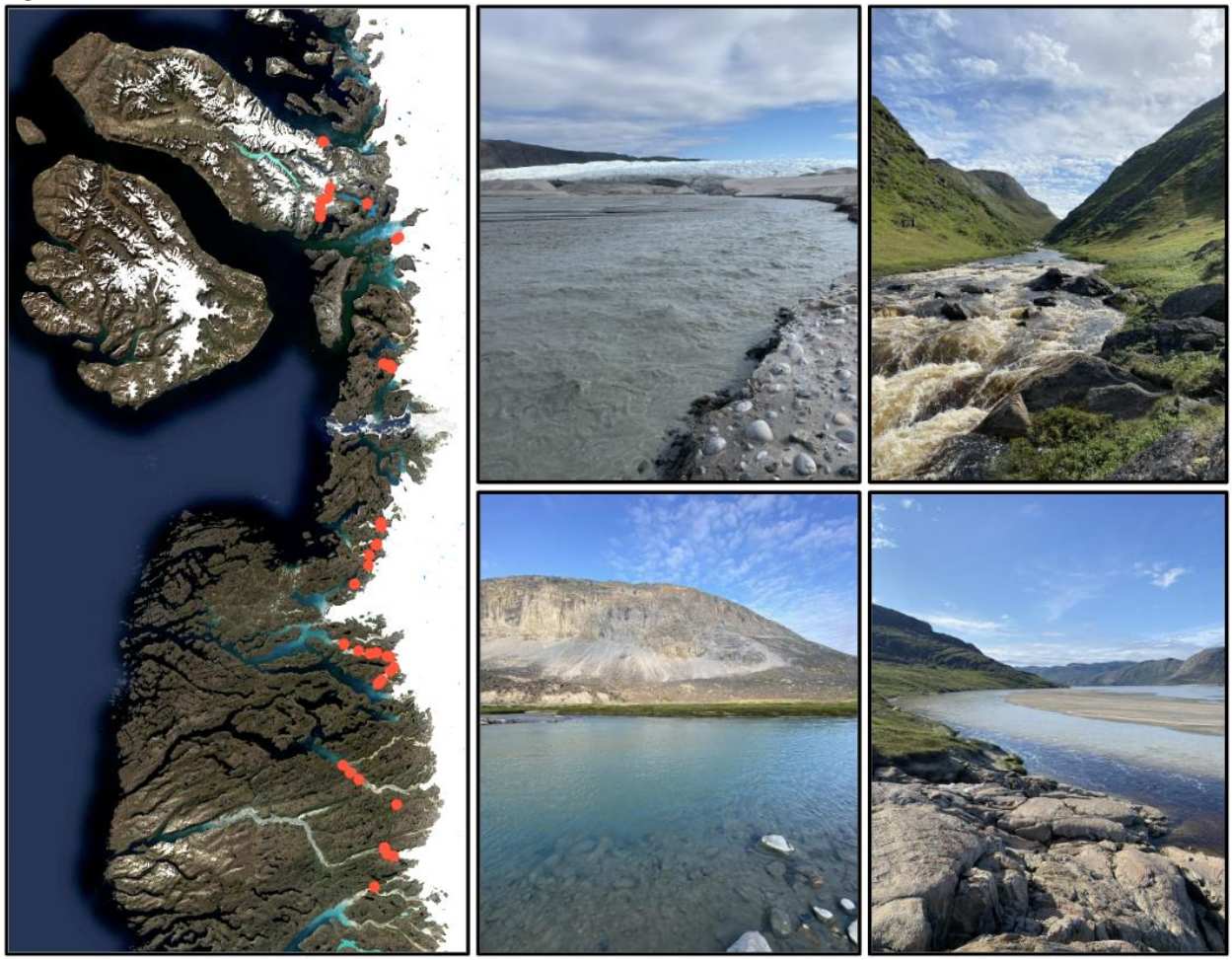
As this project only involved the collection of samples and all analysis will take place later, little can be gleaned from the work at this point beyond basic qualitative observations. As shown in the

images below, proglacial rivers appeared highly turbid and required the least volume of water to reach filter refusal. Non-glacial rivers on the other hand, appeared the least turbid and required up to 140 times more water to reach filter refusal. Rivers fed by mountain glaciers and localized icecaps landed in the middle of the spectrum, with water often appearing blue due to small particles of glacial flour scattering the light.

Significance and Interpretation of Results:

While these observations seem to indicate that rivers flowing from the Greenland Ice Sheet have higher SSC than rivers flowing from mountain ice caps, which in turn have higher SSC than non-glacial rivers, nothing significant can be determined until the samples are analyzed in the lab. Additionally, variance in SSC between different proglacial rivers cannot be determined at this time.

Figures:



*Left: Map of sampling sites in the Disko Bay Region of northwestern Greenland. Sampling sites are marked in red. Upper Middle: Proglacial river with filter refusal at 8 ml flowing directly from the ice sheet. Lower Middle: River with runoff from both mountain glaciers and snow melt and filter refusal at 232 ml. Upper Right: Low turbidity, non-glacial river with filter refusal at 846 ml and appearing dark due to plant tannins. Lower Right: Mixing of low turbidity non-glacial water and a high turbidity proglacial river.*

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