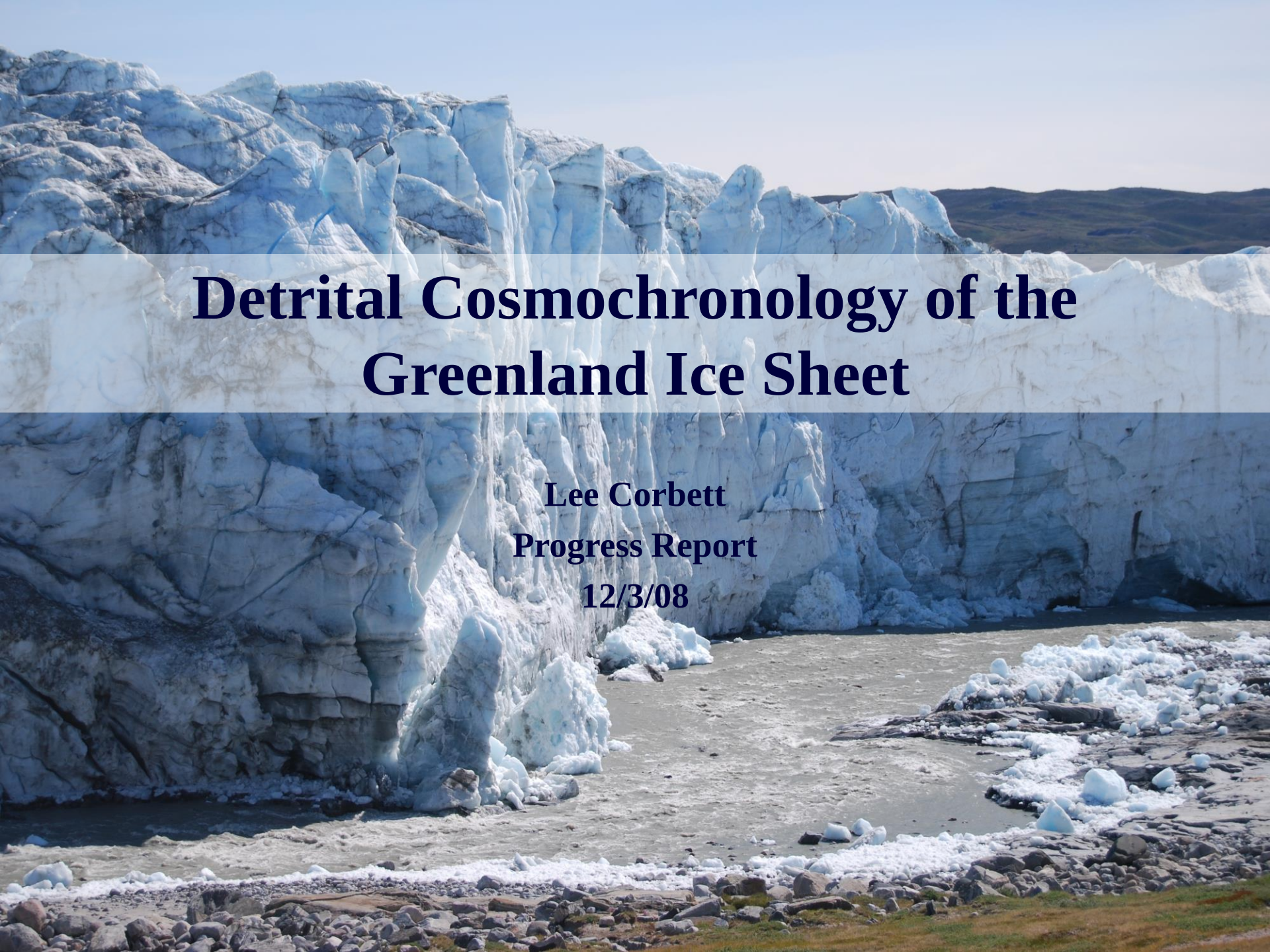


# Detrital Cosmochronology of the Greenland Ice Sheet

**Lee Corbett**

**Progress Report**

**12/3/08**

# Overview

*Unanswered Questions:*

- Has the Greenland Ice Sheet been stable in size over time?
- If not, how many times has it melted significantly?
- How extreme are melting events?
- What is the spatial distribution of melting?

# Overview

*Goals:*

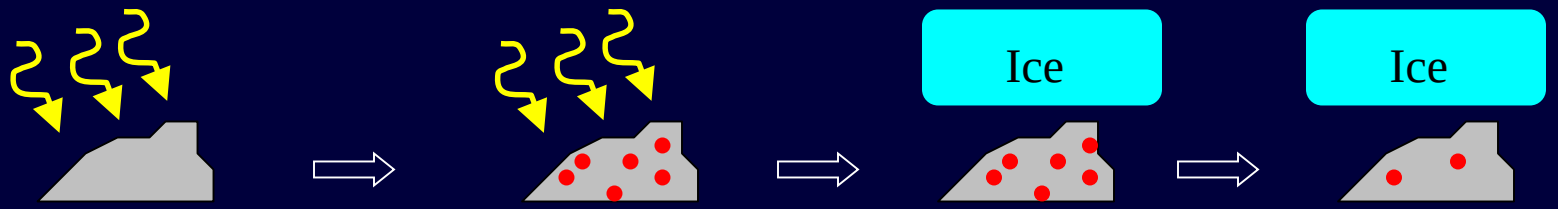
- Use cosmogenic burial dating to investigate times when the Greenland Ice Sheet was reduced in size
- Understand how the ice sheet behaves during interglacial periods

# Cosmogenic Nuclide Dating Basics

Cosmogenic Nuclides:

- $^{10}$Be (half life = 1.3 Ma), measured in quartz
- $^{26}$Al (half life = 0.7 Ma), measured in quartz
- $^{36}$Cl (half life = 0.3 Ma), measured in potassium feldspar
- $^{14}$C (half life = 0.005 Ma), measured in quartz

Burial Dating: Use cosmogenic nuclide concentration to determine how long a surface has spent exposed versus how long it has spent shielded



# Sampling

Northernmost:
***Upernavik***, 72°N
Hypothesized melting: small
98 ice-bound clasts

Middle:
***Ilulissat***, 69°N
Hypothesized melting: ?
73 ice-bound clasts

Southernmost:
***Kangerlussuaq***, 66°N
Hypothesized melting: great
100 ice-bound clasts

# Kangerlussuaq


# Kangerlussuaq: *"Dead Ice" Zone*

# Kangerlussuaq: *Drained Lake*

# Kangerlussuaq: *Outwash*

# Upernavik

# Upernavik: *Inclined Ice Faces*

# Upernavik: *Vertical Ice Faces*

# Upernavik: *Outwash*

# Ilulissat

# Ilulissat: *Inclined Ice Faces*

# Additional Sampling


Bedrock Samples
1 from Kangerlussuaq
20 from Upernavik
16 from Ilulissat

Boulder Samples
13 from Upernavik
15 from Ilulissat

Holocene Exposure Clasts
3 from Kangerlussuaq
3 from Upernavik
4 from Ilulissat

# Laboratory Work

Physical Preparation

- Crushing
- Grinding
- Sieving for 250-710μm grain size fraction
- Magnetic separation

*170 samples during August*

# Laboratory Work

Chemical Preparation

- Two 24-hour etches in hot HCl
- Three 24-hour etches in hot $HF/HNO_3$
- Density separation
- One 72-hour etch in hot $HF/HNO_3$

*75 samples (all bedrock, boulder, and Holocene exposure clasts) during September, October, and November*

# Timeline

| Time Period | Bedrock, Boulders, and Holocene Exposure Clasts | Burial Dating Clasts |
|---|---|---|
| *Fall 2008* | Make quartz | Finish crushing, grinding, etc. |
| *Winter 2008/2009* | Perform dissolutions, isolate Be and Al, perform isotopic analysis | Etch all samples in HCl, isolate kspar if possible, begin $HF/HNO_3$ etches |
| *Spring 2009* | Analyze data, begin writing manuscript | Continue $HF/HNO_3$ etches, begin dissolution and isotopic analysis |
| *Summer 2009* | Finish manuscript | Continue with etches and isotopic analysis |
| *Fall 2009* | Present results at GSA or AGU | Continue isotopic analysis, begin data analysis, present preliminary data at AGU(?) |
| *Winter 2009/2010* | Begin writing thesis | Continue data analysis, begin writing thesis |
| *Spring 2010* | Finish data analysis, finish writing thesis, present and defend | |
| *Summer 2010* | --- | Write manuscript |
| *Fall 2010* | --- | Present results at AGU |

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