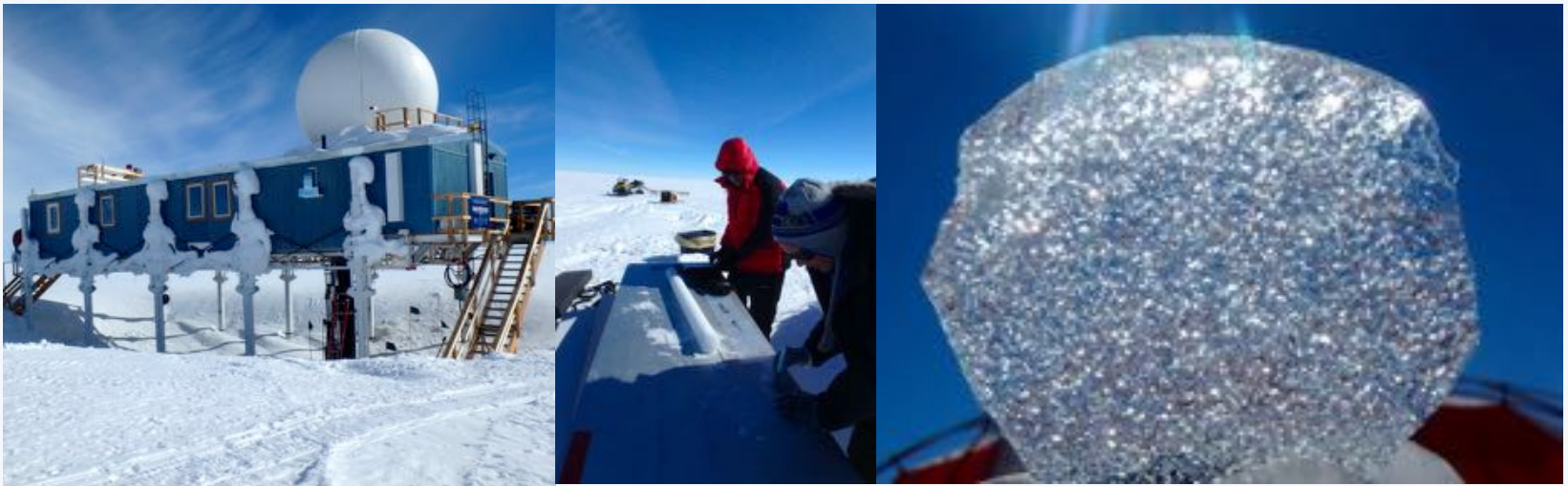


Welcome to *PolarConnect*



Dynamic Observations of the Microstructural Evolution of Firn

With Steve Kirsche,

Dr. Ian Baker, & Eric Wagner

June 20, 2017

Getting to Know Adobe Connect

Slides will be shown here

Exit presentation

Mute your speakers

Raise your hand

List of all participants

Follow the chat

Find out more about the presentation

Chat here



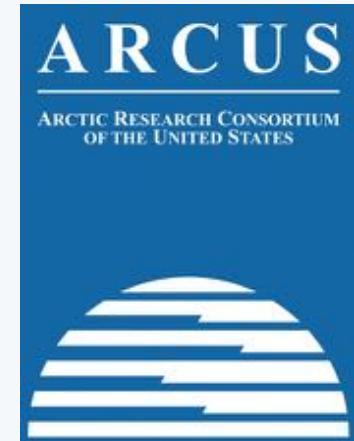
Participant Introductions

**In the Chat box, please introduce yourself
by typing in your:**

- ✓ Name
- ✓ School or Institution
- ✓ The number of students and adults participating with you in the same location

What is PolarTREC?

- Since 2004, the Arctic Research Consortium of the United States (ARCUS), a non-profit organization, has been administering the PolarTREC Program.
- PolarTREC is professional development for K-12 teachers. They are paired with researchers for 2-6 week research experiences in the polar regions.
- Over 150 teachers from around the United States have joined scientists in the Arctic and Antarctica to learn about science, the polar regions, and to share what they have learned with their students and communities.



25 Years of Connecting Arctic Research
www.arcus.org

Questions

During the Presentation:

- Type your question in the text chat box

At the End of the Presentation, two options:

1. Type your question in the text chat box, or
 2. Raise your hand with the “hand button”.
- PolarTREC staff will call on you and activate your microphone.
 - Speak loud and clear, directly into the computer microphone or the phone to ask your question.

Meet the Team



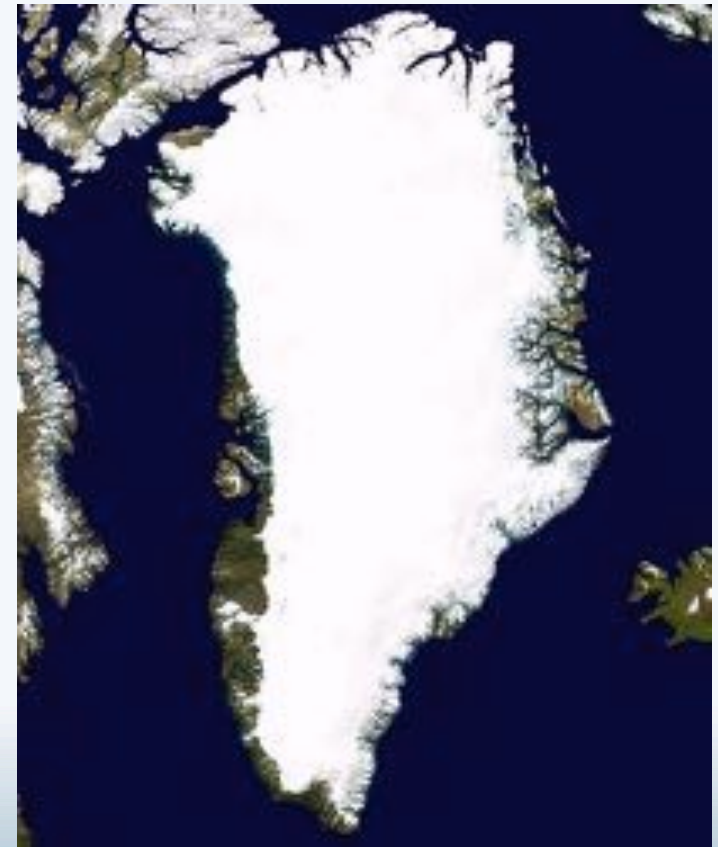
- Dr. Ian Baker (right) – Associate Dean of Engineering, Dartmouth College
- Eric Wagner (left) – PhD Candidate, Dartmouth College



- Steve Kirsche, 7th & 8th Grade Science Teacher, Liberty Pines Academy

Greenland

- Territory of Denmark
- Largest island in North America
- Least densely populated country with only 56,000 people
- $\frac{3}{4}$ of the country is covered by an ice sheet
- Ice sheet is melting near the edges, but building up in the middle due to colder temperatures there

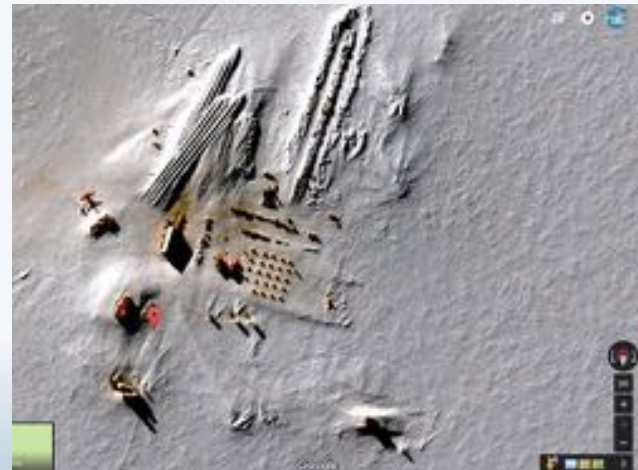


Summit Station

- Located on top of the Greenland Ice sheet
- Established in 1989
- Run by National Science Foundation (NSF)



<http://maps.google.com>



<http://maps.google.com>

Getting to Summit Station

- Only accessible via LC-130 airplane that is equipped with skis
- Plane lands on a 15,000 foot runway made on the snow



Life at Summit Station

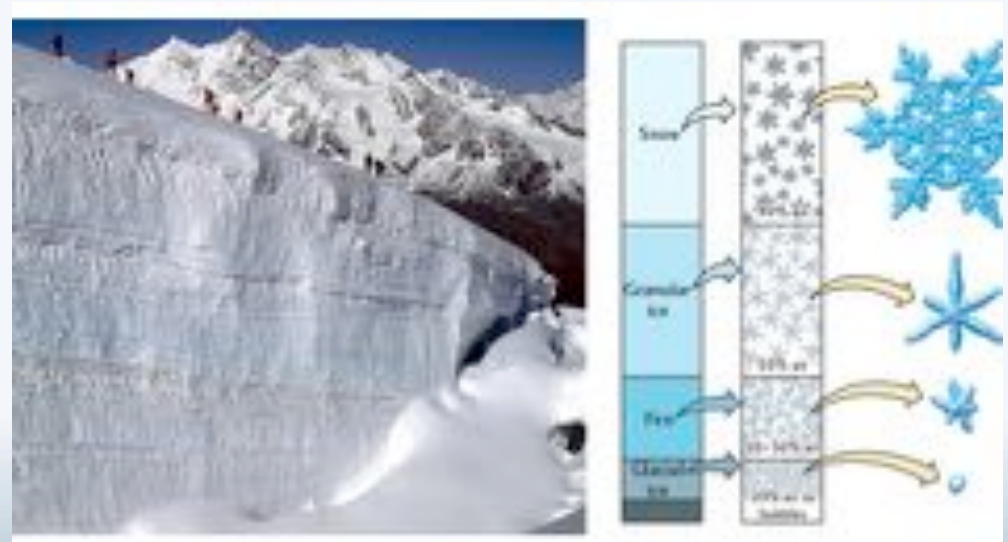


What is an ice sheet?

- An ice sheet is a mass of ice that covers more than 20,000 m² of land
- There are two ice sheets: Antarctica and Greenland (there were more during the ice age)
- 99% of the freshwater ice is contained in these two ice sheets
- Formed when snow doesn't fully melt so it builds up over time and turns into ice

How does snow turn into ice?

- In Greenland, snow that falls doesn't melt
- As snow piles up, the deeper snow has more weight on it
- This causes the snowflakes to Compress
- Firn (composite of air and ice) is produced



Firn Compaction

- As the depth increases, the firn is compacted
 - On the surface, the temperature gradient in the snow is the biggest factor
 - Deeper, the overpressure from above snow dominates
- It eventually turns in glacial ice
- In Greenland, this occurs at a depth of about 80 meters
- In Greenland, firn is about 200 years old before it turns into ice

What are we studying?

- We know that snow turns into firn and then into ice
- We are studying how this actually happens (how does the structure of the ice crystals change as you go deeper)
- To do this, we are drilling ice core samples from the Greenland ice sheet
- We are drilling to a depth of 80 meters

Drilling Site



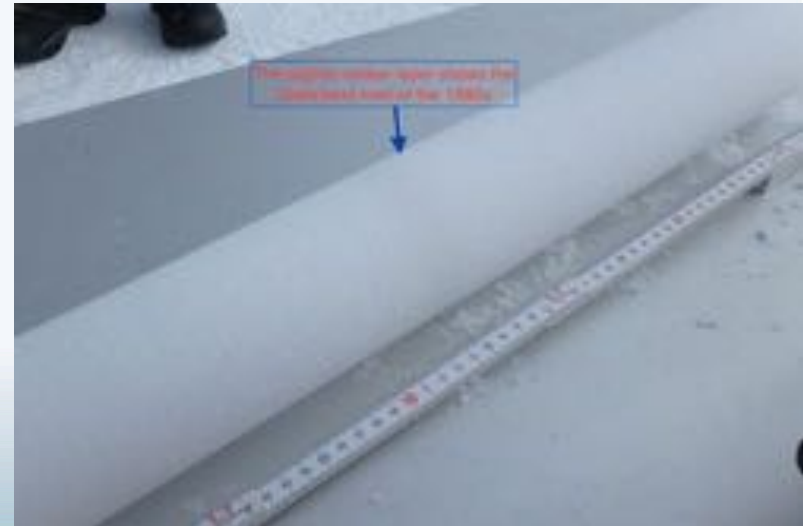
<http://maps.google.com>

Drilling Site



Ice Core Samples

- An ice core sample is a cylindrical piece of ice that is drilled out of the ice sheet
- As you go deeper, the ice gets older
- Scientists can perform many types of experiments on these samples
- Layers on the samples can show events from the past



Getting Ice Core Samples

- A hollow drill is used to drill down into the ice
- The drill is attached to the end of a cable
- The end of the drill has very sharp cutters that cut around the outside of the core sample
- It is lowered into the hole until it drills out approximately 1 meter of ice
- It is then pulled back up and the sample is removed from the drill

Drilling Video



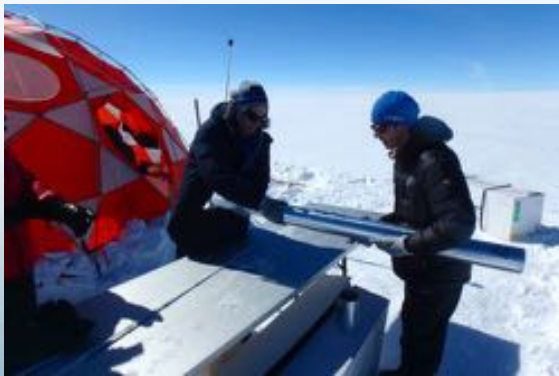
What is done with the ice core samples?

- After the sample is retrieved, it is pushed out of the hollow barrel
- The sample is then measured and logged



What is done with the ice core samples?

- It is prepared for transporting back to Dartmouth College
 - Put in a plastic tube
 - Then put in an insulated cardboard tube
 - Tubes are placed in a heavily insulated box and packed with snow
 - These boxes are kept at $-20\text{ }^{\circ}\text{C}$



What will be done with the samples?

- The samples will be taken back to Dartmouth College
- Over the next few years, the core samples will be used to test how the firm changes
- The structure of samples from various layers will be analyzed using a micro-CT and SEM



Paleoclimatology

- Once firn compacts into ice, air is trapped in the ice
- The deeper you go, the older the trapped air is
- Scientists can extract the air from ice and study it
- This provides direct evidence of atmospheric conditions in the past

What do we hope to learn?

- How the structure of the ice changes due to the temperature near the surface and the pressure further down will be studied
- This is important for areas that build on top of the snow to determine how they are supported
- Understanding the changes the ice goes through will make it easier to interpret data used for paleoclimatology

Thank You!

An archive of the event will be available shortly.

<http://www.polar-trec.com/polar-connect/archive>



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