



TEACHERS AND RESEARCHERS
EXPLORING AND COLLABORATING

Welcome to a live **C-ISE** Event!

With Researcher Elizabeth Webb
Healy, Alaska

Thursday 29 March 2012

3pm AKDT

(4pm PDT, 5pm MDT, 6pm CDT, 7pm EDT)

www.polarrec.com

Blackboard collaborate

Slides will be shown here

Exit the presentation

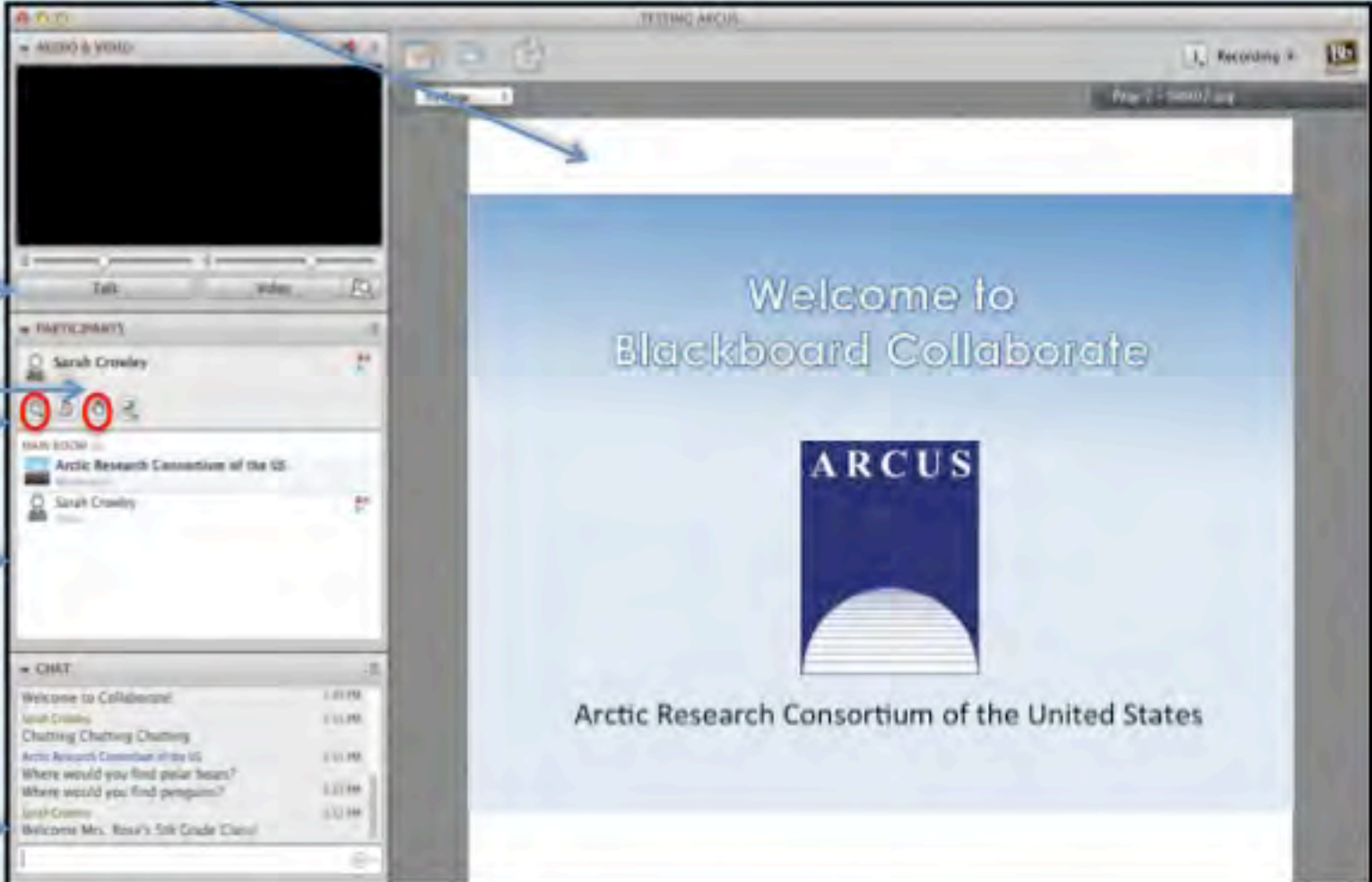
Click to Talk,
Unclick to finish talking

Raise your hand to ask a question

Share with emoticons

List of all participants

Chat with one person or the entire group



The screenshot shows the Blackboard Collaborate interface. The main area displays a presentation slide titled "Welcome to Blackboard Collaborate" with the ARCUS logo and the text "Arctic Research Consortium of the United States". The left sidebar contains several panels: a "Talk" panel with a microphone icon, a "PARTICIPANTS" panel listing "Sarah Crowley" with a hand icon, a "EMOTICONS" panel, a "CHAT" panel with a list of messages, and a "CHAT" panel with a text input field. Arrows point from the text labels on the left to the corresponding UI elements in the screenshot.

Please Note:

- Participants using the telephone can mute/unmute by **pressing *6** on the phone.
- Today's event will be recorded and archived.



TEACHERS AND RESEARCHERS
EXPLORING AND COLLABORATING

Participant Introductions

When called, please state your:

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



TEACHERS AND RESEARCHERS
EXPLORING AND COLLABORATING

What is PolarTREC?

PolarTREC is a professional development experience in which K-12 teachers are paired with researchers for 2-6 week research experiences in the polar regions.

From 2010-2013, nearly 50 teachers from around the United States will join 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.



TEACHERS AND RESEARCHERS
EXPLORING AND COLLABORATING

Questions

During the Presentation:

- Type your question in the text chat box

At the End of the Presentation:

- Raise your hand with the “hand button”.
- PolarTREC staff will call on you.
- Speak loud and clear and directly into the phone to ask your question.

Click on the Talk button to speak.

Unclick when you are done.

A landscape photograph of a tundra with mountains in the background and a low sun in the sky. The sun is a bright, glowing orb in the upper left corner, partially obscured by light, wispy clouds. The sky transitions from a pale pinkish-purple near the horizon to a deeper blue at the top. The mountains in the background are layered, with some peaks covered in snow. The foreground is a dark, flat expanse of tundra vegetation.

Carbon Balance in a Warming Tundra

Elizabeth Webb, Sue Natali, Ted Schuur
University of Florida

PolarTREC webinar
March 29, 2012

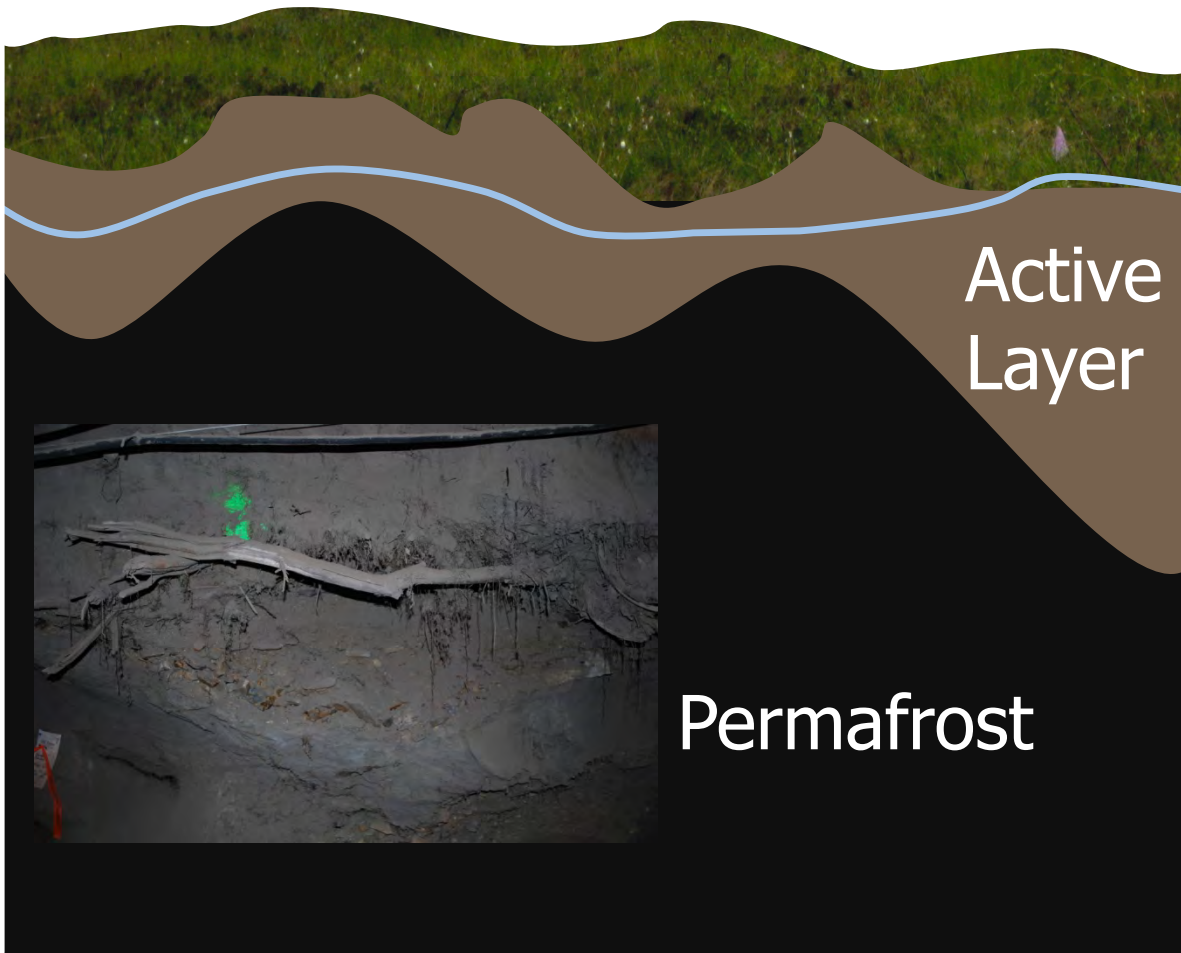
Why study climate change in high latitudes?



-Greatest regional warming on earth

- 2-3 °C temperature [↑] since 1950

-Potential for positive feedback

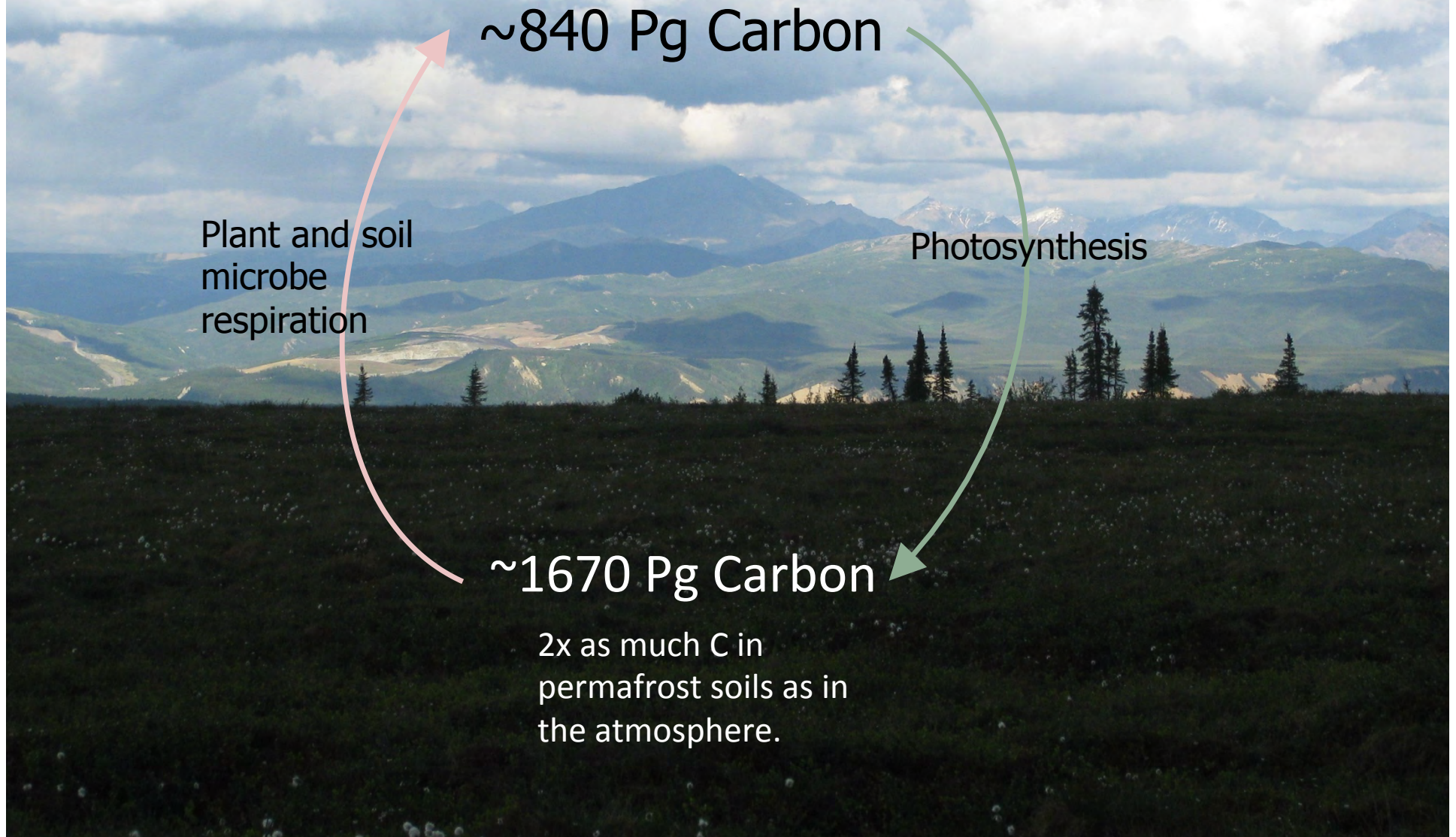


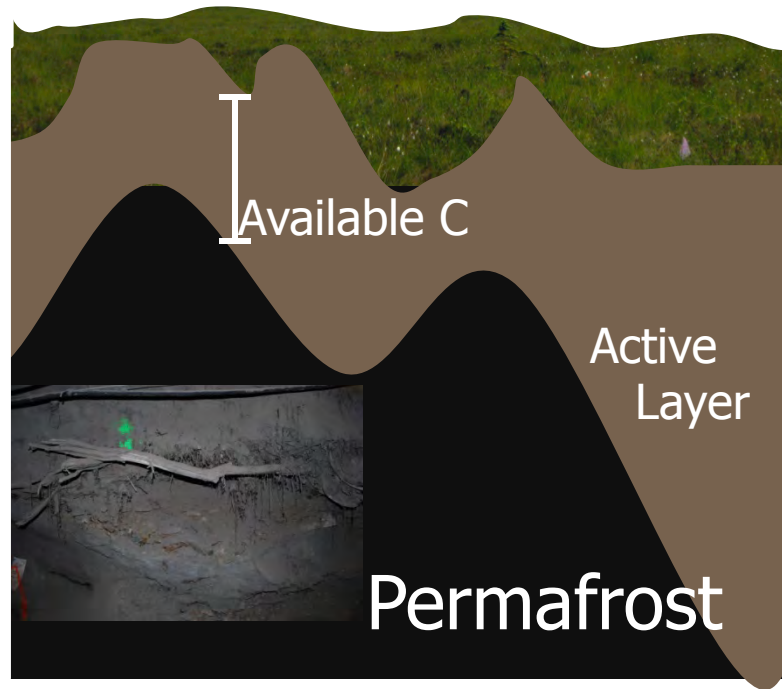
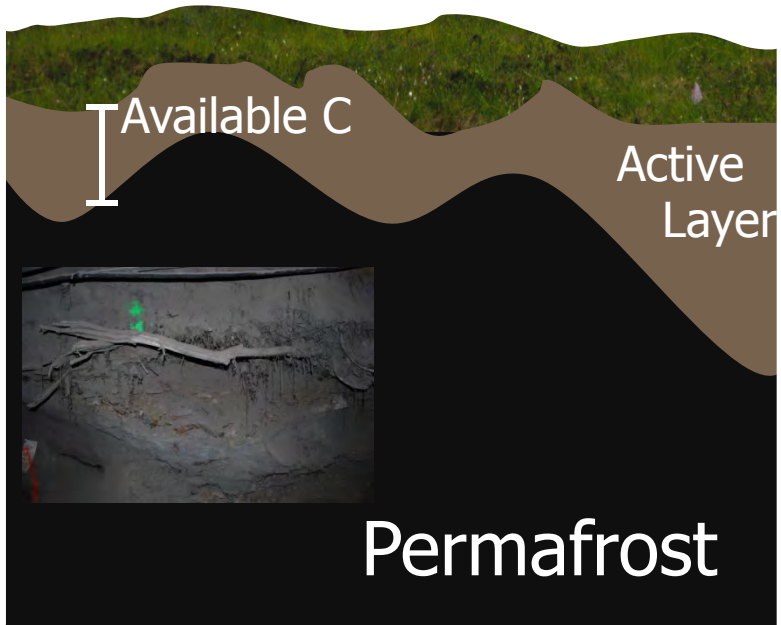
Water
table

Active
Layer

Permafrost

Historically, tundra ecosystems have been a carbon sink.
How will this change with warming?





Our over-arching question:

What is the annual carbon balance of a warmed tundra?



**Carbon In Permafrost Experimental
Heating Research (CiPEHR)**

Field Site

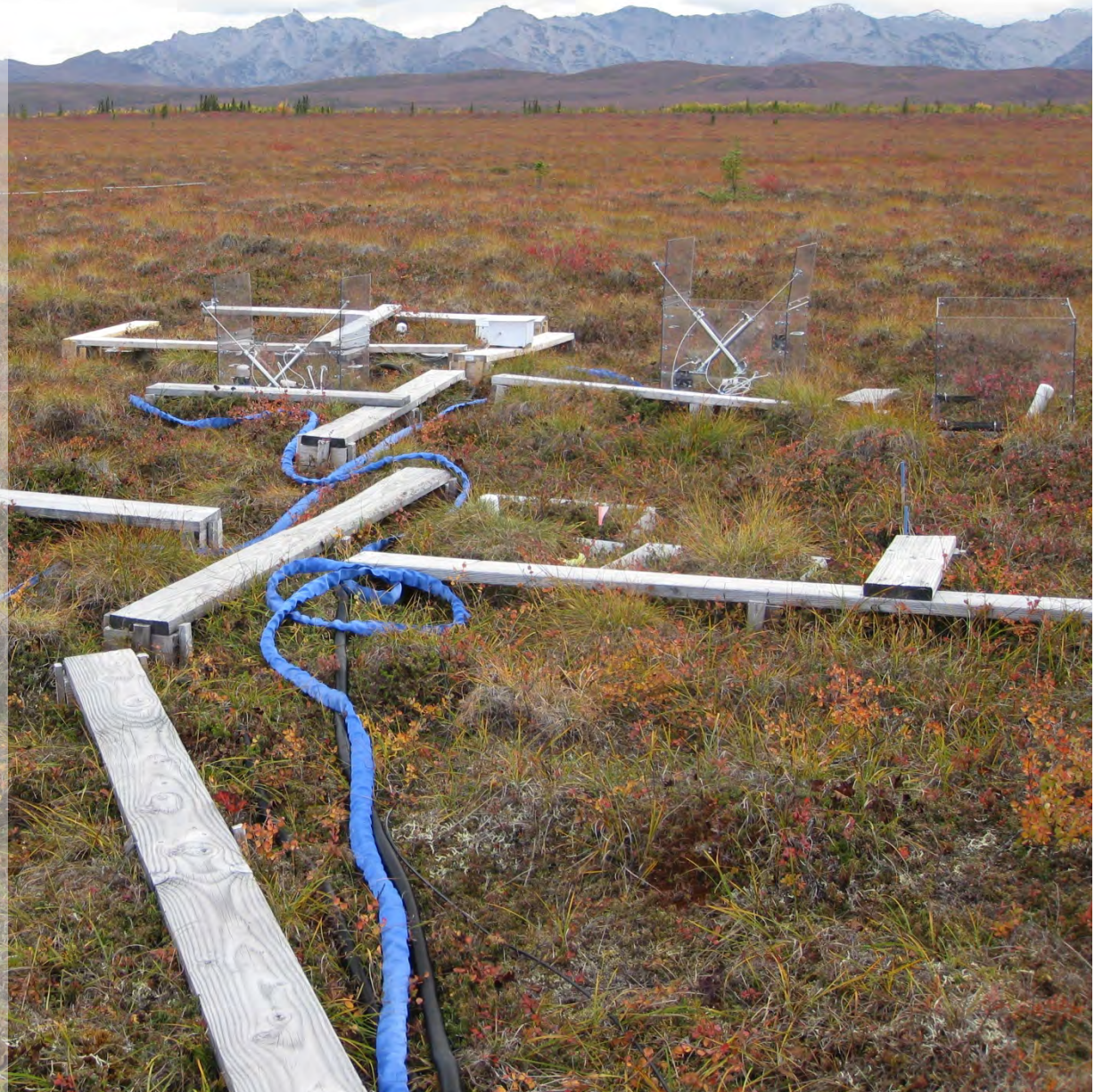


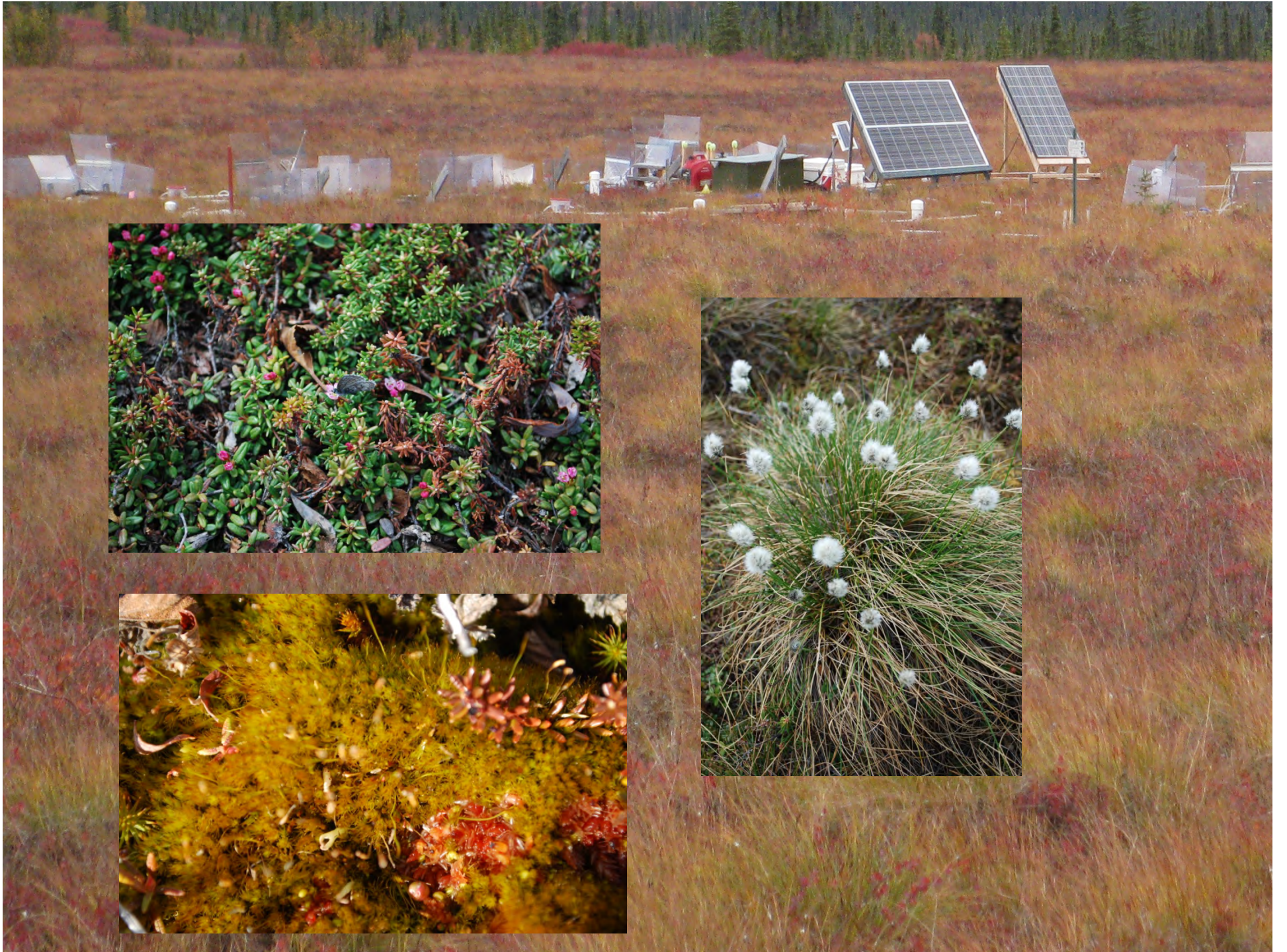
-Healy, Alaska
(63°52'N)

-North slope of
the Alaska Range

-Discontinuous
permafrost zone

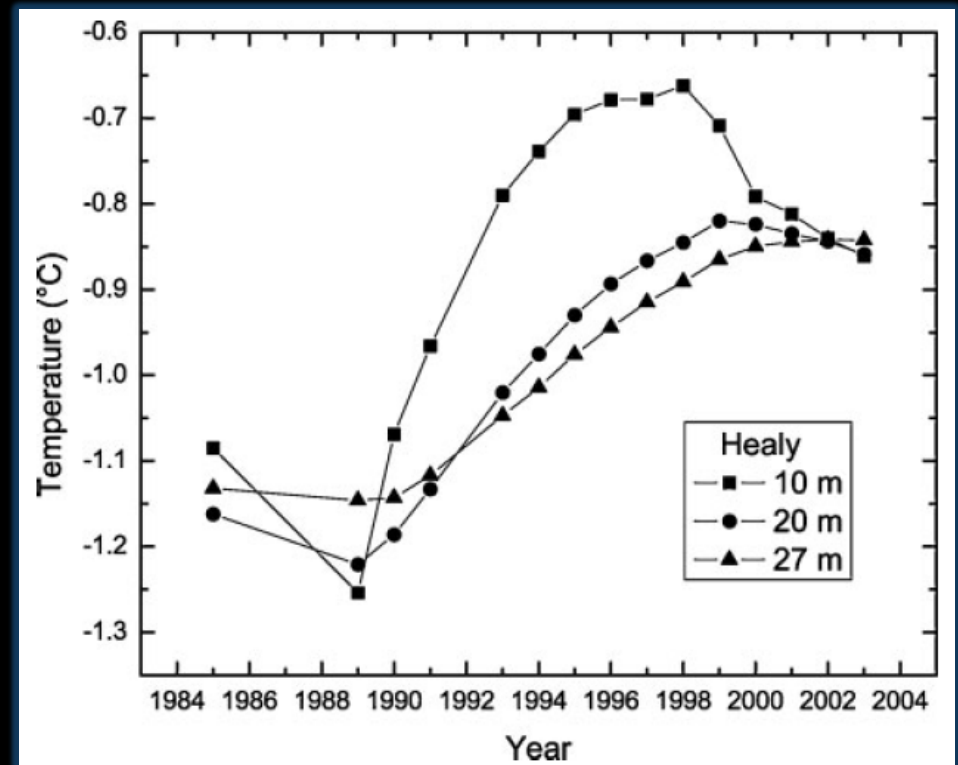
-Tussock tundra





Why Healy?

- Southern extent of permafrost zone
- On-going permafrost borehole measurements

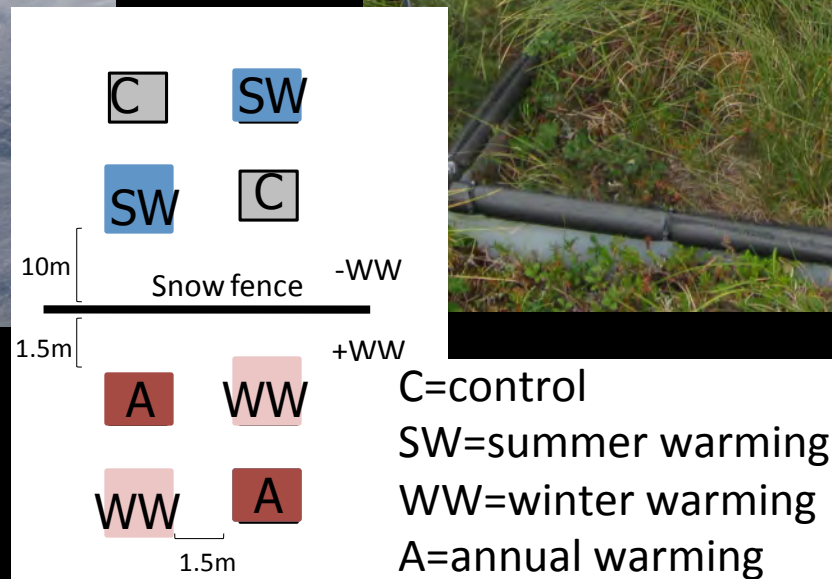
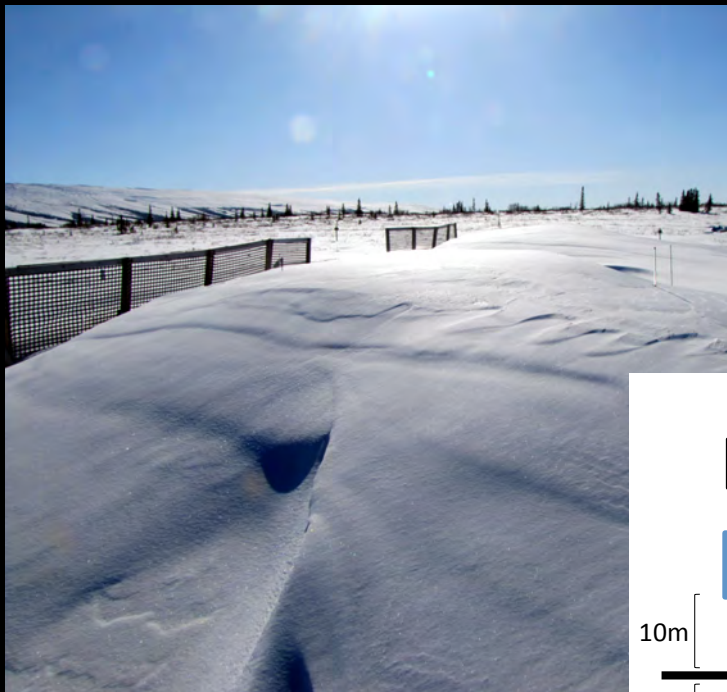


Osterkamp et al. 2009

Experimental Design

Winter warming 2-3 °C

Summer warming 1 °C





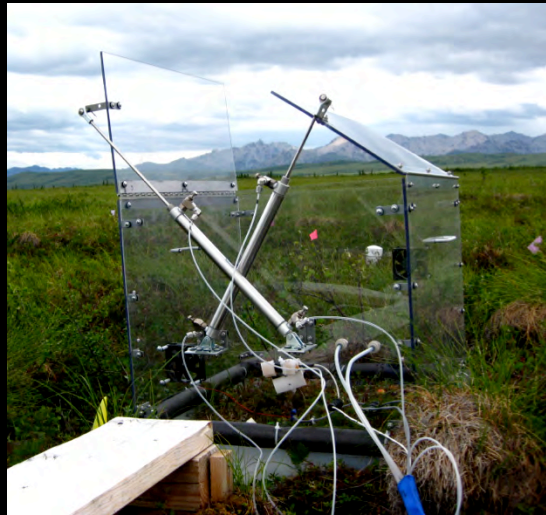
In the growing season:



Is CO_2 uptake by plants cancelled out by CO_2 loss due to respiration and decomposition?

During the growing season:

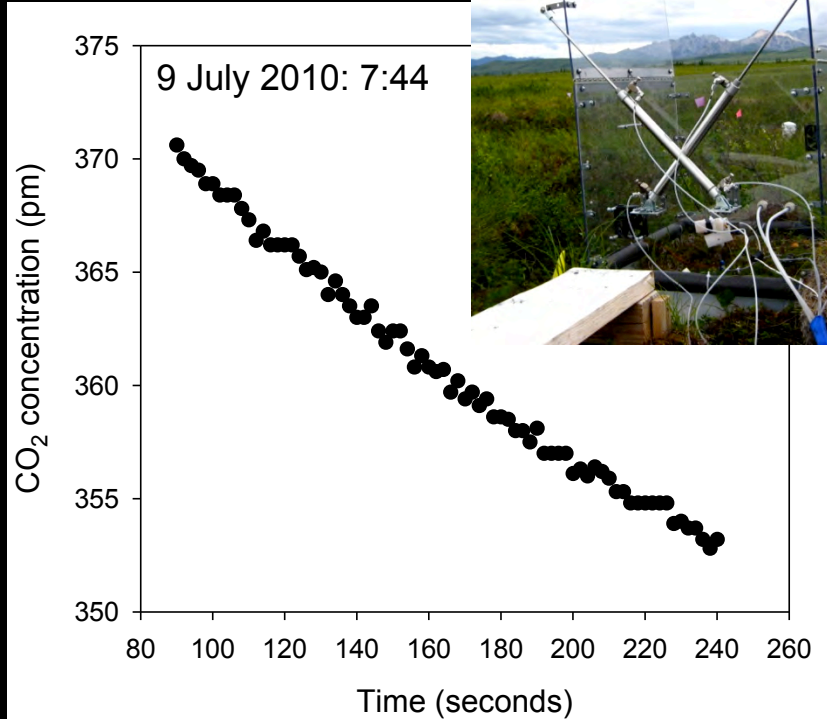
We measure CO₂ flux from automated chambers



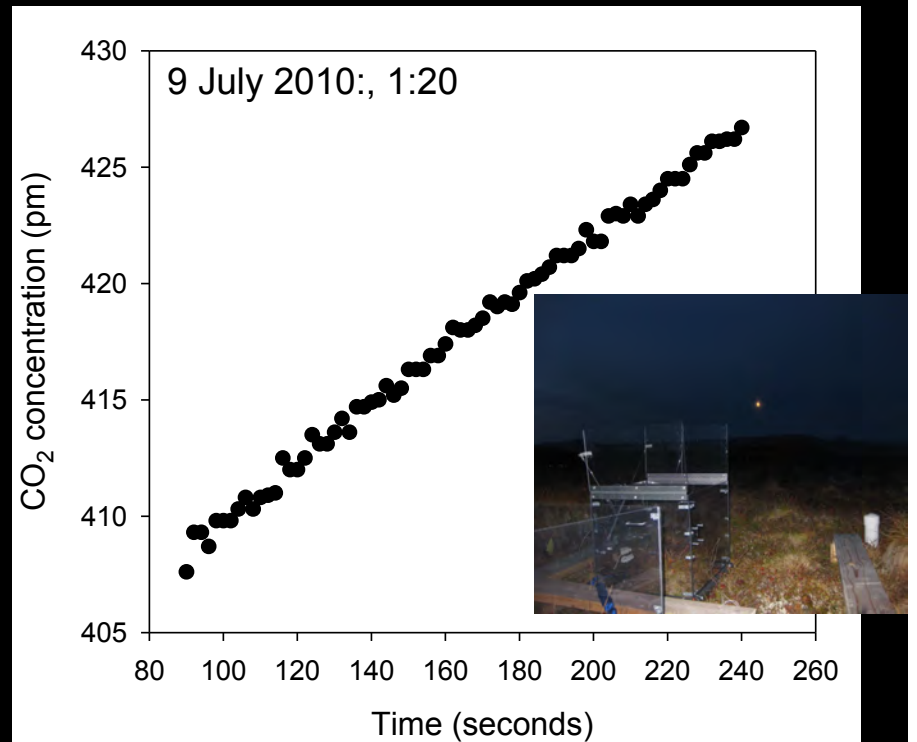
We also measure:

- precipitation
- photosynthetically active radiation
- air pressure
- soil temperature
- air temperature

During the growing season:



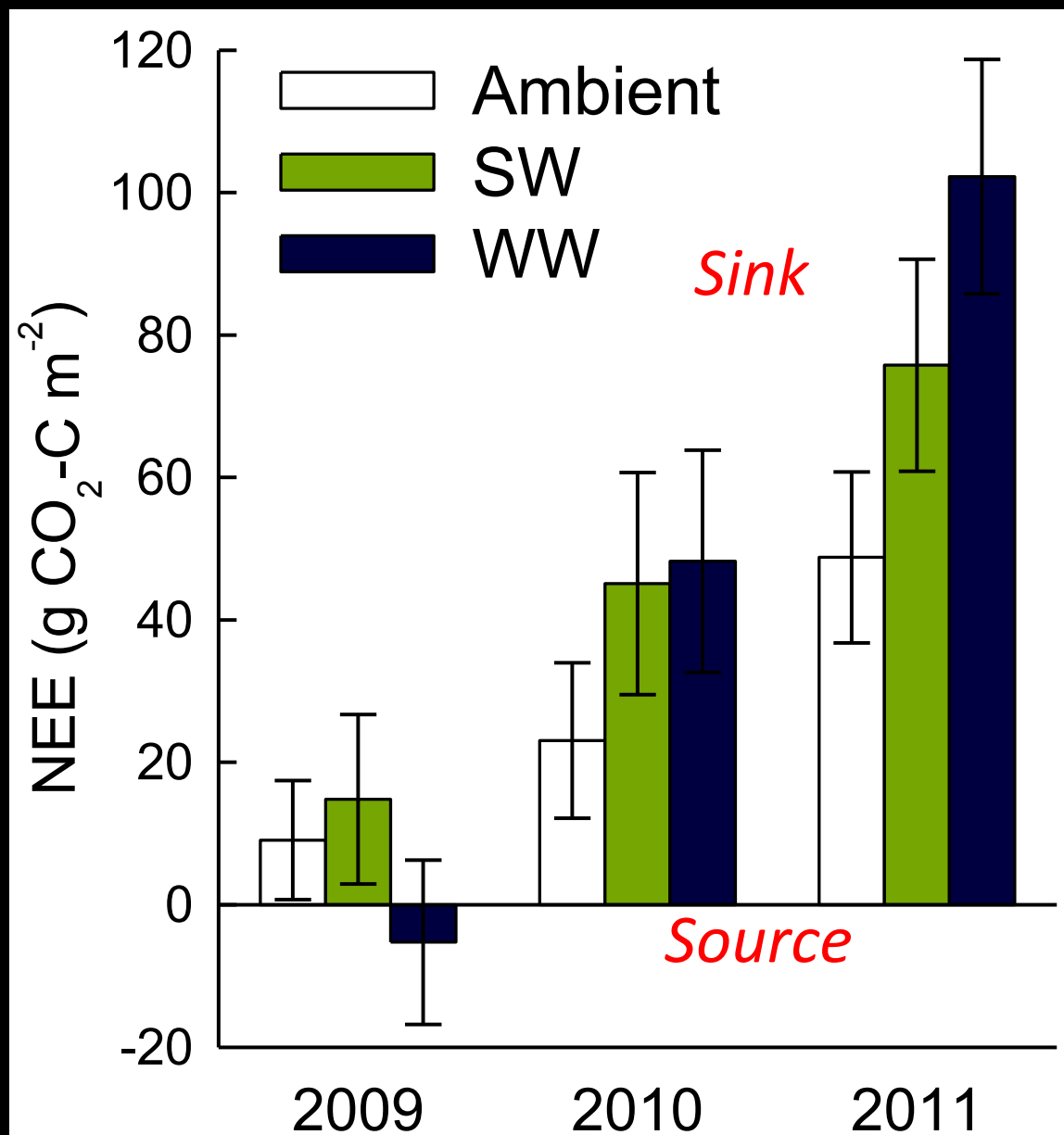
Day (plant uptake)



Night (respiration)

Growing Season Net Ecosystem Exchange

(Net amount of carbon coming in to CiPEHR)



Warming advanced bud break and delayed senescence

May 23, Control/
Ambient



May 23, Warmed/
Experimental



Warming increased flower and fruit production



In the winter:



How much CO₂ is lost during the winter?

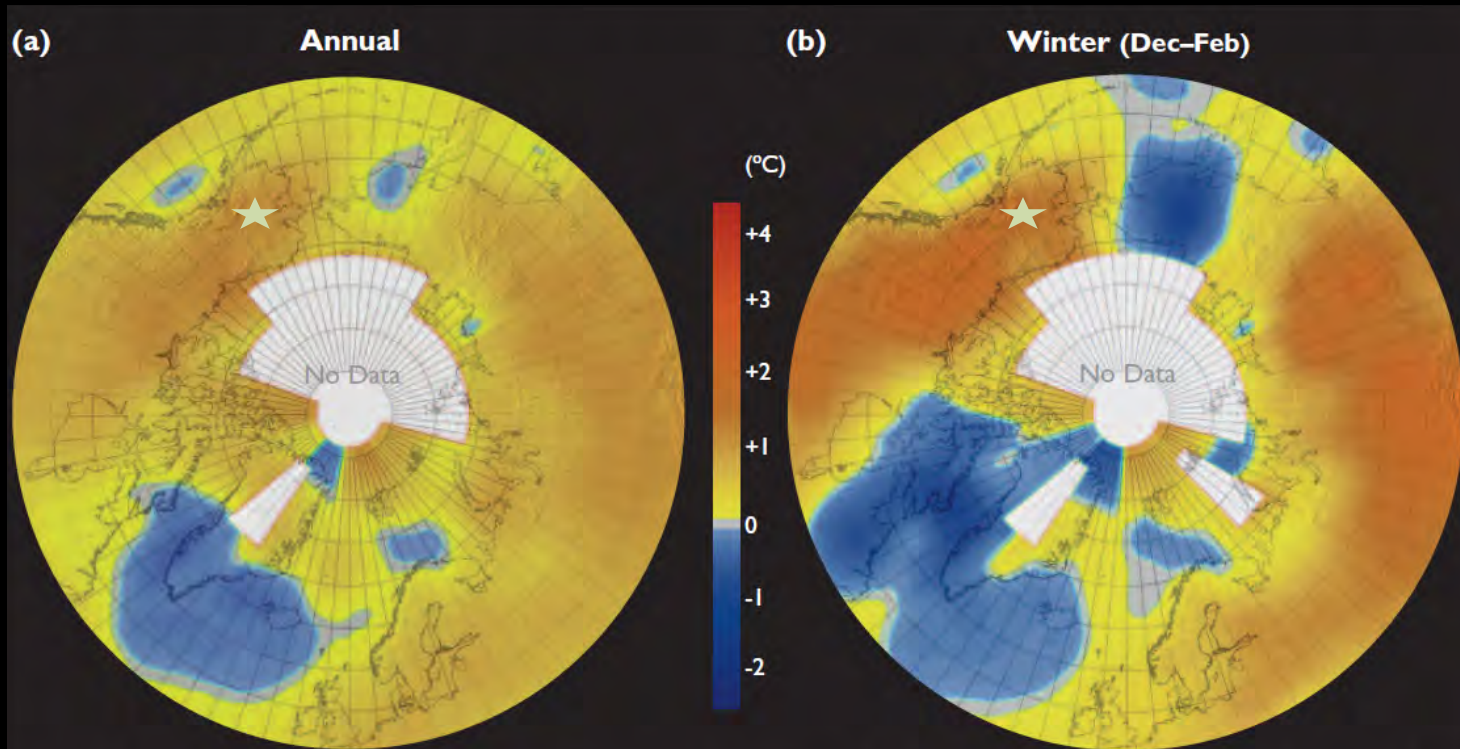


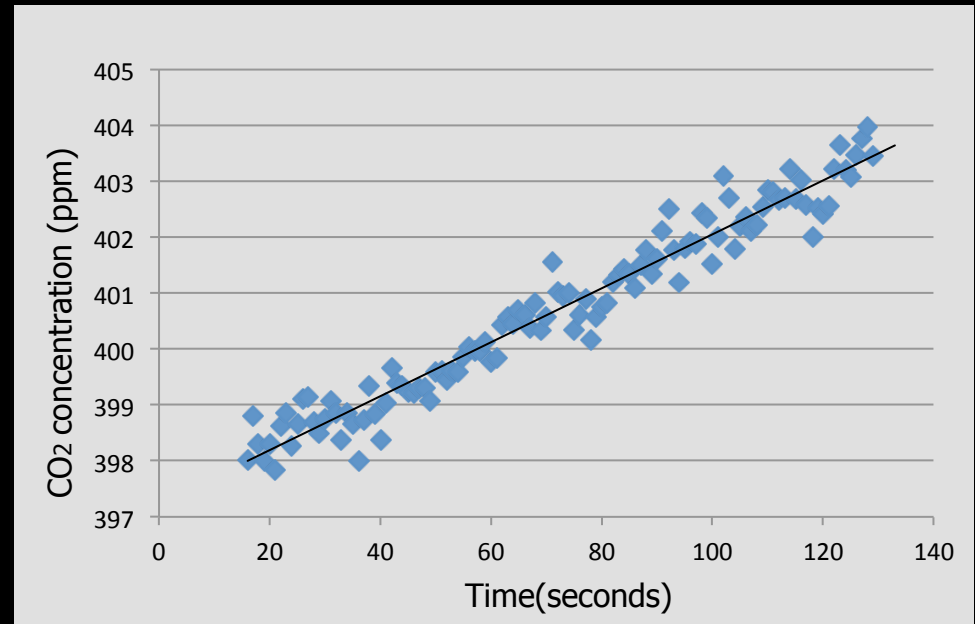
Fig. 1.3. Change in observed surface air temperature between 1954 and 2003: (a) annual mean; (b) winter (Chapman and Walsh, 2003, using data from the Climatic Research Unit, University of East Anglia, www.cru.uea.ac.uk/temperature).

Arctic Climate Impact Assessment

Greatest temperature increase **observed** during the winter

Greatest temperature increases **expected** during the winter

Winter flux measurements



Also collect:

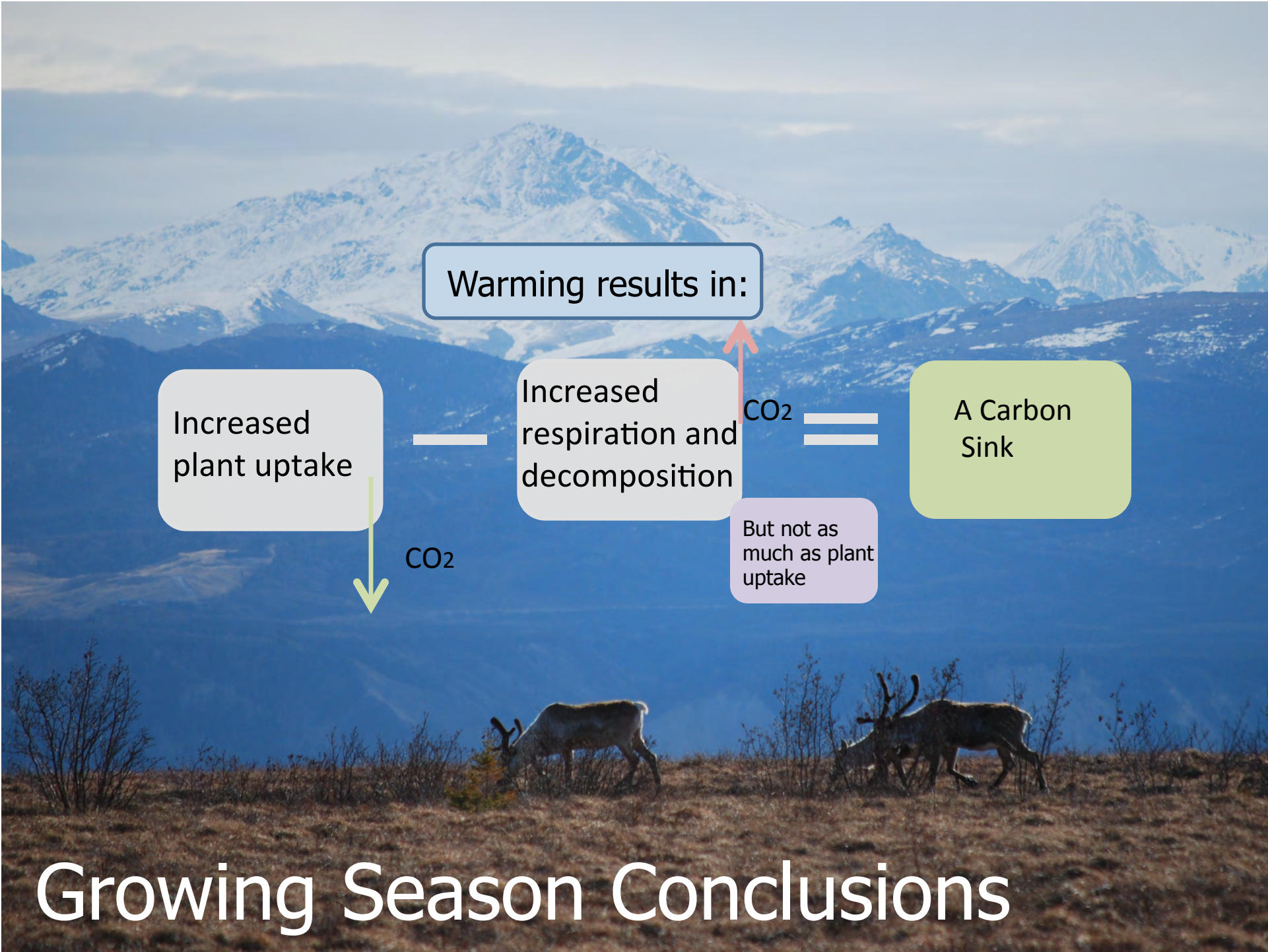
-soil temperature
-air temperature

-snow depth
-air pressure



70-300% more CO₂
released from
experimental warming
plots as from control
plots





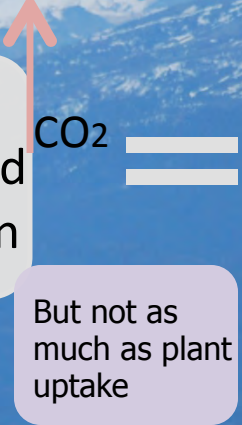
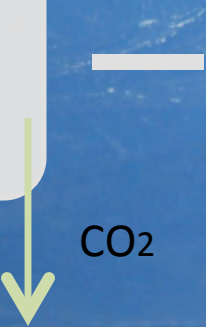
Warming results in:

Increased plant uptake

Increased respiration and decomposition

A Carbon Sink

But not as much as plant uptake



=

Growing Season Conclusions

Winter Conclusions

Warming results in:

Increased
respiration CO_2



=

A Carbon
Source

More-so than
in a non-
warmed
tundra

What is happening on an annual basis?

C sink during the summer + C source during the winter (70% increase) = Just about the same amount of C entering and leaving

C sink during the summer + C source during the winter (300% increase) = Net C source

Acknowledgements



Peter Ganzlin
Sue Natali
Ted Schuur
John Wood
(pictured)



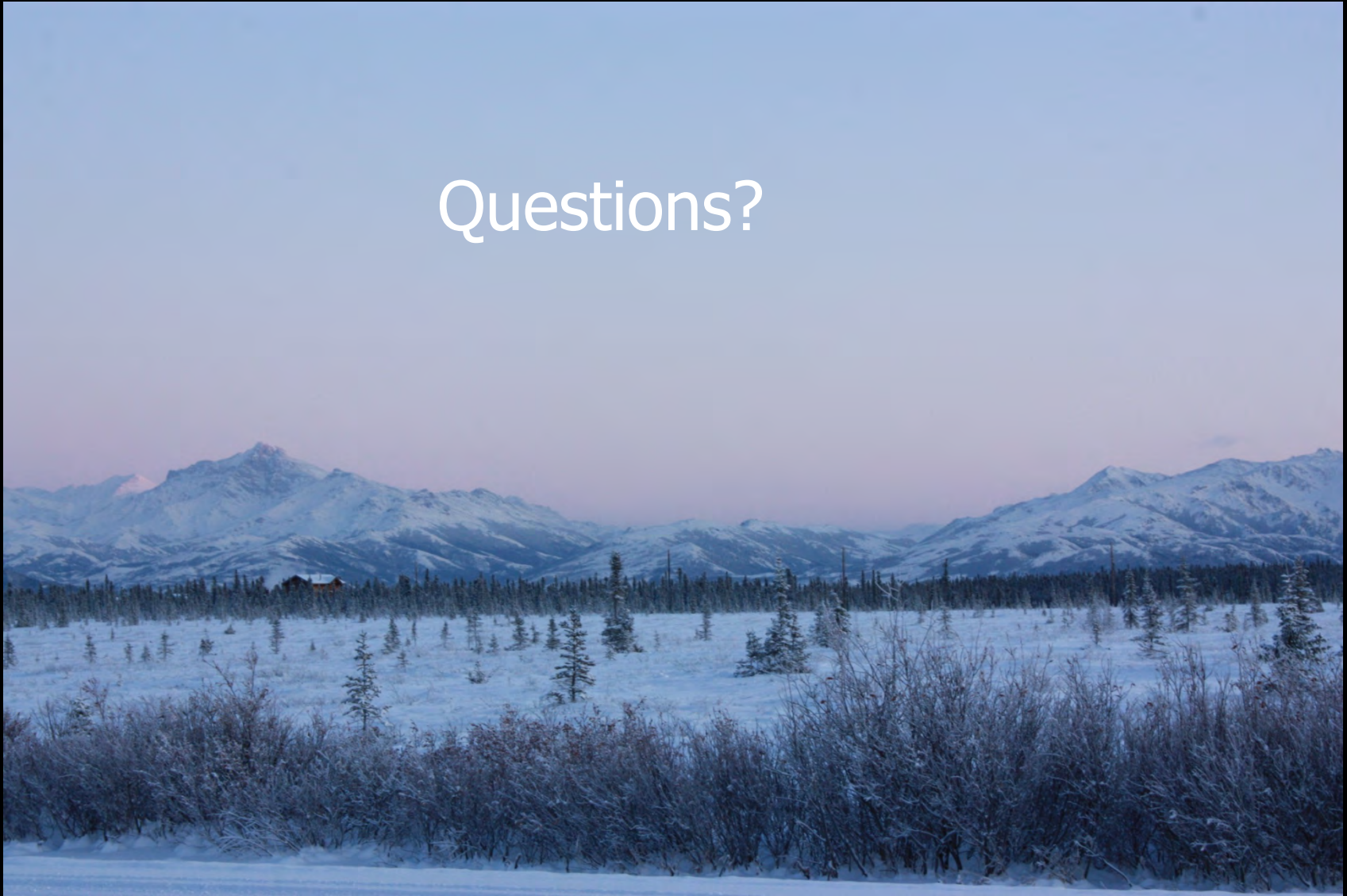
Funding from: NSF
CAREER Program, NSF
Bonanza Creek LTER
Program, NSF OPP,
and the DOE NICCR
program



Andres Baron Lopez
Christian Trucco
Grace Crummer
Bonanza Creek LTER
(Not pictured)



Questions?





TEACHERS AND RESEARCHERS
EXPLORING AND COLLABORATING

Questions

During the Presentation:

- Type your question in the text chat box

At the End of the Presentation:

- Raise your hand with the “hand button”.
- PolarTREC staff will call on you.
- Speak loud and clear and directly into the phone to ask your question.

Click on the Talk button to speak.

Unclick when you are done.



TEACHERS AND RESEARCHERS
EXPLORING AND COLLABORATING

Teachers: Join PolarTREC!

www.polartrec.com/about/join

Every teacher can participate in different ways:

- **Following Expeditions**
- **Participate in PolarConnect Events**
- **Join the Polar Education Email List**
- **Take Online Professional Development Courses**
- **Become a PolarTREC Teacher!**



TEACHERS AND RESEARCHERS
EXPLORING AND COLLABORATING

Upcoming Events

Watch for and register for upcoming events at [www.polartrec.com!](http://www.polartrec.com)



TEACHERS AND RESEARCHERS
EXPLORING AND COLLABORATING

Thank You!

An archive of the event will be available shortly.
<http://www.polartrec.com/polar-connect/archive>

