Causes and Consequences of Arctic Greening

Team:

PI: K. Fred Huemmrich (University of Maryland Baltimore County)

Co-Is: Craig Tweedie (UTEP)

Petya Campbell (UMBC)

Betsy Middleton (NASA/GSFC)

Impacts on ABoVE Science:

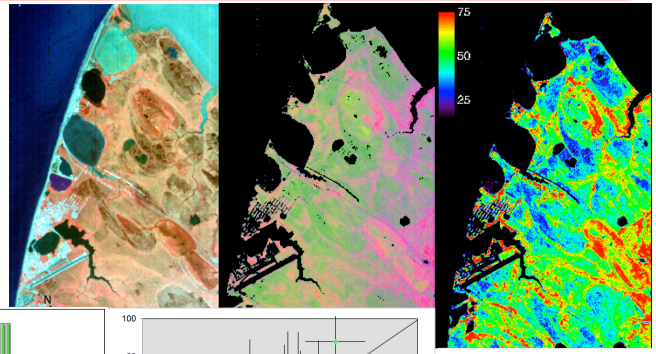
Determine how the structure and function of tundra ecosystems respond to changes in biotic and abiotic conditions, and how these changes affect land-atmosphere exchanges of carbon

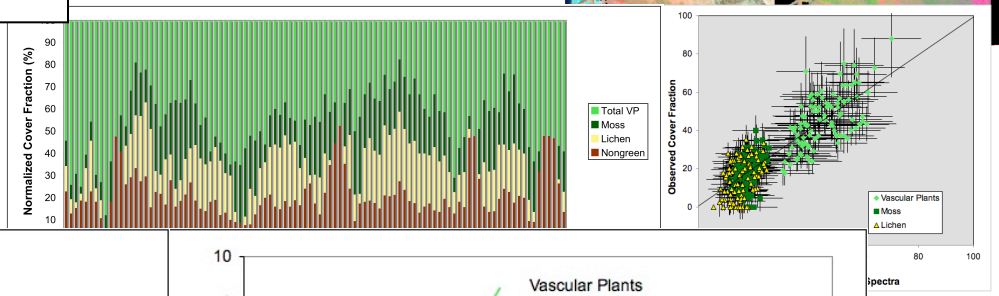
Determine the causes of greening and browning trends and their impacts on ecosystem structure and function.

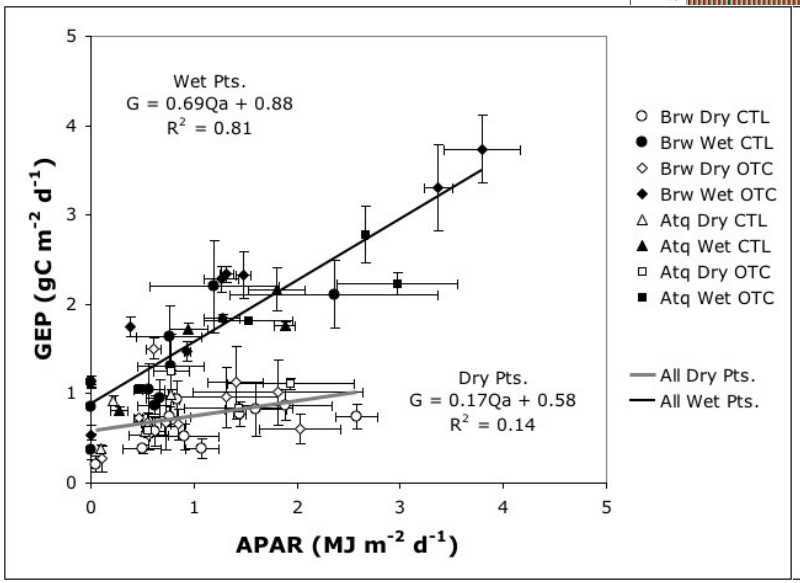
Causes and Consequences of Arctic Greening

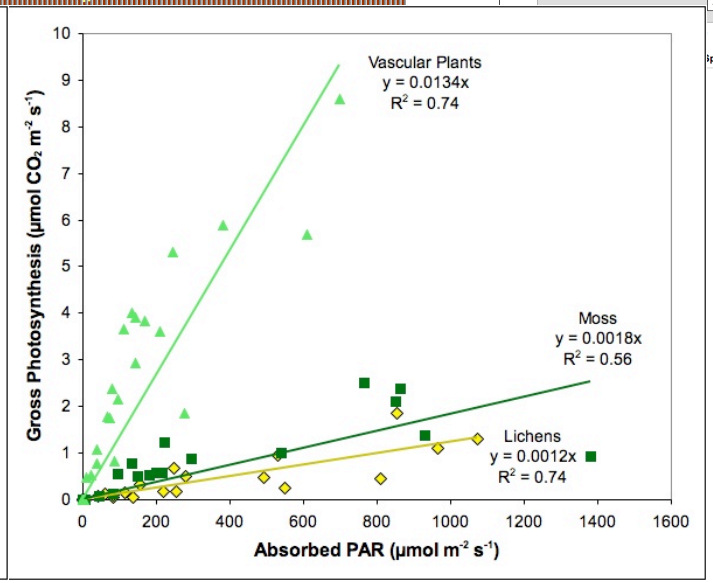
Background

Plot level studies show differences in photosynthetic light use efficiency









Huemmrich et al. RSE 2010, JSTARS 2013

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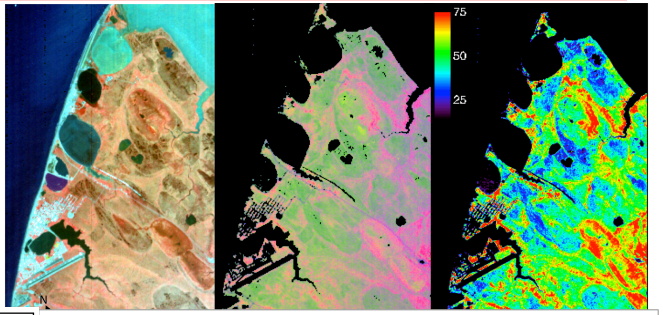
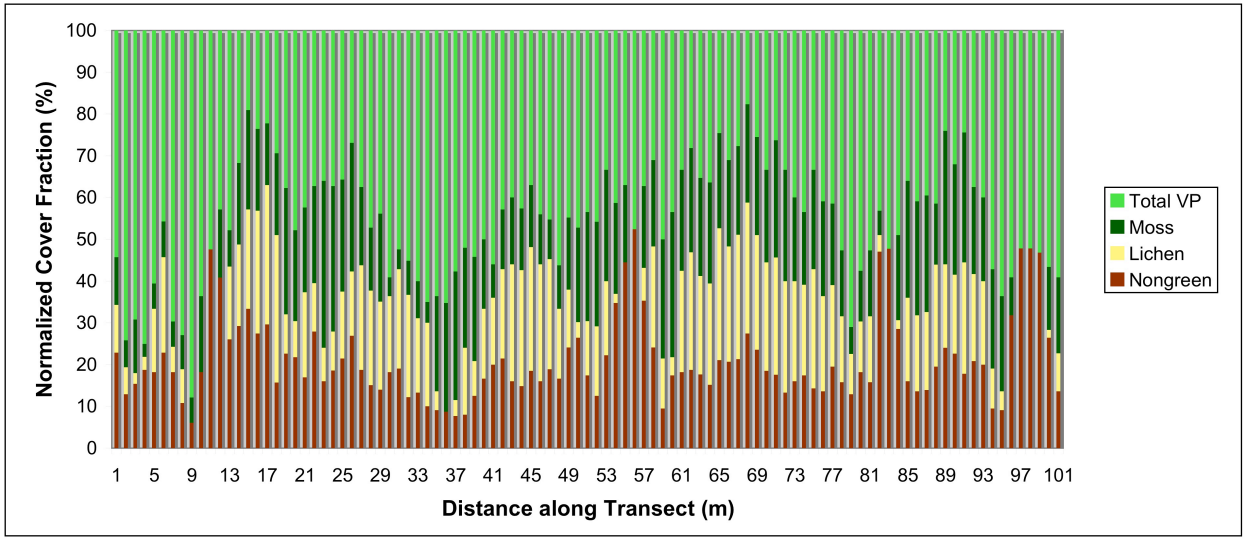
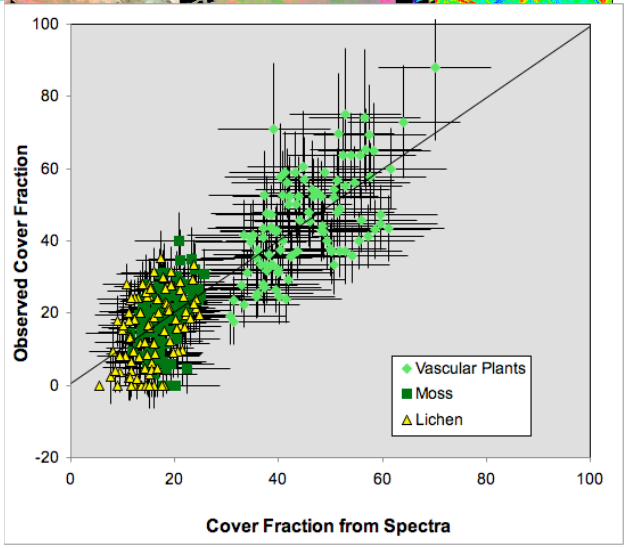
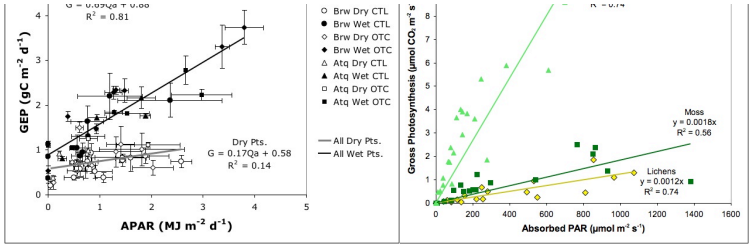
Background

Spectral unmixing can determine cover fractions of tundra plant functional types









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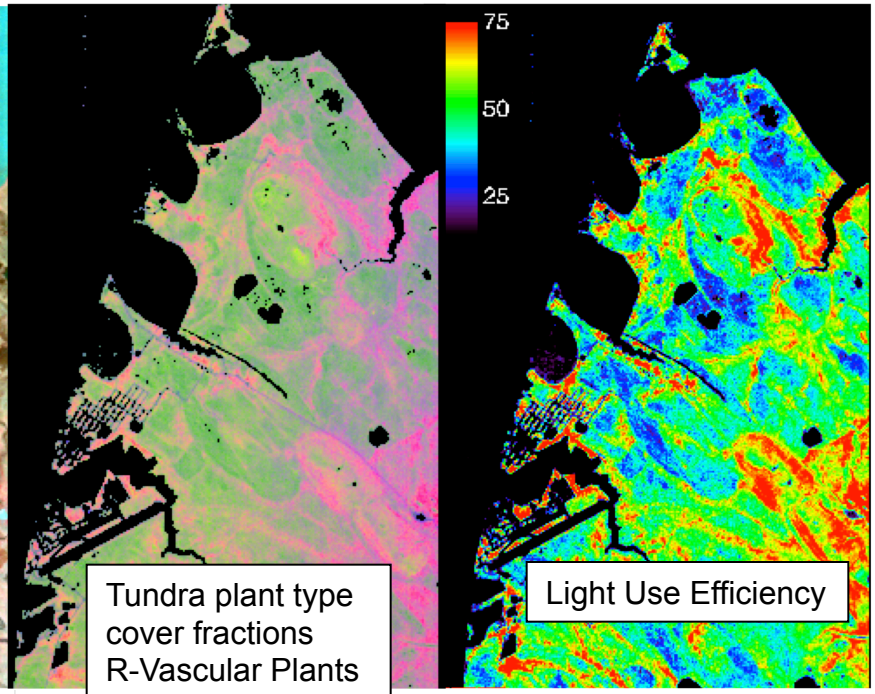
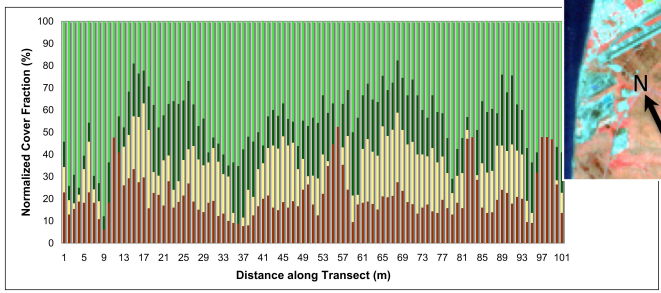
Algorithms are applied to spectral imagery describing spatial patterns of cover fractions and LUE

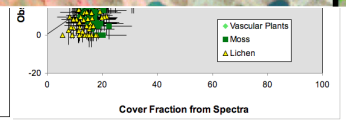
Color IR

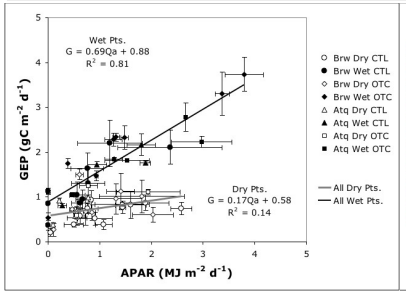


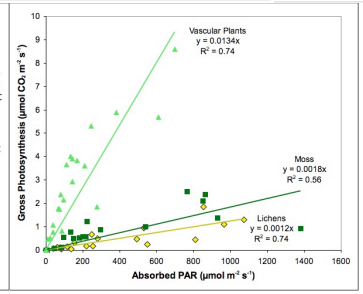
Tundra plant type cover fractions
R-Vascular Plants
G-Moss
B-Lichen

Light Use Efficiency









Huemmrich et al. RSE 2010, JSTARS 2013

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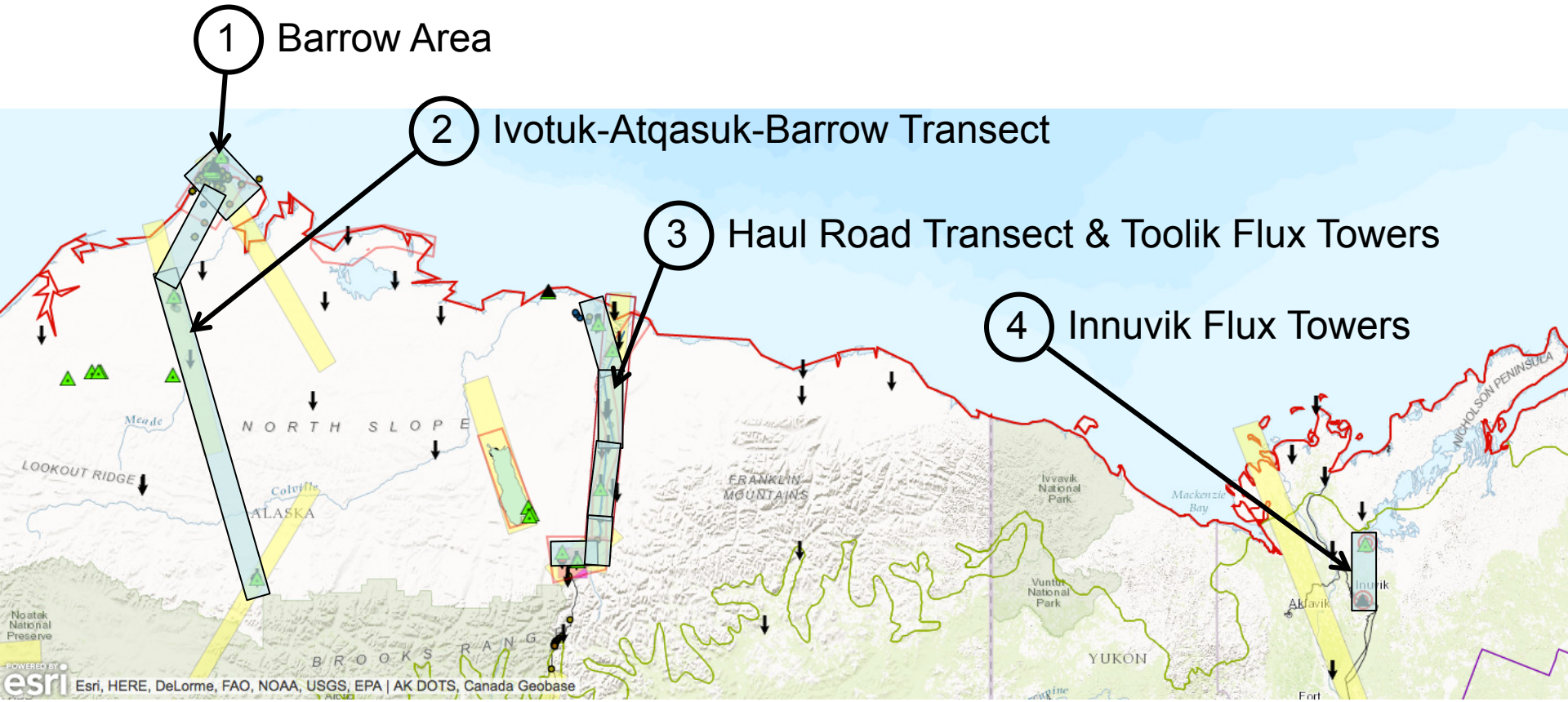
Requested Flight Lines for AVIRIS-NG

- Near growing season peak



Causes and Consequences of Arctic Greening

Science Objectives

1. Map Plant Functional Types (PFT), Gross Ecosystem Production (GEP), and Albedo for tundra regions within the ABoVE domain from AVIRIS imagery

2. Link the AVIRIS snapshots to temporal changes using high spatial resolution time series from commercial satellite and air photo imagery
    - examine how present distributions are related to ongoing processes, including herbivory, thermokarst, and changes in surface hydrology

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ARCTIC BOREAL VULNERABILITY EXPERIMENT

Causes and Consequences of Arctic Greening

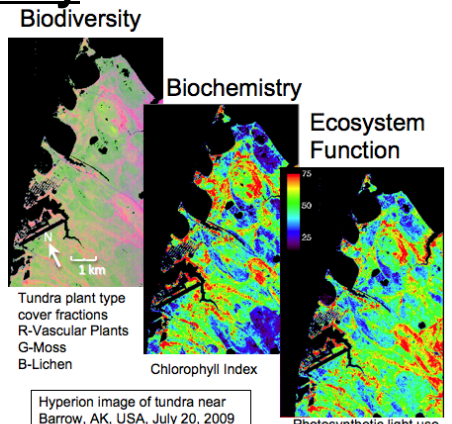
PI: K. Fred Huemmrich, University of Maryland Baltimore County
karl.f.huemmrich@nasa.gov

Science Objectives

1. Map Plant Functional Types (PFT), carbon flux parameters, and albedo for tundra regions within the ABoVE domain from AVIRIS imagery
2. Link the AVIRIS snapshot to temporal changes through time series of commercial satellite and air photo data for the region around Barrow, AK
   - examine how present distributions are related to ongoing processes, including herbivory, thermokarst, and changes in surface hydrology

Sensor/Platform Summary

- AVIRIS NG data
- Commercial high spatial resolution satellite imagery (e.g. WV2, WV3)



Hyperion image of tundra near Barrow, AK, USA, July 20, 2009
Huemmrich et al. JSTARS 2013

Preliminary study

Impacts on ABoVE Science:

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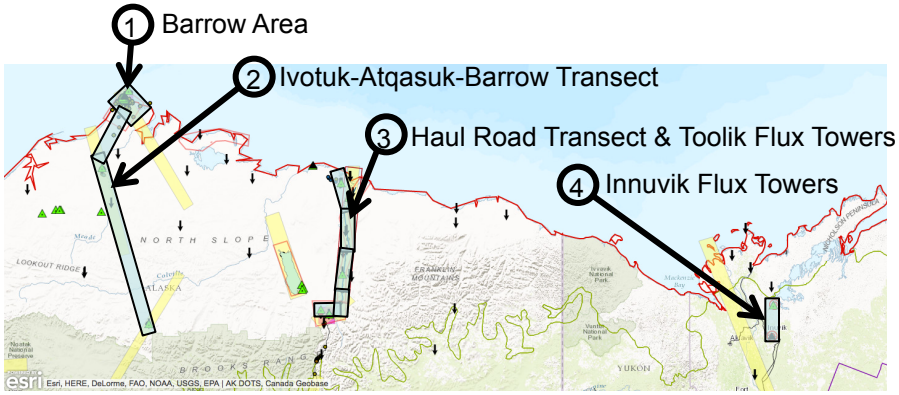
Determine the causes of greening and browning trends and their impacts on ecosystem structure and function.

Cols: C. Tweedie (UTEP) ctweedie@utep.edu,
P. Campbell (UMBC) petya.k.campbell@nasa.gov,
E. Middleton (NASA/GSFC)

Flight Line/Ground Site/Timing Priorities

Priority flight lines over AK North Slope tundra - mid-summer



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