Cold-season gas exchange of arctic plants - resolving winter carbon and water balances of Alaskan arctic tundra.

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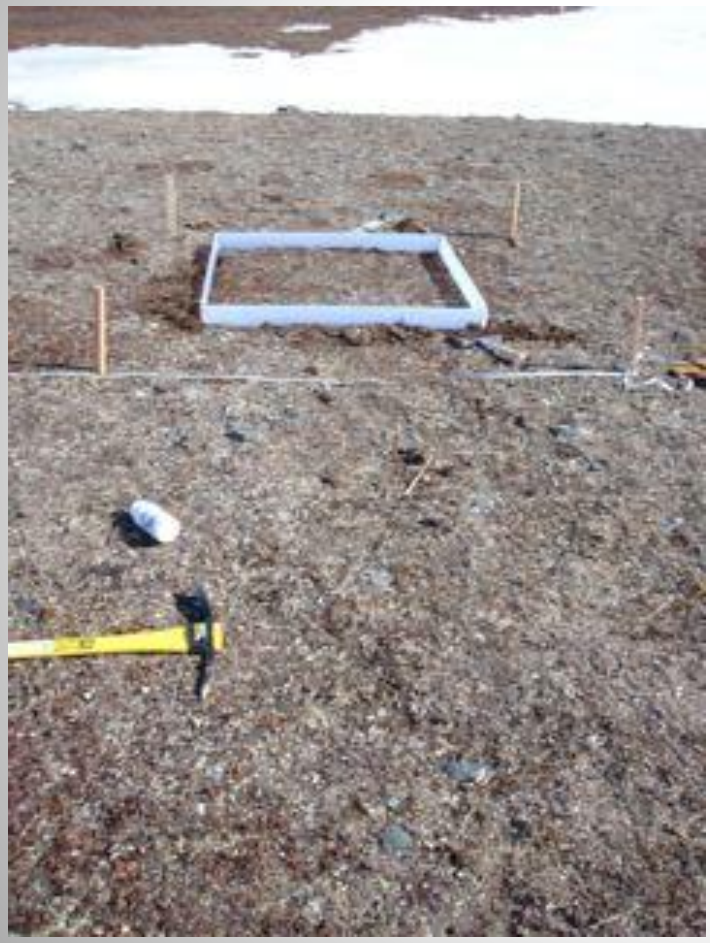
Primary Objectives

- 1) fill the large gap in our understanding of physiological processes of arctic tundra vegetation during the cold season
- 2) determine how these physiological processes contribute to the carbon dynamics of the ecosystem under current environmental conditions.

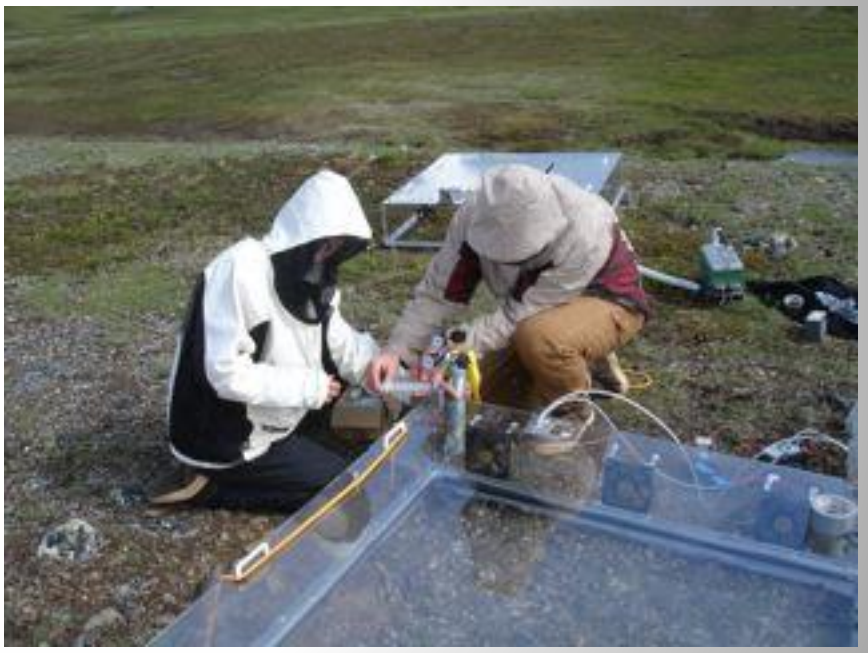
Primary Questions

- *1.A. What are the rates and controls on plant respiration during the cold season? B. How will respiratory rate change with moderate changes in temperatures below freezing?*
- *2.A. What are the retention times for carbon within the individual plants and the system as a whole? B. What portion of the yearly physiological activity contributes to the carbon retention (i.e. spring physiology, peak growing season, or fall or winter)?*
- *3.A. How important is photosynthesis of evergreens and mosses in late fall and under the snow. B. How does the fringe season physiological activity counter respiratory losses? C. How do evergreens and mosses protect against high light during cold conditions?*
- *4. How do evergreen plants manage water loss and water uptake during high-light low-temperature periods of the cold season?*
- *5. What factors drive winter shoot mortality, direct freeze damage, xylem embolism, snow abrasion, or some other factor such as carbon deficit?*

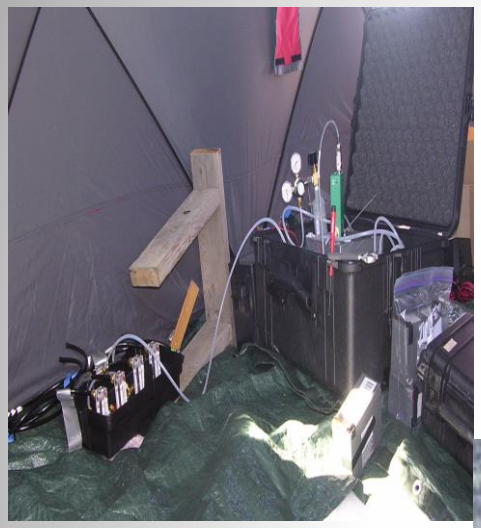


The Studies

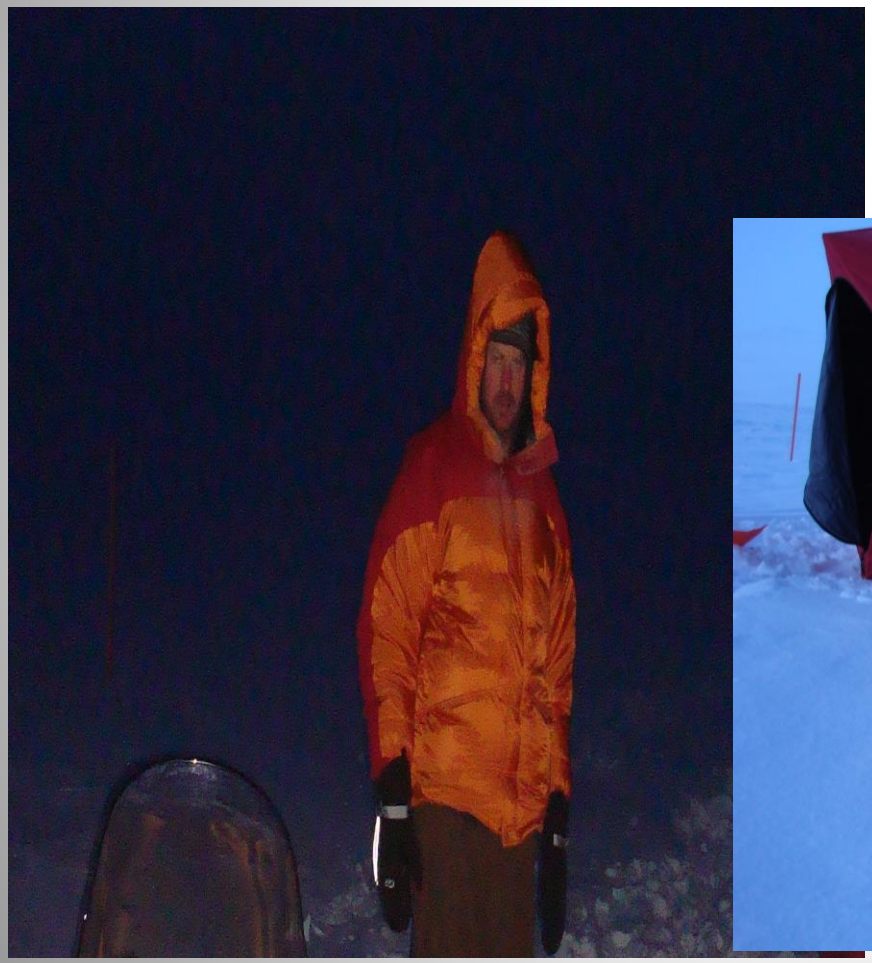
- 2009-11 Labeling experiments
- Winter physiological measurements
- Growth chamber studies



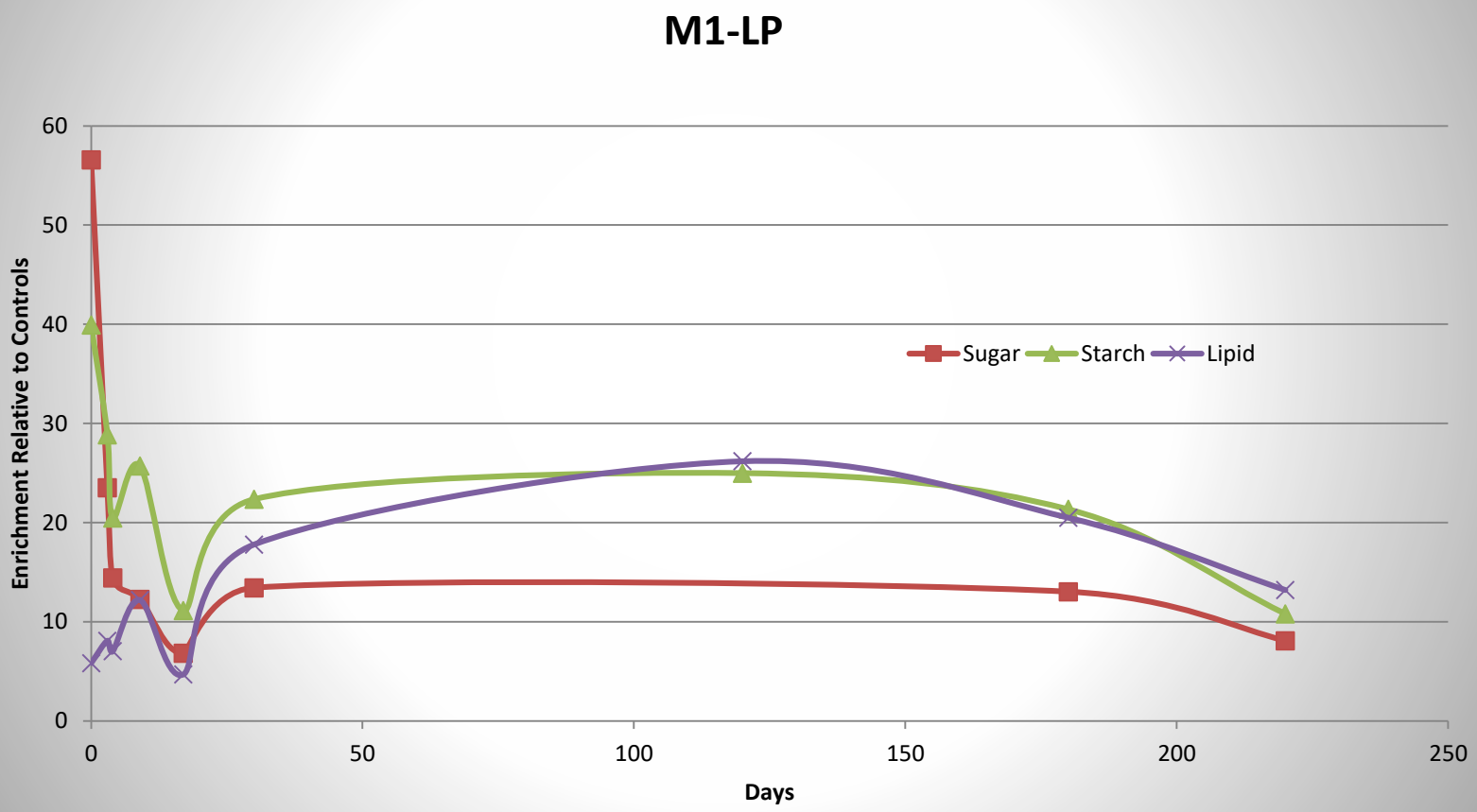
Shoulder Season Labeling



Challenges of the Winter



Some of the findings



Where is the research going?

We want to expand our studies by incorporating active warming (power needs)

Greater integrated studies (scales and disciplines).

- Aquatic vs. Terrestrial (more integration)
- Coupling of all systems.

Winter conditions, relative quick fixes

- need to have an absolute failsafe way of insuring warm storage stays warm.
- food situation is not very good, especially lunch and breakfast
- the moving equipment to another lab is a big problem. in cold soaked labs plastic and wire insulation are extremely brittle and easily damaged while moving. I have had to have things repaired for this very issue

Winter conditions, relative quick fixes cont.

- Items needs secure storage over winter since material disappears.
- Safety during sorties in winter
  - better snowmobiles,
  - working radio communications.
- Modifications of the bridge across the creek so that we can move around easier at melt out.

2011 Spring

Suggested Needs (low cost)

- Needs for additional freeze drying capacity
- Need for additional -80 freezer space
- Industrial movement and supply of liquid nitrogen

Suggested Needs (high cost)

- Need for Garage and staging
  - Extremely important for winter studies
- Increased Winter laboratories that will limit the risks of associated with moving equipment. (increase scientific productivity and costs).
- Scientific Community is changing (dual career couples) Family Housing.

Education

- Use what we know from other stations
- Distinctions between research and education

Need for Increase Safety to reduce Liability

- A chemistry professor at UCLA and the regents of the UC system are facing felony charges in the death of Sheri Sangji, a young research associate who died after a chemical fire. The university had been cited for previous occupational health and safety violations, but it's the first time a professor in the U.S. has been charged with a felony for the death of a worker. This case will have consequences not only for UCLA, but for every campus lab in the country.

- http://californiawatch.org/higher-ed/case-begins-against-professor-uc-regents-ucla-researcher-s-death-17280
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Questions/Comments?