Quantifying glacial melt and movement using remote sensing in Greenland's Sermilik Fjord

Lucy Roberts[2,3], Dave Sutherland PhD[1], Nicole Abib[1]

[1]UO Department of Earth Sciences, [2]UO Department of Geography, [3]Clark Honors College

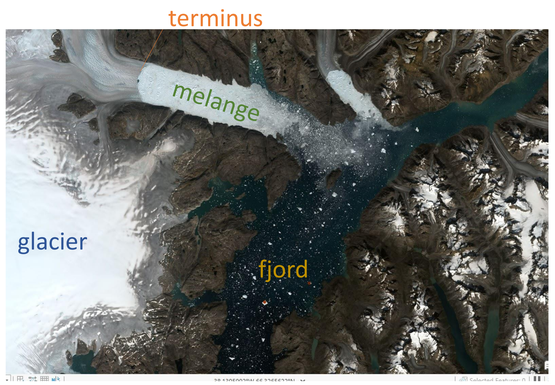
Introduction

As global climate change leads to warming of polar regions and the recession of glacial bodies, freshwater from icebergs and glacial discharge get mixed in with salty ocean water. As such, it is important to be able to understand and quantify how icebergs melt and where that freshwater gets distributed spatially. This research project contributes to the data on icebergs tracked annually by Dave Sutherland in the Ocean and Ice lab.

Research Question

How did iceberg movement and melt on tracked icebergs in Sermilik fjord differ year-to-year?

Terminology

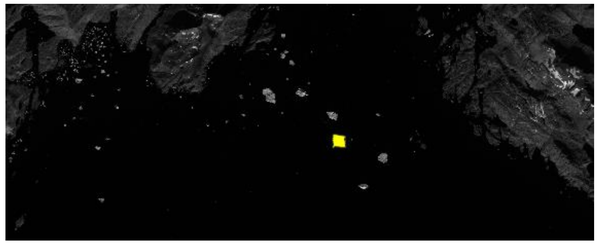


Methodology

Initially, my exploration of the iceberg data provided by Dr. Sutherland began with experimenting with data structures in MATLAB to load 8 years of GPS data into a single dataset from which we could visually compare inter-annual fluctuations between iceberg travel. Graphics such as graphic B gave me a better understanding of the data structure from which we decided we wanted to explore remotely sensed satellite imagery.

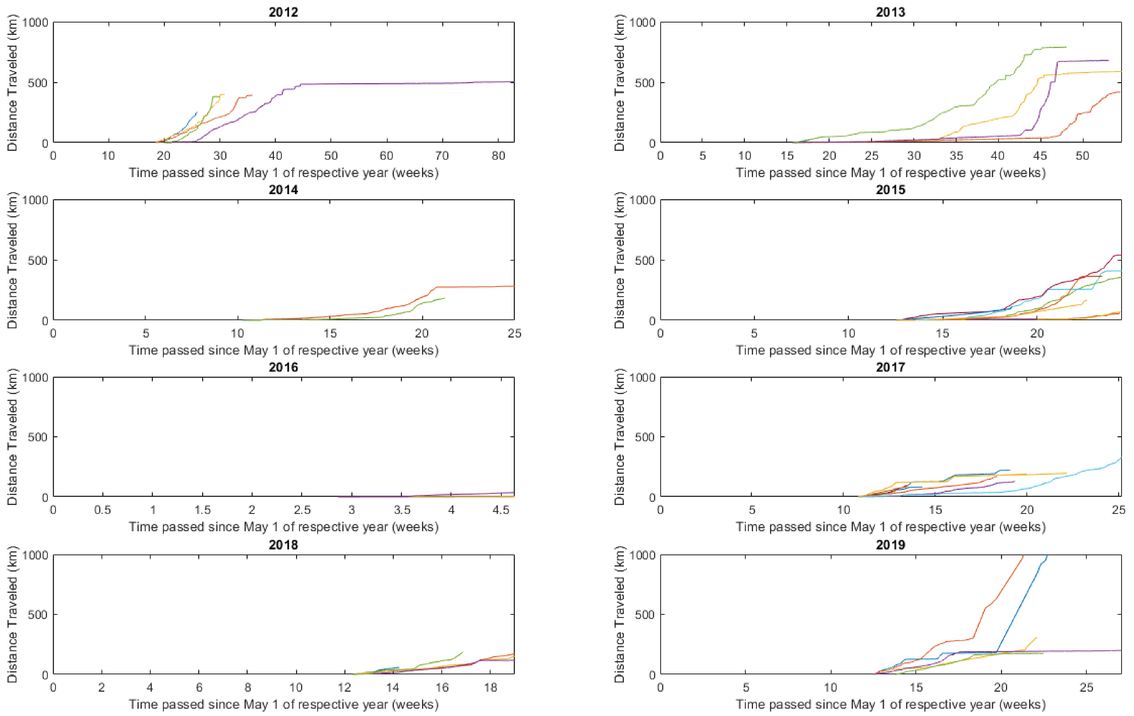
Using satellite imagery from LANDSAT and Sentinel satellite programs, we loaded satellite imagery into QGIS in order to color-rectify the image. We then juxtaposed the regularly reported GPS coordinate data with the time signature of the satellite imagery

A) Example of iceberg perimeter traced from satellite imagery



in order to identify which of the imaged icebergs was tracked with our GPS units. Drawing polygons of the exposed ice and diagonals along the longest edges allowed for a spreadsheet to be developed with data on surface-level melt.

B) Iceberg cumulative distance traveled over time



Results

Developed workflow for identifying remotely sensed icebergs connected to GPS units

Populated spreadsheet with preliminary data on surface area

Quantified and visualized inter-annual differences between GPS data

Future Directions

Continuation of work cut short due to forest fires

Integration of other satellite imagery to create finer temporal scale

Applying workflow to other fjords in Greenland

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