The concentration of in situ ^{10}Be in fluvial sediments as a tool for deciphering 6 My of Greenland Ice Sheet history from a marine sediment core

PROGRESS REPORT

Alice Nelson

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Photo: Josh Brown

Talk Outline

- Research Goals
- Cosmogenic Background
- Hypotheses
- Data sources
- Fieldwork
- Lab work
- Initial Results and Interpretations
- Timeline

Big Picture Question

How has extent of the Greenland Ice Sheet (GIS) changed over the last 6 million years?

Photo: Josh Brown

Research Goals

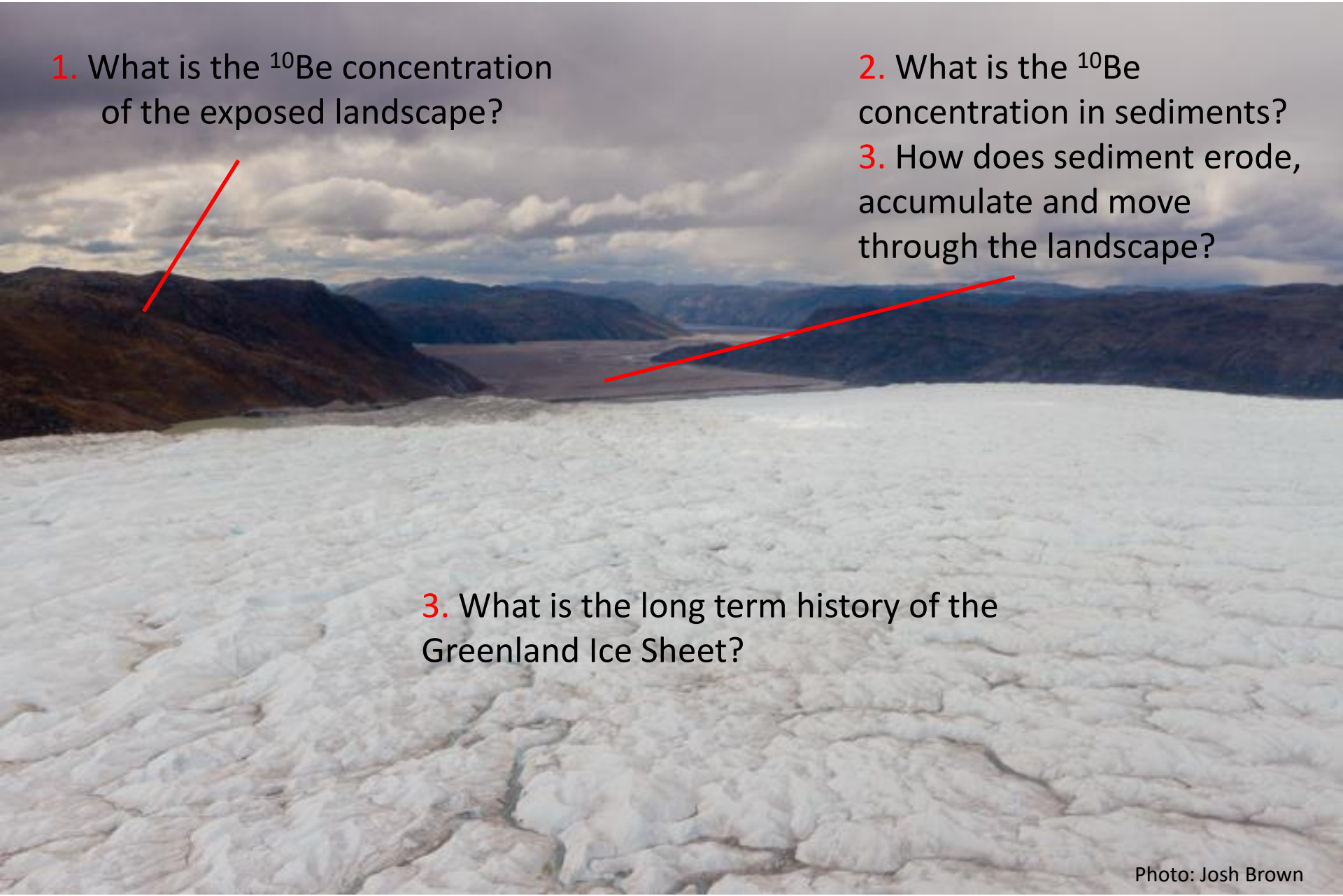
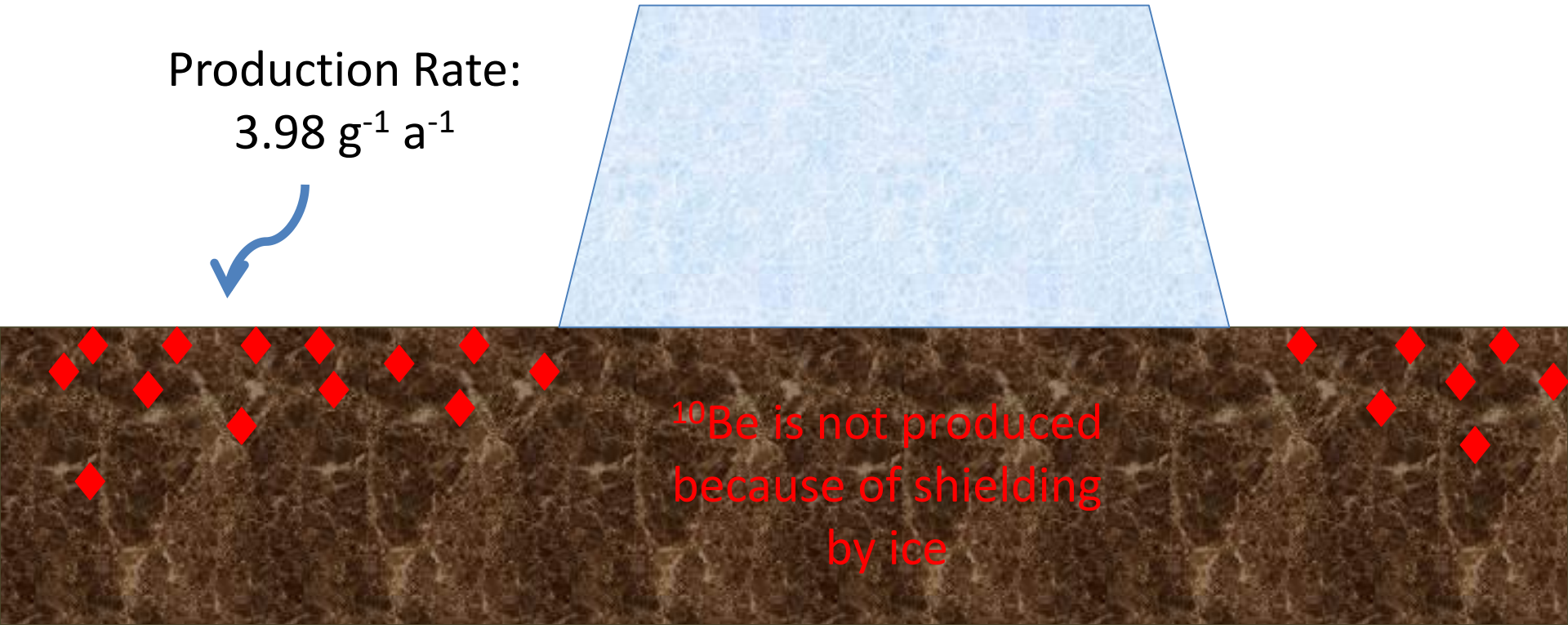


Photo: Josh Brown

Cosmogenic Background

- ^{10}Be is produced in near surface rocks and sediments because of terrestrial exposure to cosmic rays



Hypothesis

I expect the concentration of ^{10}Be in ocean core sediments to fluctuate over time because of changes in:

A.

duration and extent of landscape exposure

B.

rate of regolith erosion

C.

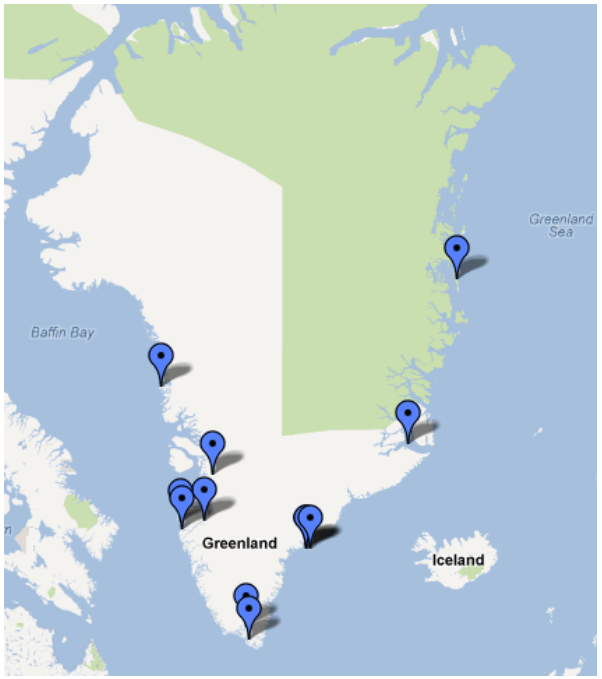
duration of sediment storage within the landscape and timing of sediment transport to the ocean

Photos: Josh Brown

3 Sources of ^{10}Be Data

Field Samples
n=102

Ocean Core Samples
n=30



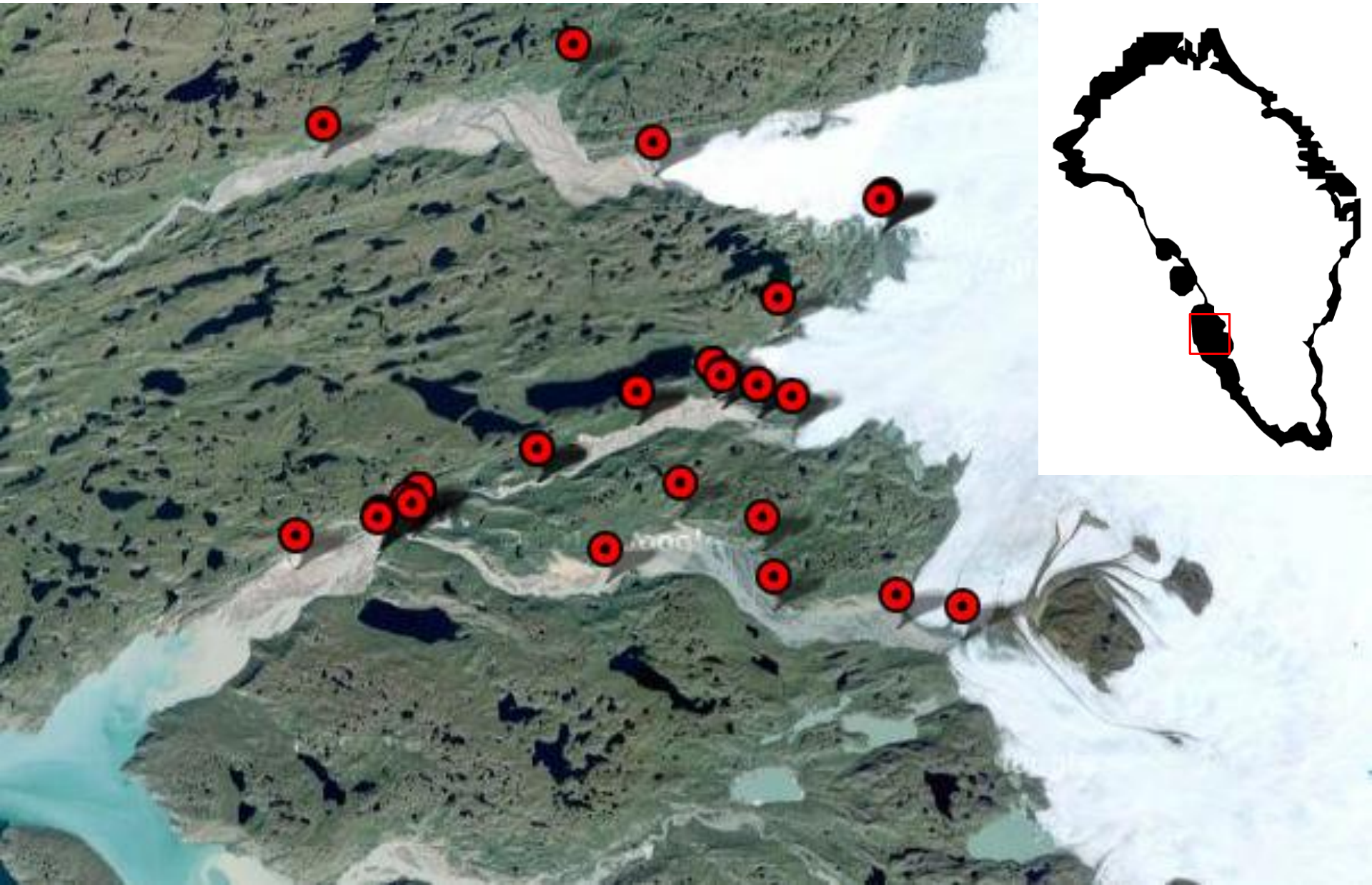
Previously Published
n=176

Field Work


SVALBARD
ELLESMERE ISLAND
BAFFIN ISLAND
ICELAND
Kangerlussuaq
Tasiilaq
918
Narsarsuaq
0 100 200 300 400 KILOMETERS

Field Work - Tasiilaq

Field Work - Kangerlussuaq



Field Work

Getting to the sample sites

Collecting elevation data

Sampling bedrock

Sampling moraine material

Taking field notes

Sampling outwash

Photos: Josh Brown

Lab Work

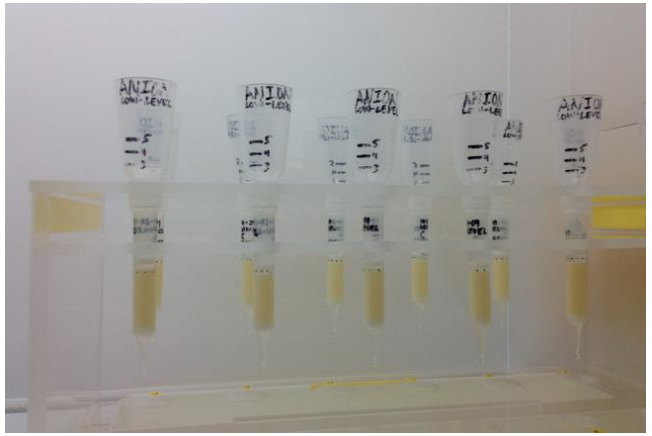
sieving

magnetic separation

labeling

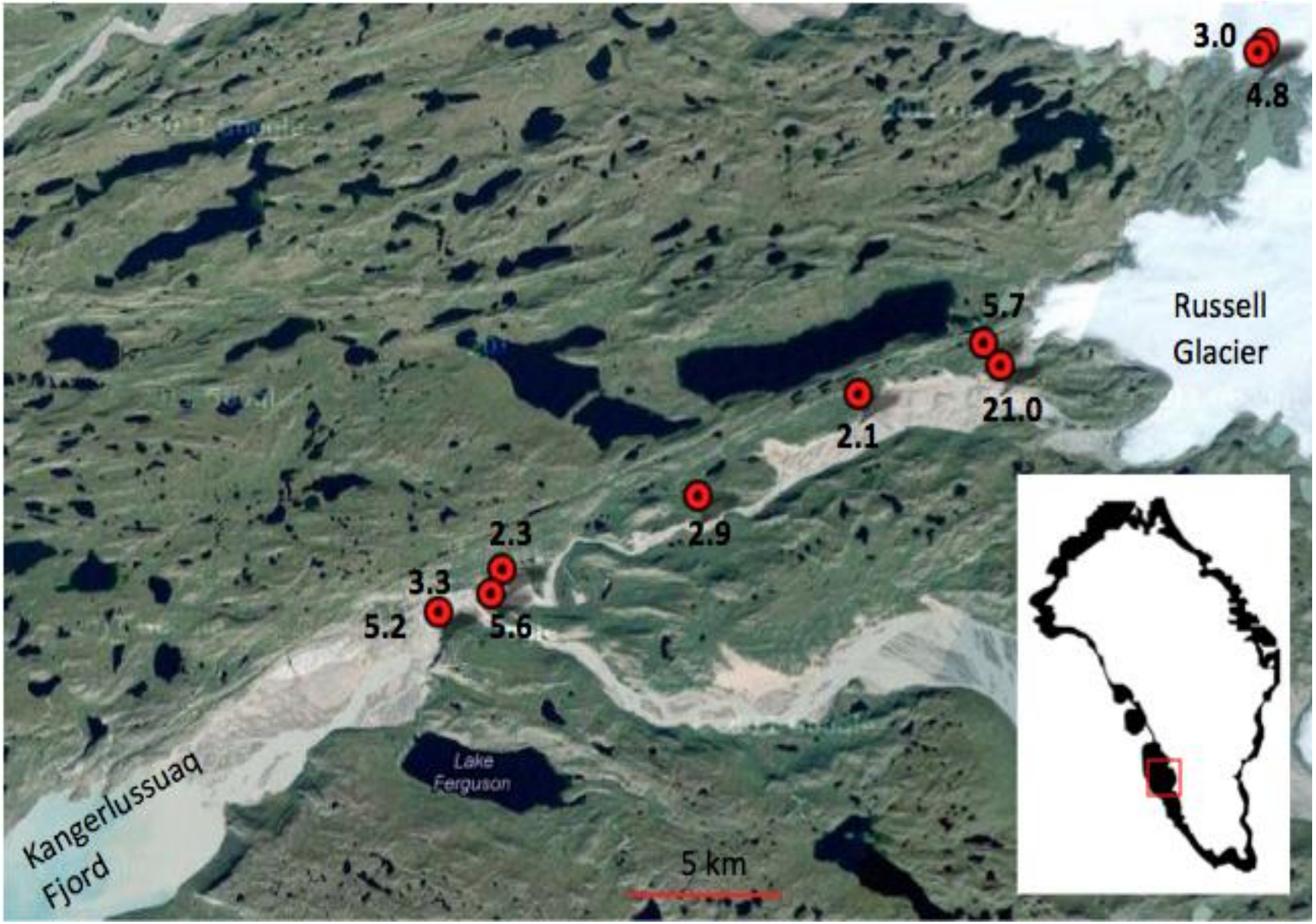
acid etches

density separation

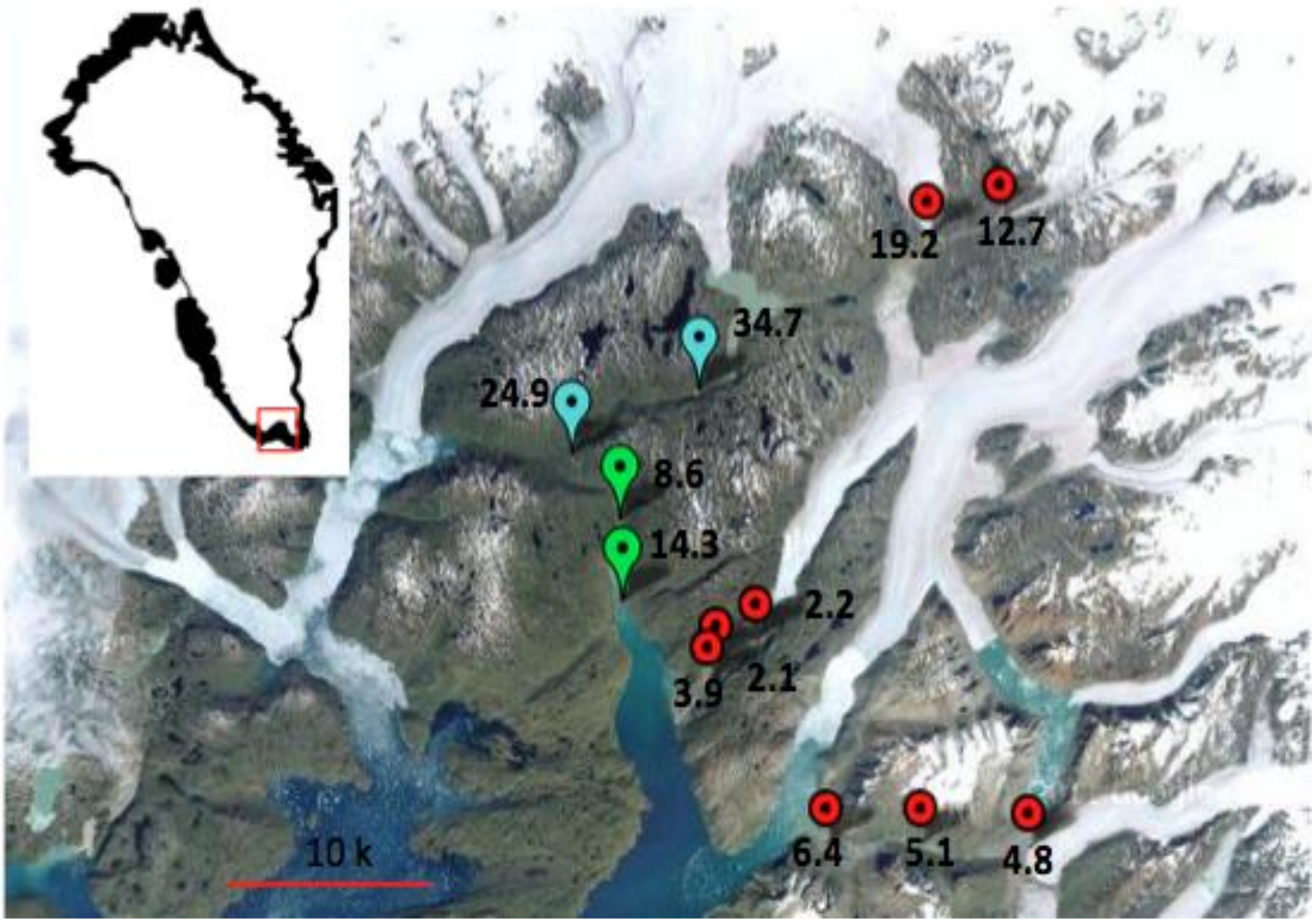


^{10}Be extraction

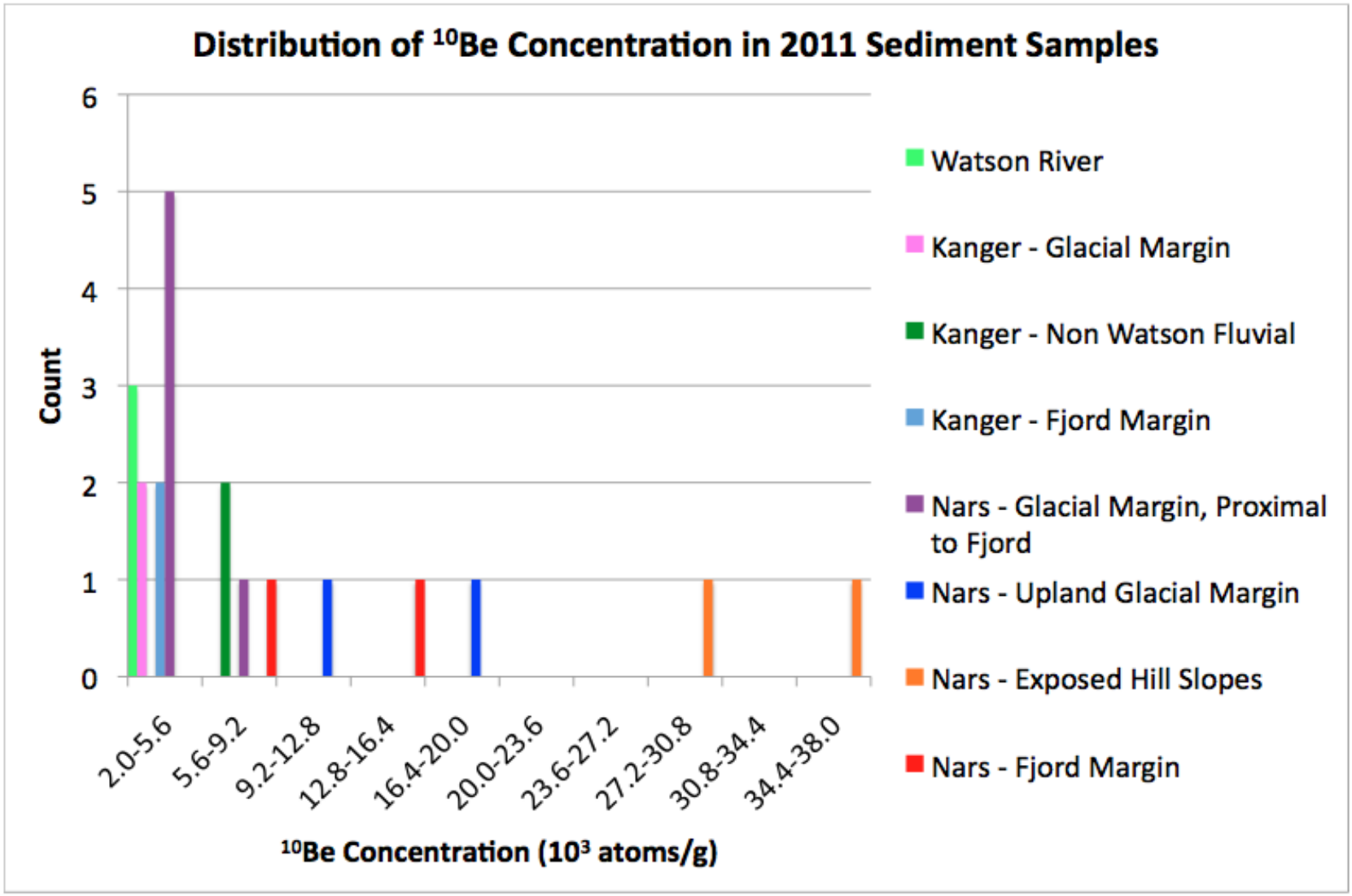
Initial Results - Kangerlussuaq



Initial Results - Narsarsuaq



Initial Results



Interpretations

- Sediments discharged by the GIS today contain varying concentrations of ^{10}Be
- ^{10}Be concentration in sediments eroding from exposed hill slopes is greater than ^{10}Be concentration in sediments sourced from the ice sheet
- ^{10}Be concentration in fluvial sediments increases downstream as that sediment is transported through deglaciated areas

To Do

	Sample Preparation	Quartz Production	^{10}Be extraction	Data Acquisition
Summer 2011 *65 samples*	✔	✔	✔	✔
Summer 2012 *37 samples*	✔	✔	September and October	January
ODP Site 918 *30 samples*	✔	Early October	Late October, November and Early December	January

Photo: Josh Brown

Timeline

October	•Finish quartz production for core samples •Cosmo lab processing (2 batches of field samples) •Present Progress Report
November	•Cosmo lab processing (2 batches of core samples) •Geospatial analysis of published ^{10}Be data •Begin processing data for first batch of samples •Prepare for AGU
December	•Present poster at AGU •Cosmo lab processing (final batch of core samples)
January	•Receive, process, and begin to interpret AMS data •Begin geospatial analysis
February, March	•Data interpretations •Create area-weighted model in GIS of ^{10}Be concentration in sediments •Work on writing
April	•Work on figures and writing
May	•Finish writing thesis •Defend thesis