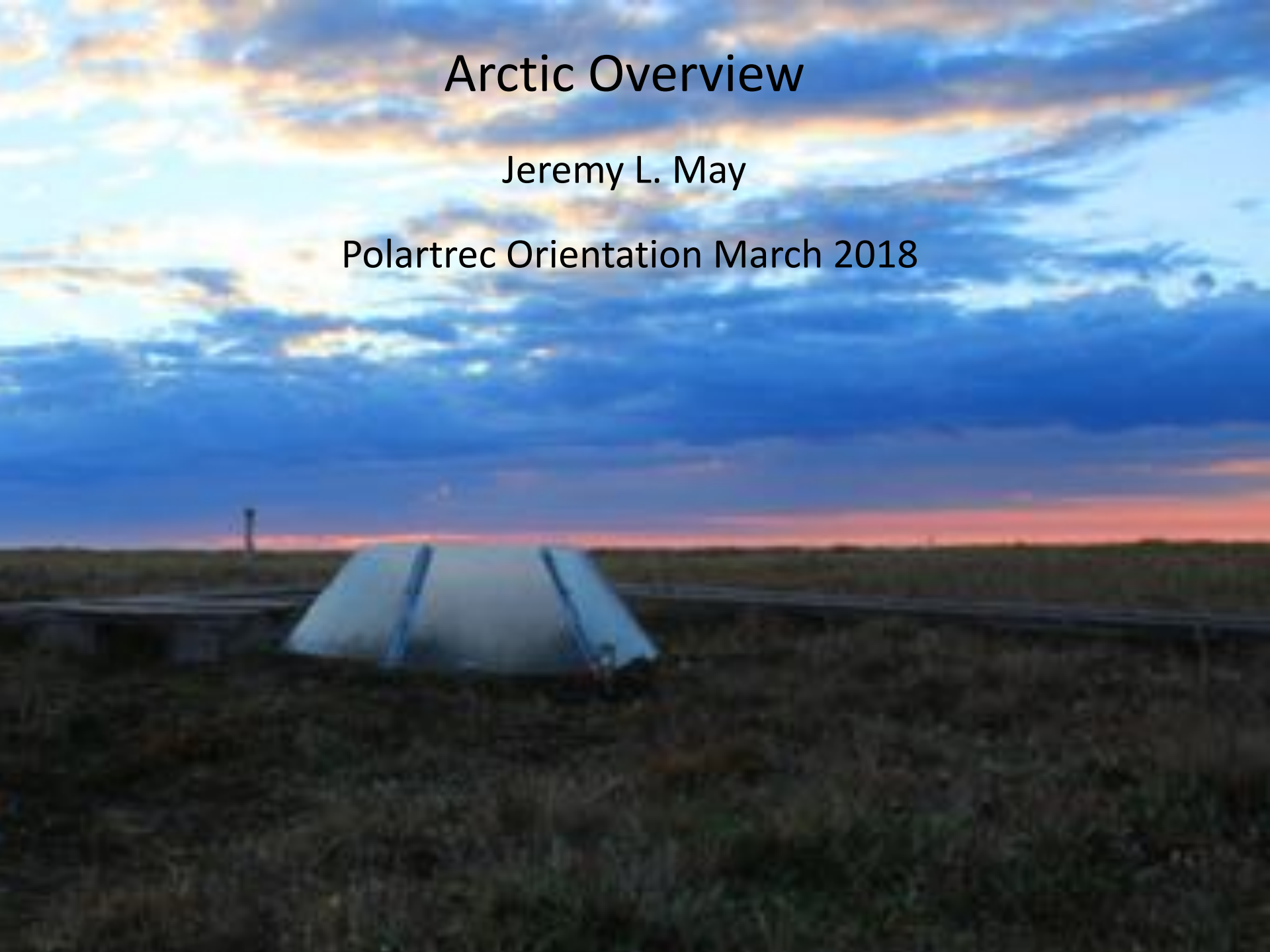
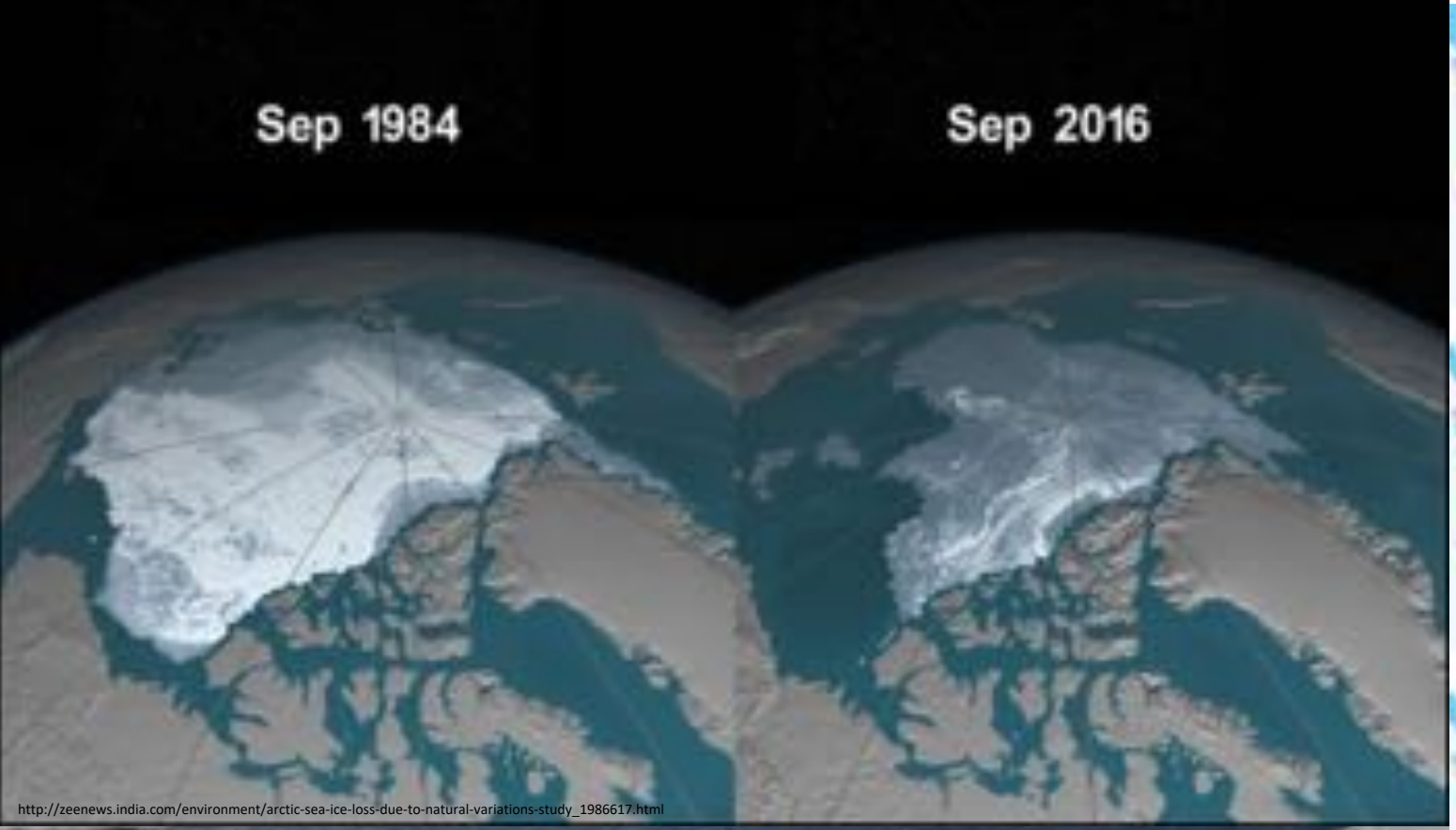


Arctic Overview

Jeremy L. May

Polartrec Orientation March 2018

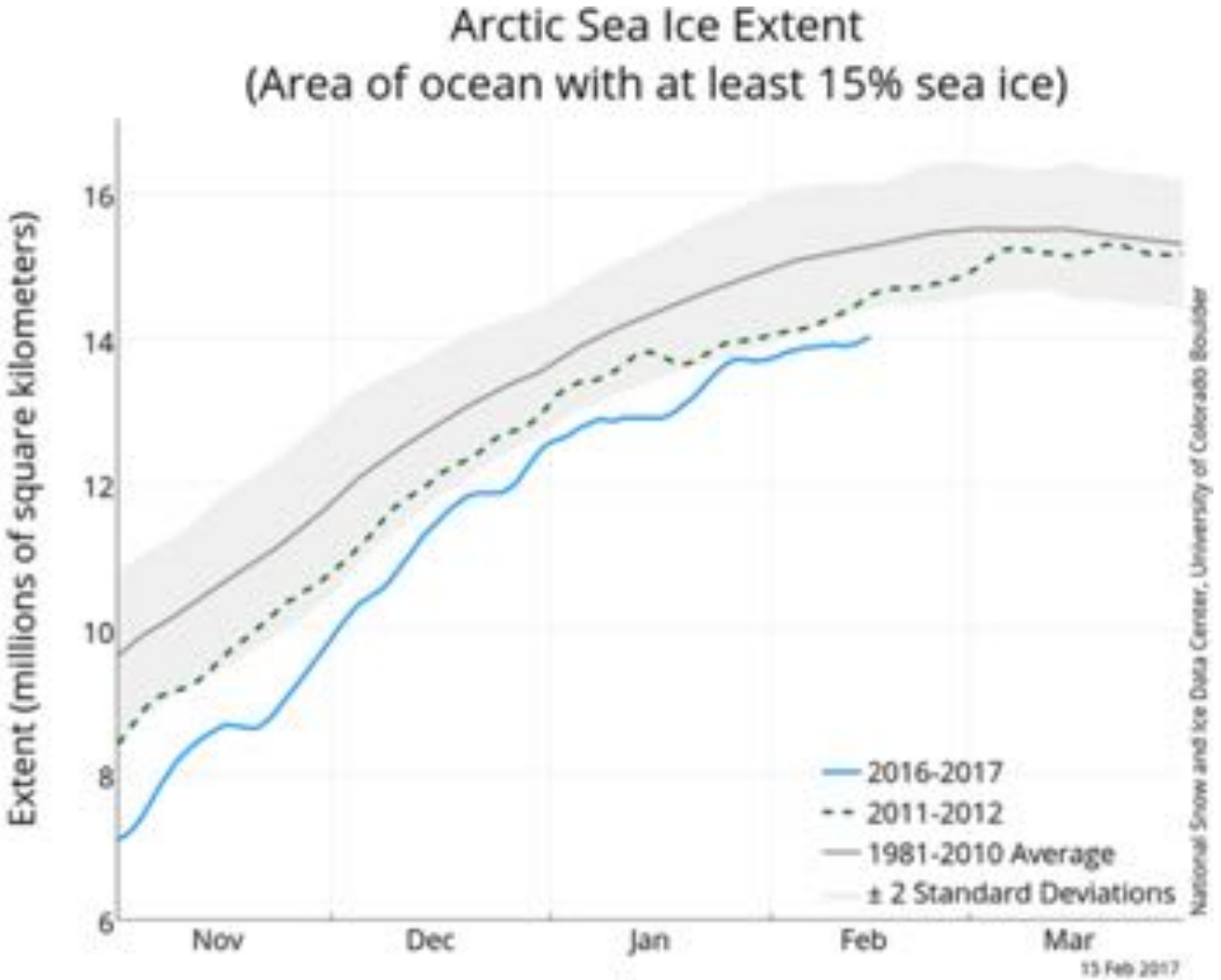
-66˚ 33’ N latitude
-Tree line



http://zeenews.india.com/environment/arctic-sea-ice-loss-due-to-natural-variations-study_1986617.html

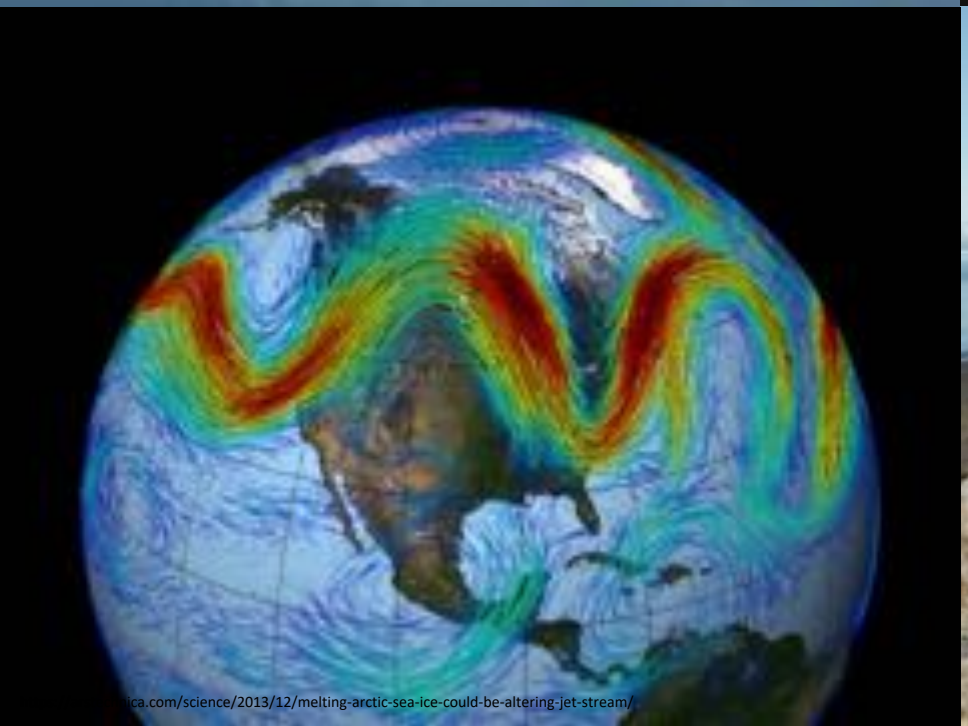
https://www.carbonbrief.org/arctic-sea-ice-hits-lowest-winter-peak-on-record

Less sea ice=
more open water=
more humidity=
warmer
temperatures (NOAA)



https://www.ualberta.ca/newtrail/spring-2016/features-dept/beyond-the-polar-bear

http://www.oceanhealthindex.org/news/The_Big_Melt



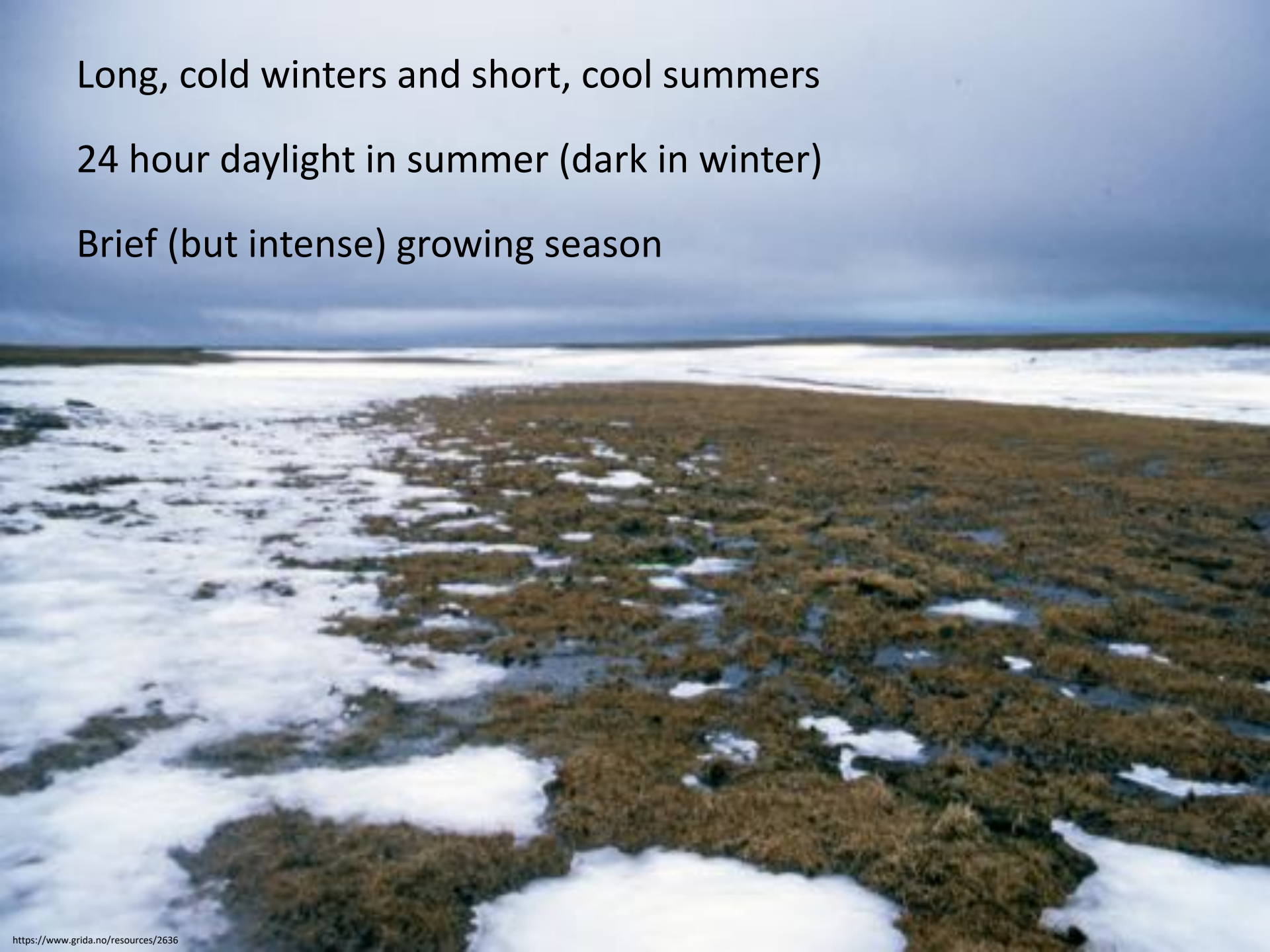
ica.com/science/2013/12/melting-arctic-sea-ice-could-be-altering-jet-stream/

http://www.oceanhealthindex.org/news/The_Big_Melt

Long, cold winters and short, cool summers

24 hour daylight in summer (dark in winter)

Brief (but intense) growing season



https://www.grida.no/resources/2636

Source: Brown et al. (1997);
International Permafrost Association

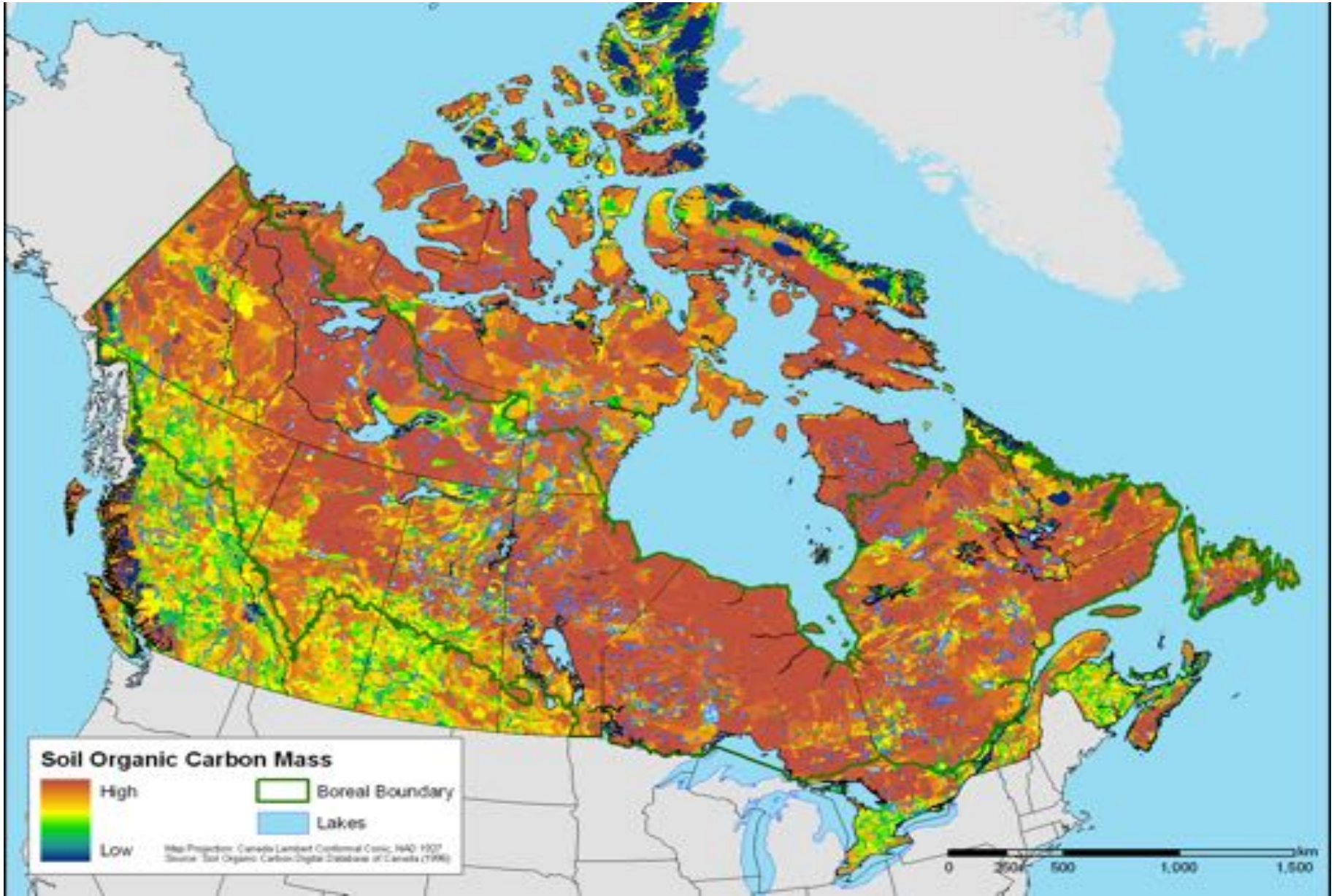
http://www.tunisiesoir.com/wp-content/uploads/2018/02/Researchers-Find-Massive-Reserves-of-Mercury-Hidden-in-Permafrost.jpg

Continuous permafrost
Discontinuous permafrost
Sporadic permafrost
Isolated patches

1672Pg of carbon stored in permafrost

(Tarnocai et al. 2009)

1,672,000,000,000mT!



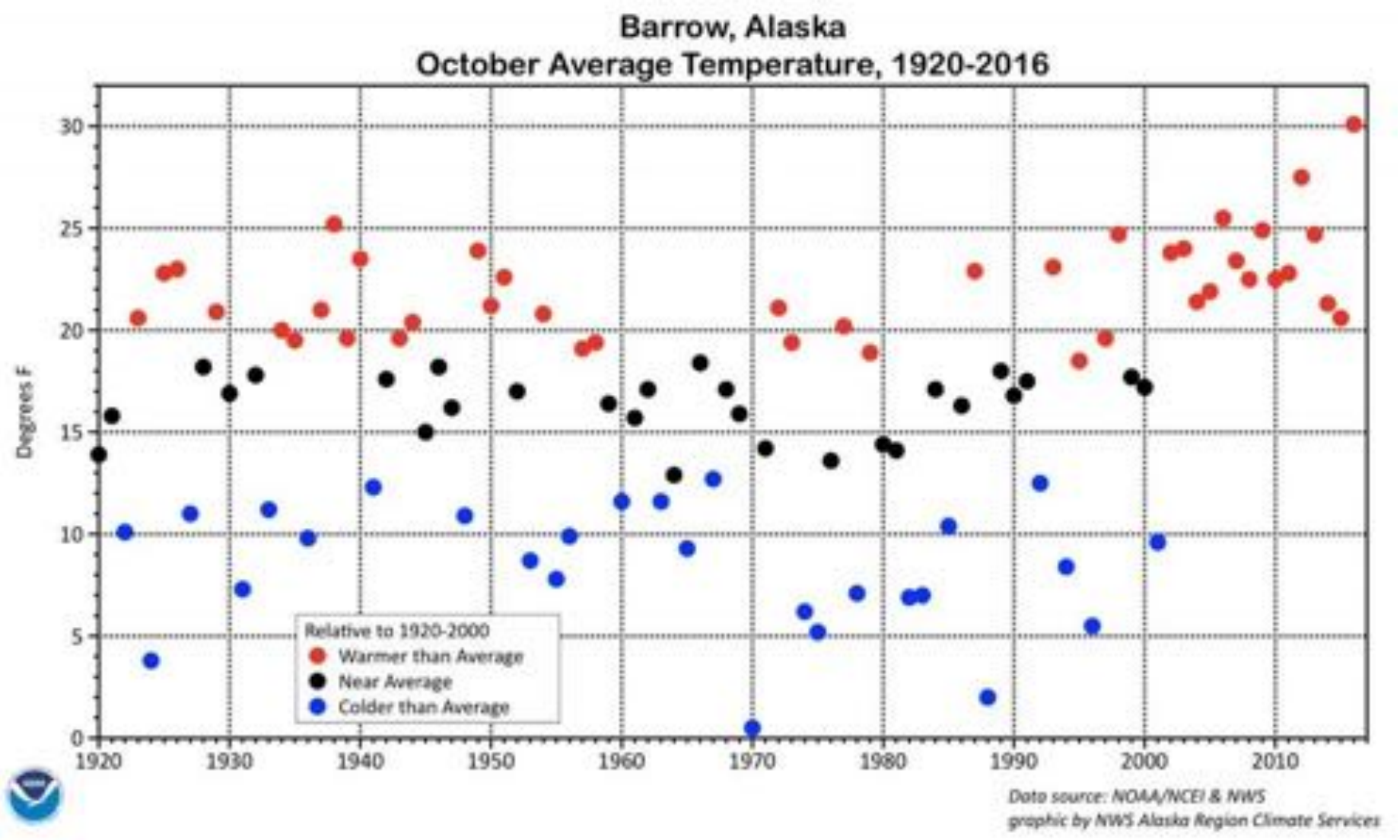
Arctic Plant Adaptations

Short statured and grow close together

Pubescent

Flowers can take multiple years to develop or do so quickly

Perennial



Every October since 2001 has been above average

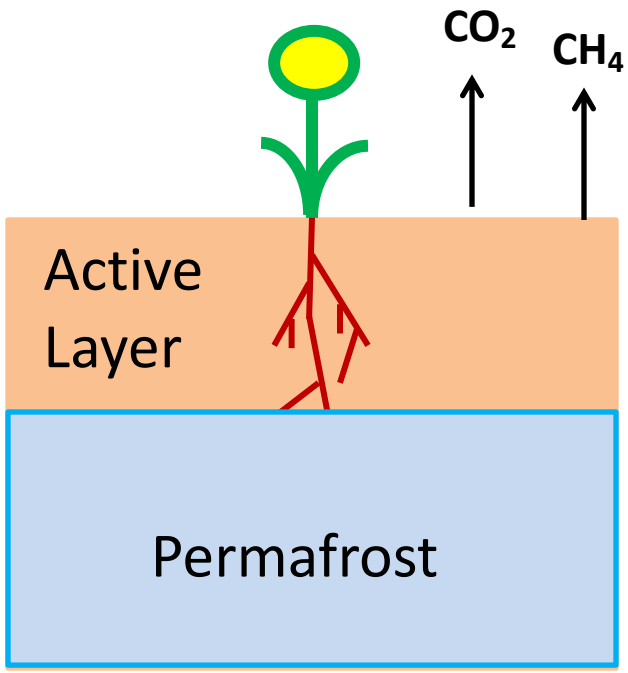
July 13, 2016

July 14, 2016 the Kuparuk station just west of Deadhorse hit 86^{o}!!!!

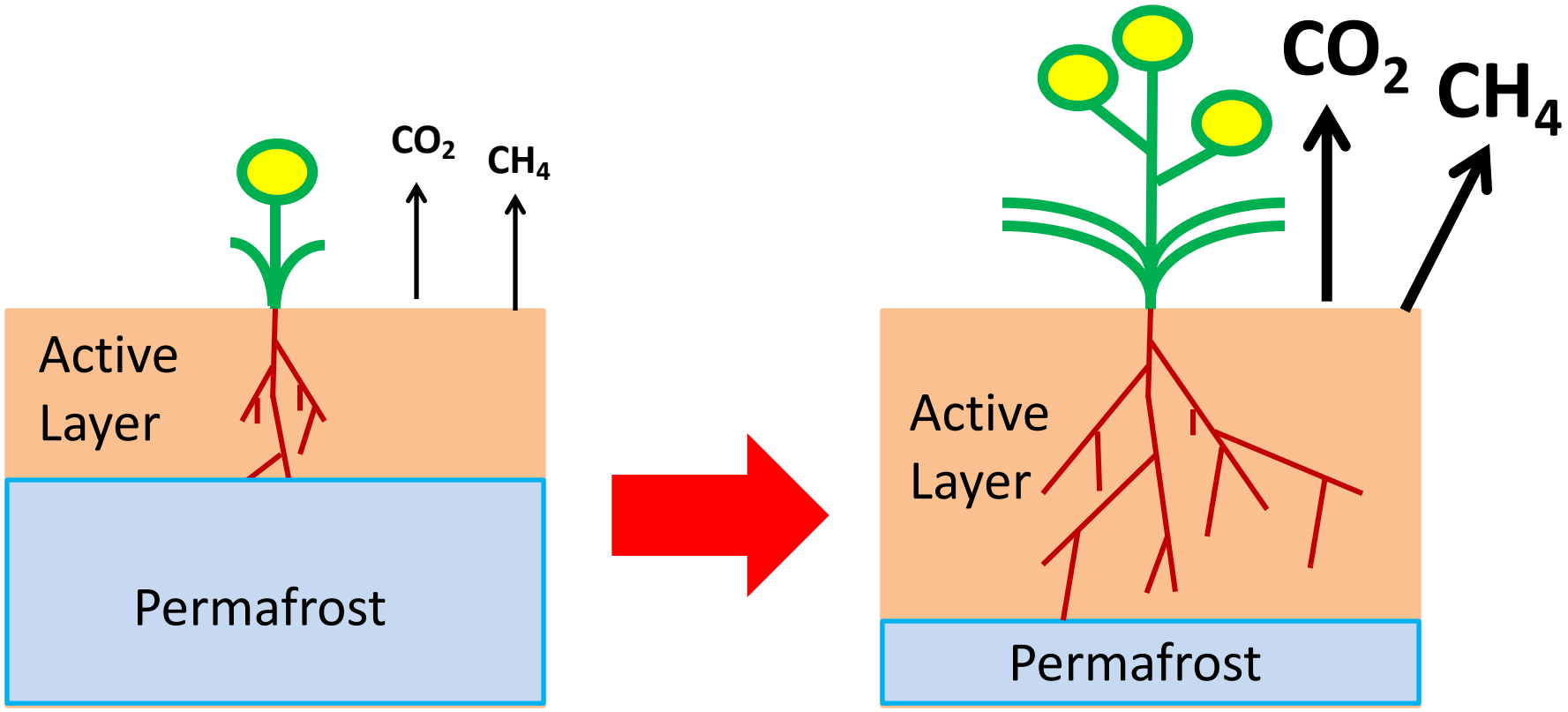
Barrow broke a temperature record of 66 ^{o}!

Earlier melt outs, Barrow was 46-47^{o} on May 17-19, 2015 and had the earlier snowmelt on record at the Atmospheric Radiation Measurement (ARM) station

Speed and timing of the melt caused flooding
….and spring to start early!

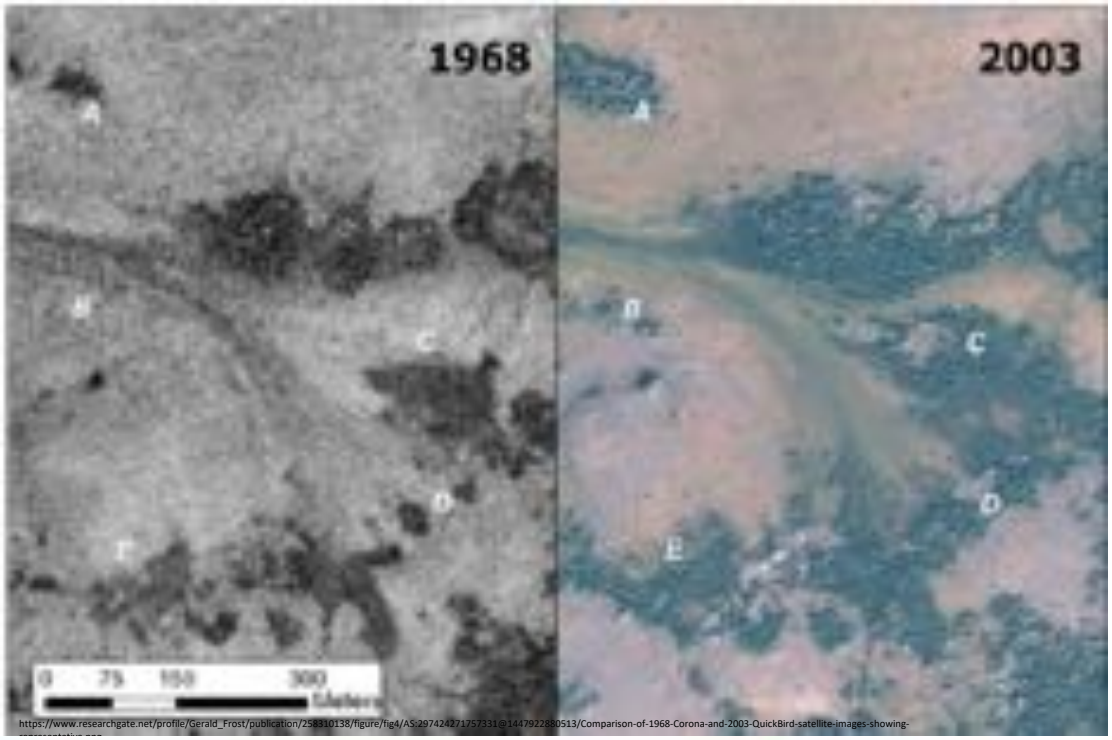


Background



Background

Warming

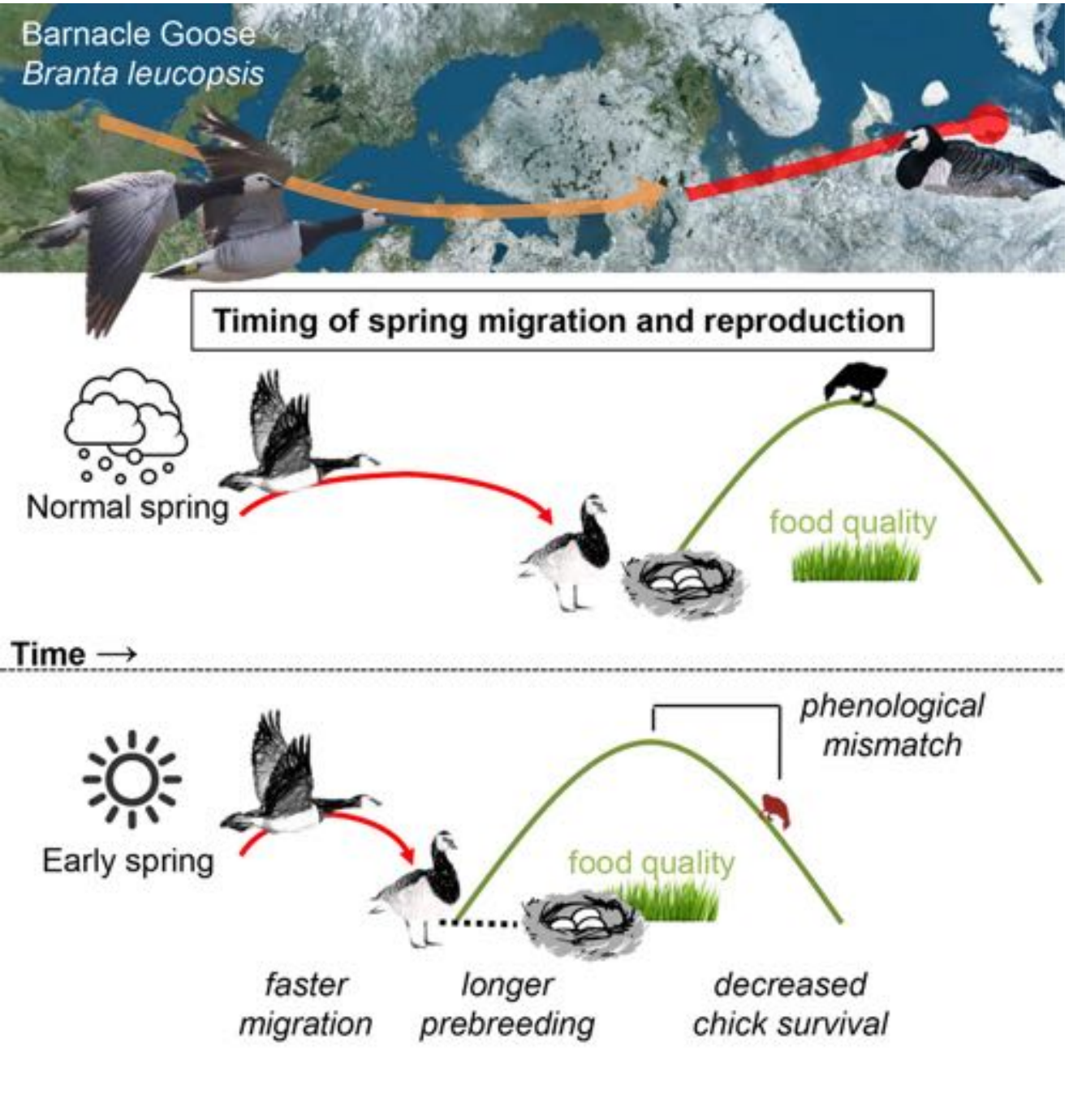


https://www.researchgate.net/profile/Gerald_Frost/publication/258310138/figure/fig4/AS:297424271757331@1447922880513/Comparison-of-1968-Corona-and-2003-QuickBird-satellite-images-showing-

1987

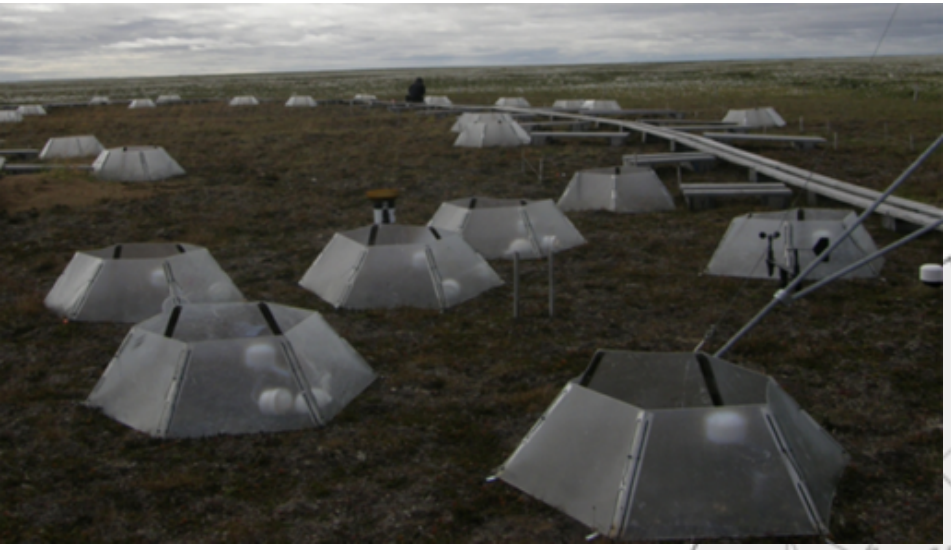
2013

Myers-Smith *et al.* **Ambio** 2011

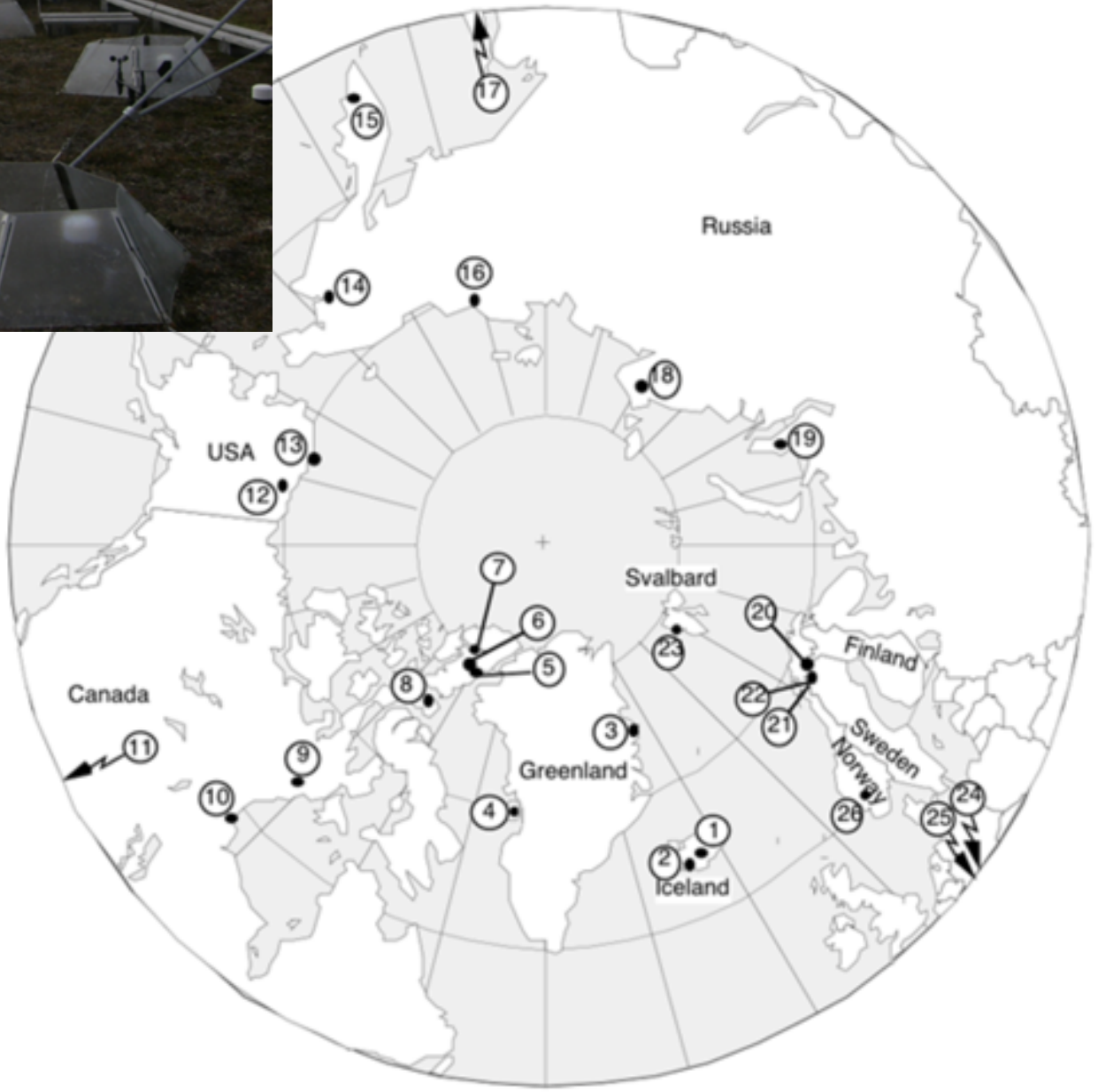


Phenological Mismatch

Changes in plant cover and phenology have ripple effects across tropic levels



ITEX


Russia
USA
Canada
Svalbard
Greenland
Iceland
Finland
Sweden
Norway
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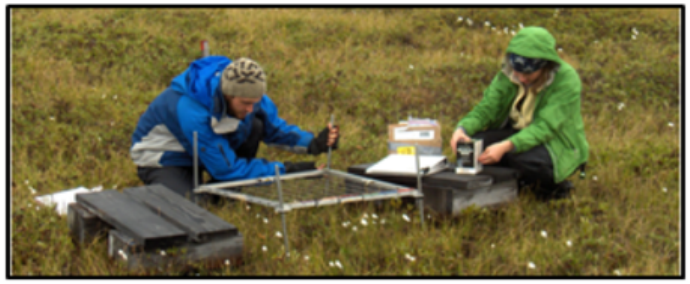
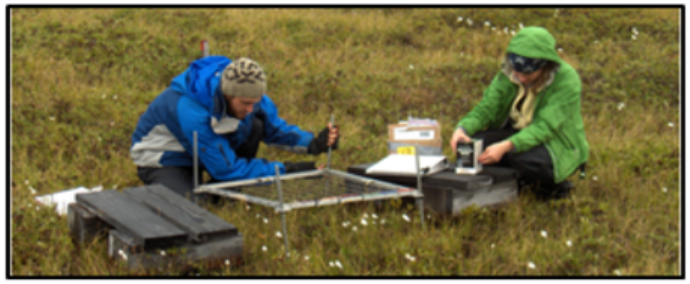


Plot scale vegetation assessment

-Highly precise

-Time and labor intensive



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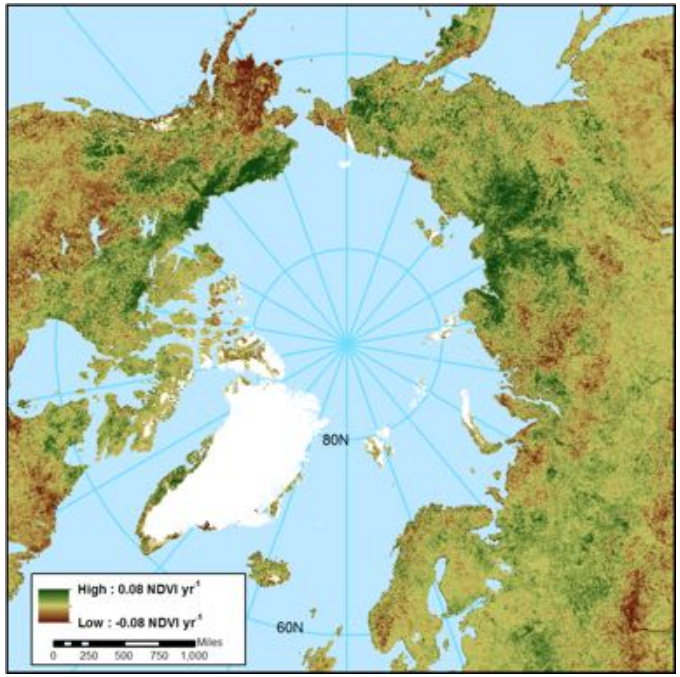
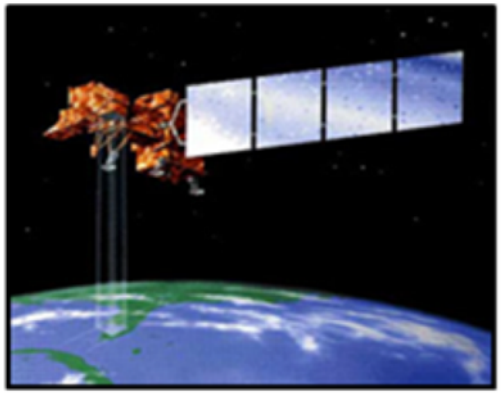
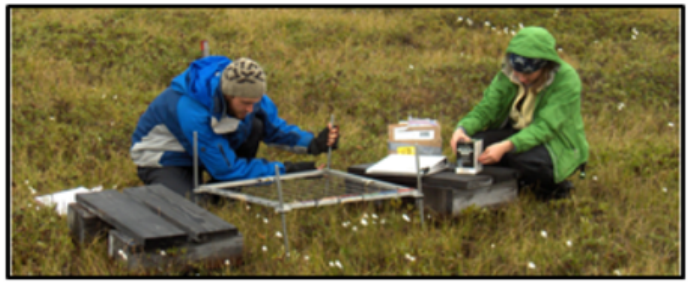




Satellites imagery
-Large scale monitoring
-Lower spatial and temporal resolution



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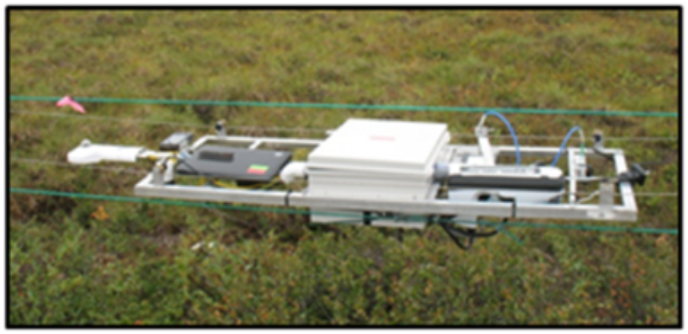
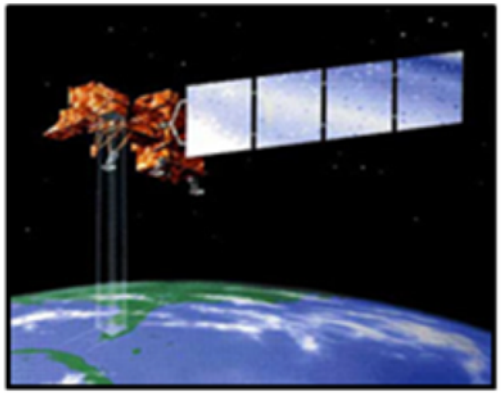


Mobile Instrumented Sensor Platform (MISP)
-Highly precise, less intensive
-Higher resolution than satellite



Satellites imagery
-Large scale monitoring
-Lower spatial and temporal resolution

MISP Transects

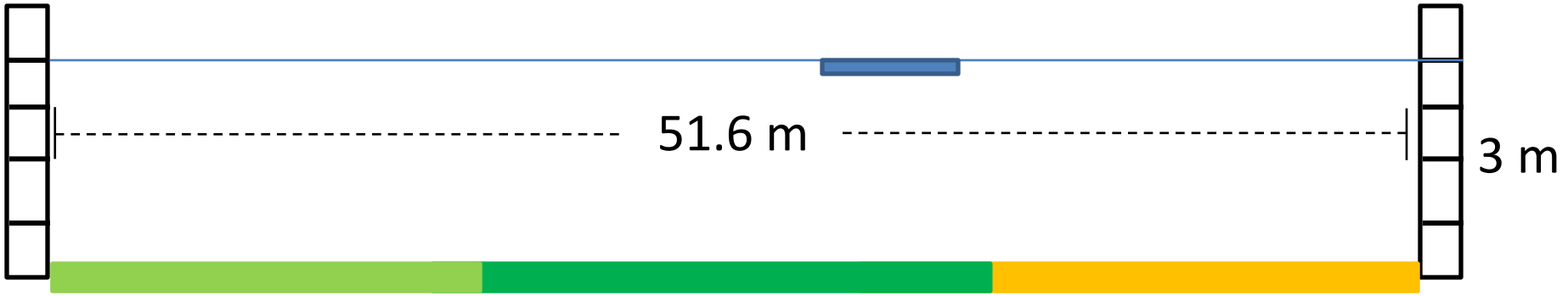
Atqasuk, Alaska

Barrow, Alaska

Imnaviat Creek, Alaska

Toolik Lake, Alaska

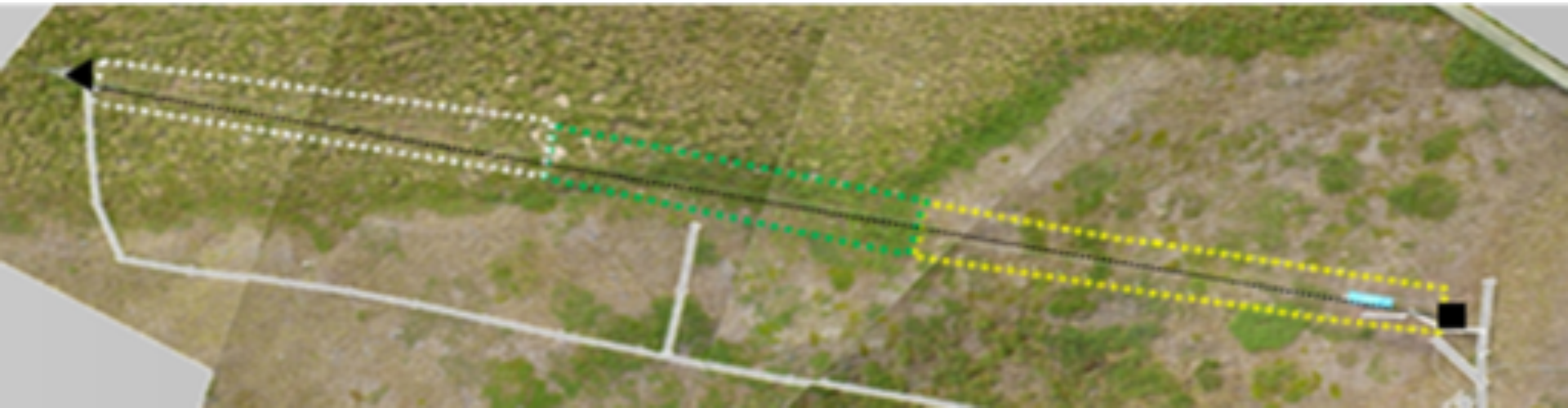
Toolik Lake Transect



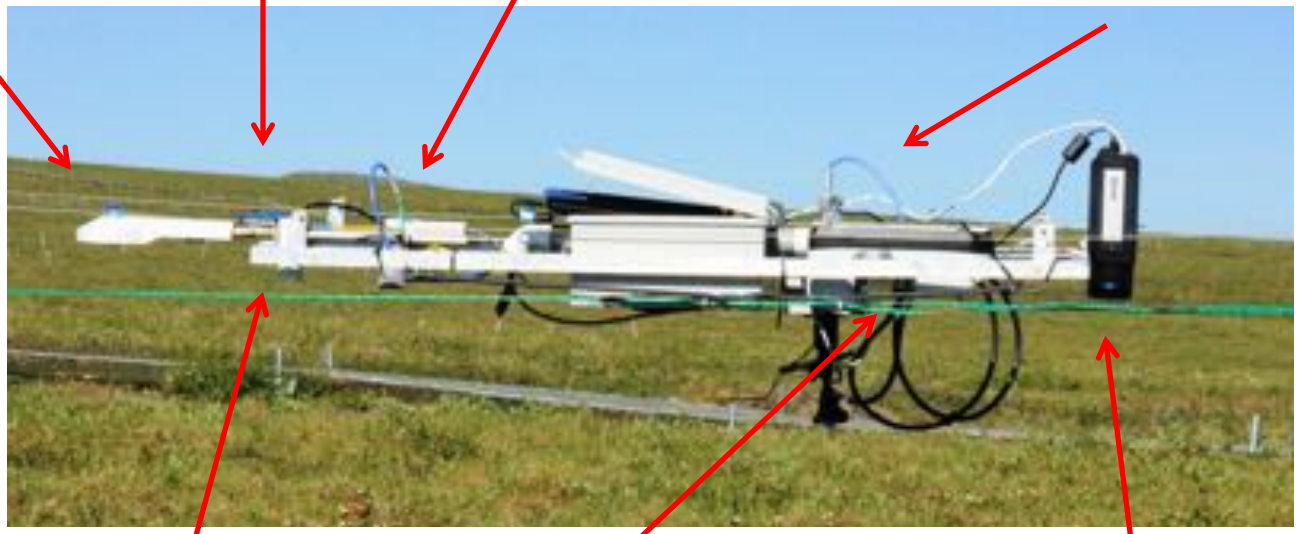
Moist Acidic

Shrub

Dry Heath



MISP Instrumentation

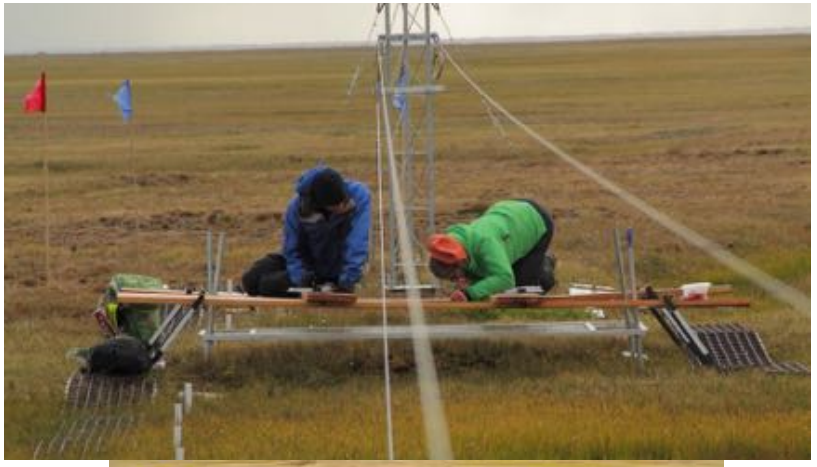


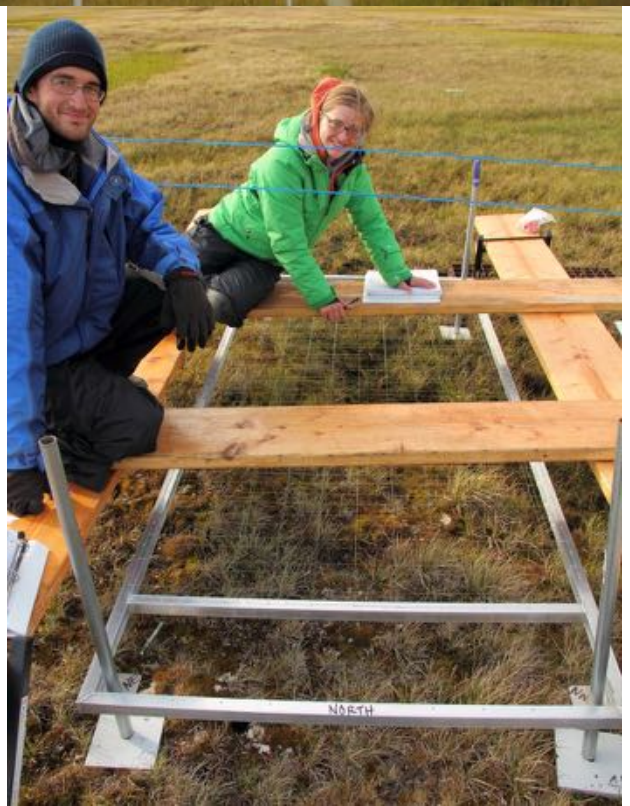
Transect vegetation assessment

Visually assessed at 10cm^2 scale

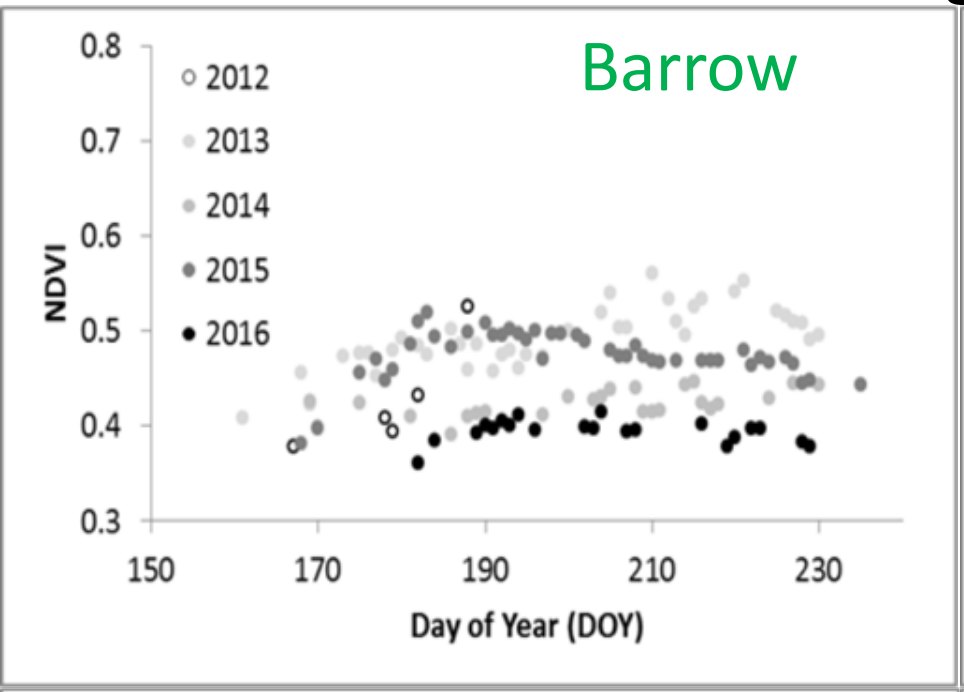
Peak season (mid-late July)

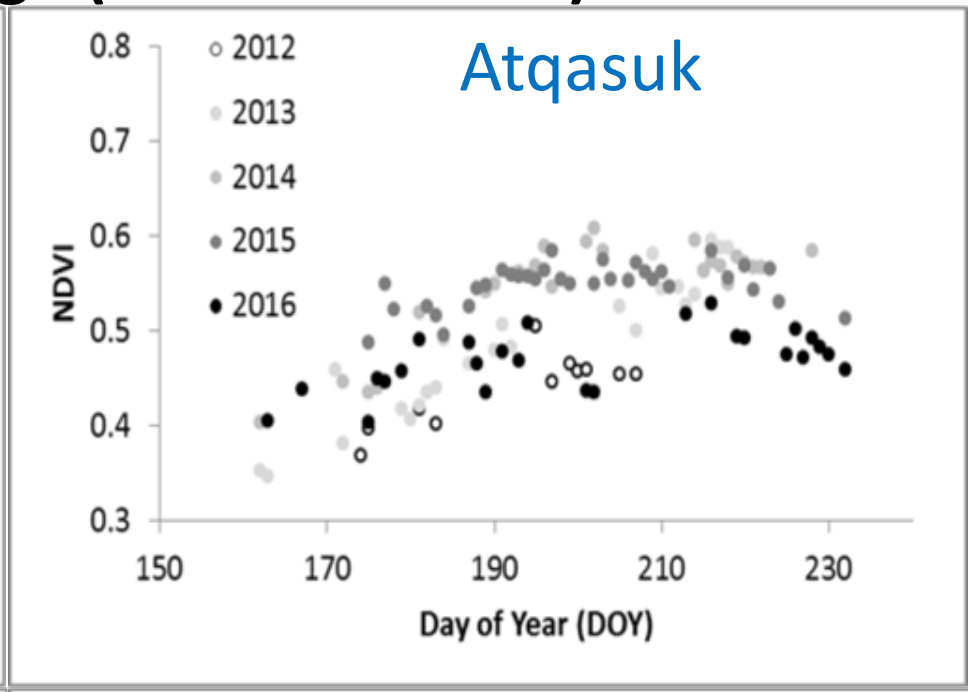
Vascular Plants
Cryptogams
Non-living objects

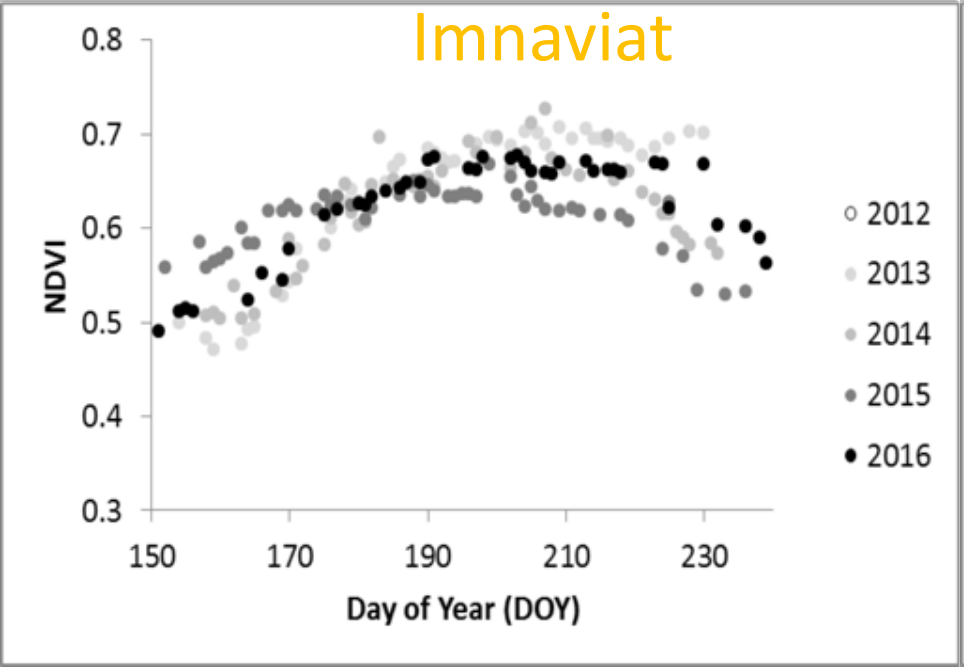


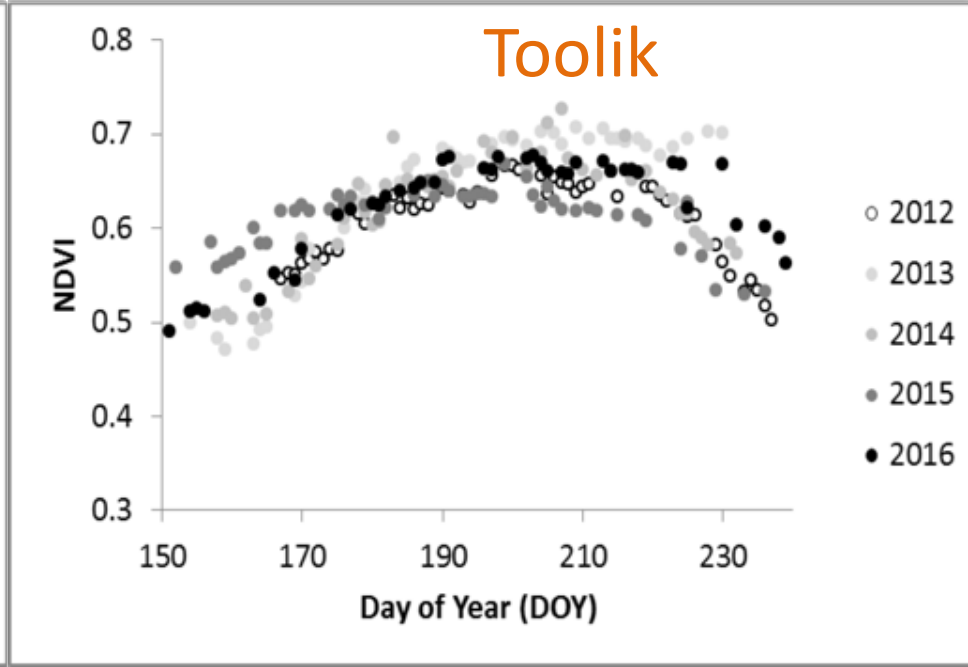


Season NDVI Change (whole transect)





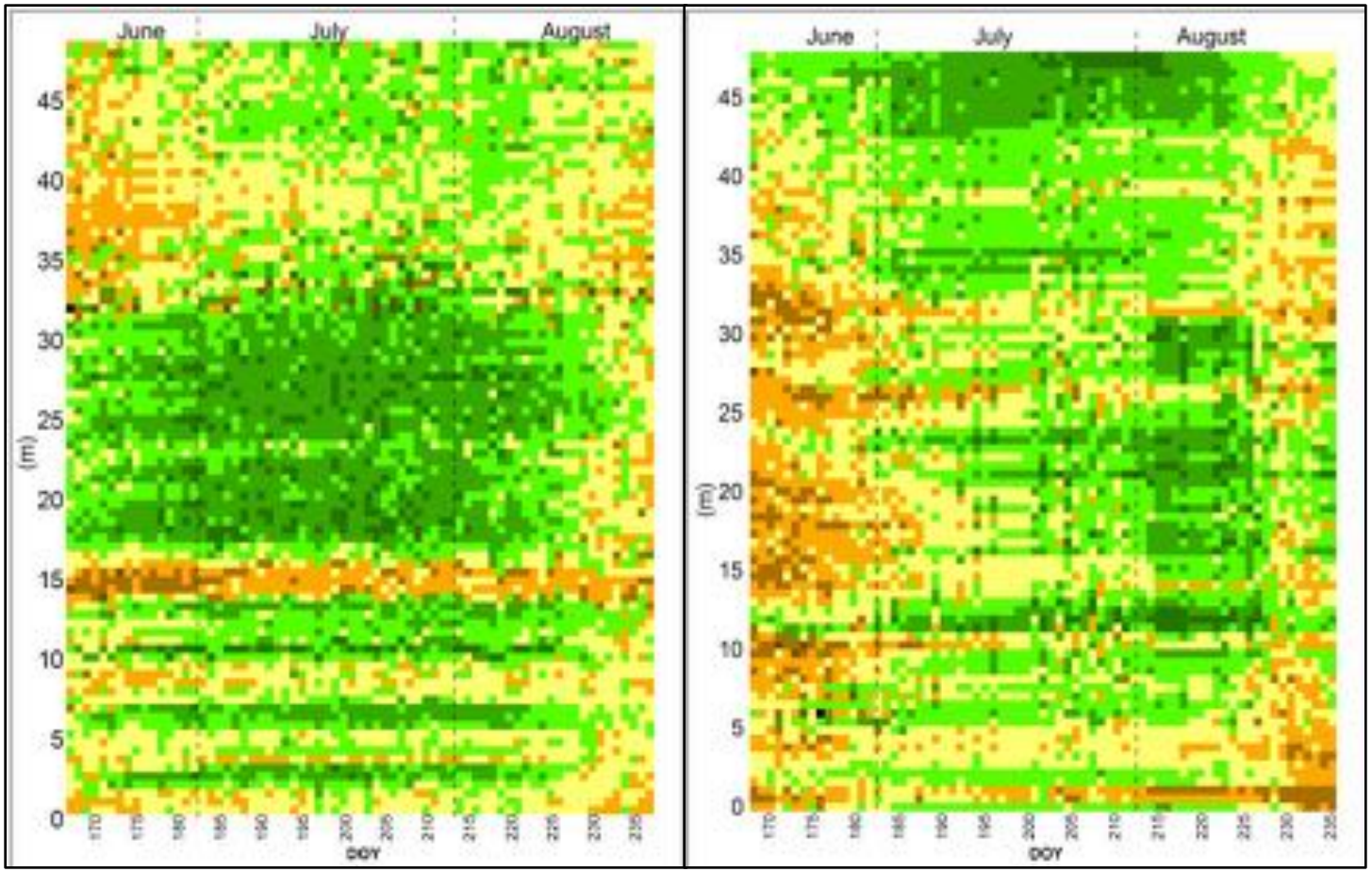




NDVI mapping through time

Toolik Lake

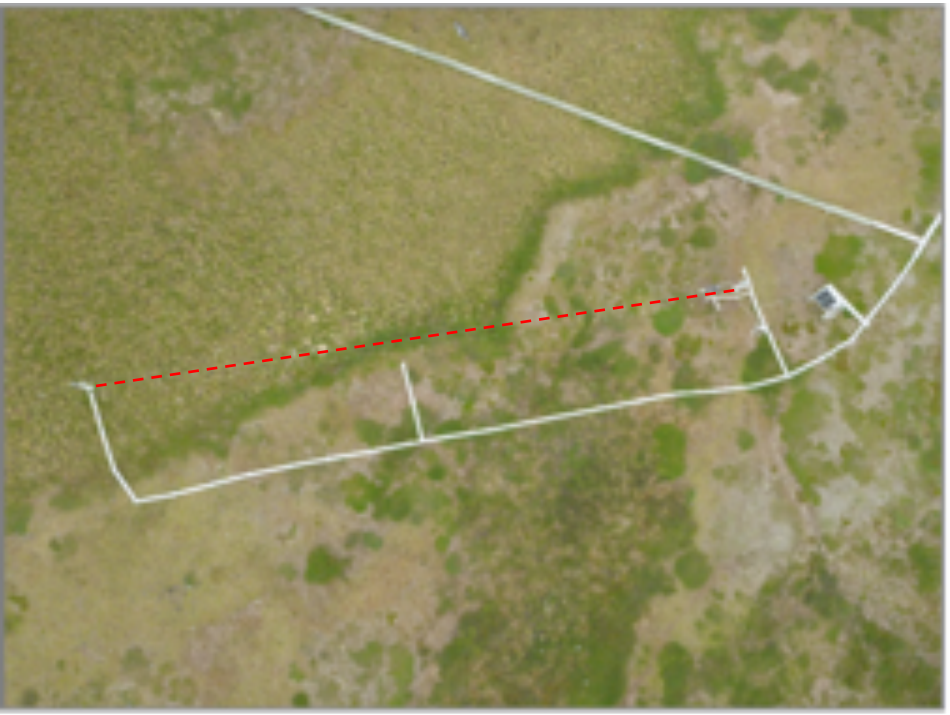
Imnaviat Creek

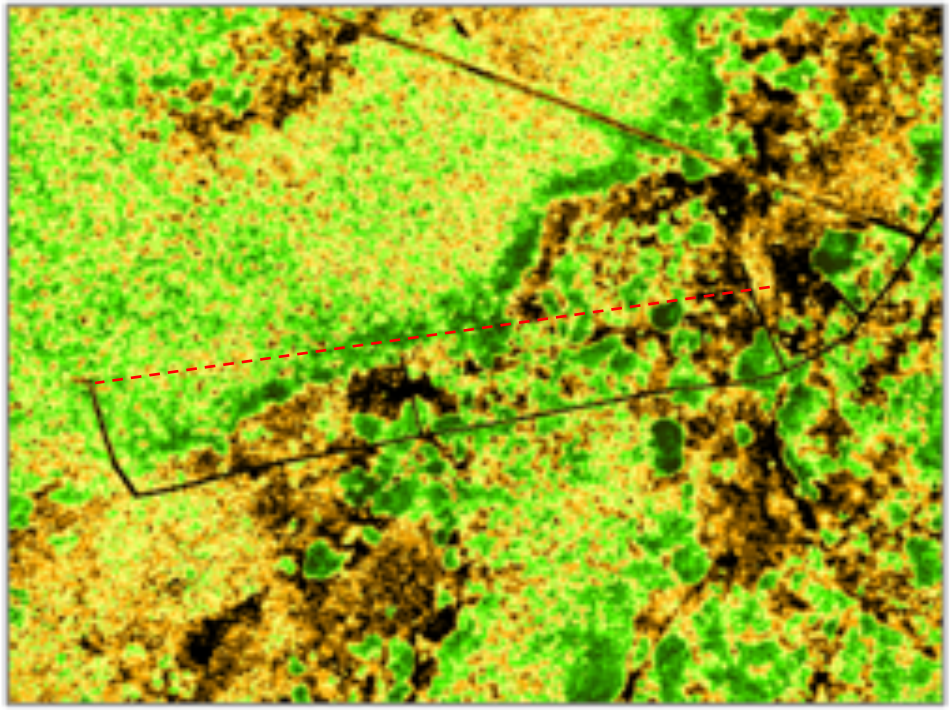


GreenSeeker data 2014

NDVI Transect Map Credit: Dr. Nathan Healey

Toolik





2GRBi = (2G-(R+B))

- -86 - 15
- 16 - 26
- 27 - 38
- 39 - 52
- 53 - 66
- 67 - 81
- 82 - 99
- 100 - 180

2GRBi analysis of the image to the left.
Image date: July 11, 2014

*2GRBi = (2*green) – (red + blue)*

Questions?