

What does a Climate Scientist do?

Uma Bhatt

Geophysical Institute & Dept. of Atmospheric Sciences

POLARTREC Teachers Webinar

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Outline

- What does my job entail?
- Research Examples
- What helped me get here?

What does my job entail?

- Teaching - primarily graduate classes
- Research - conduct Arctic climate research & seek funding for support & mentor students
- Service
 - Local: help governance of university at many levels, technical support
 - National: review papers & proposals, & organize conferences.

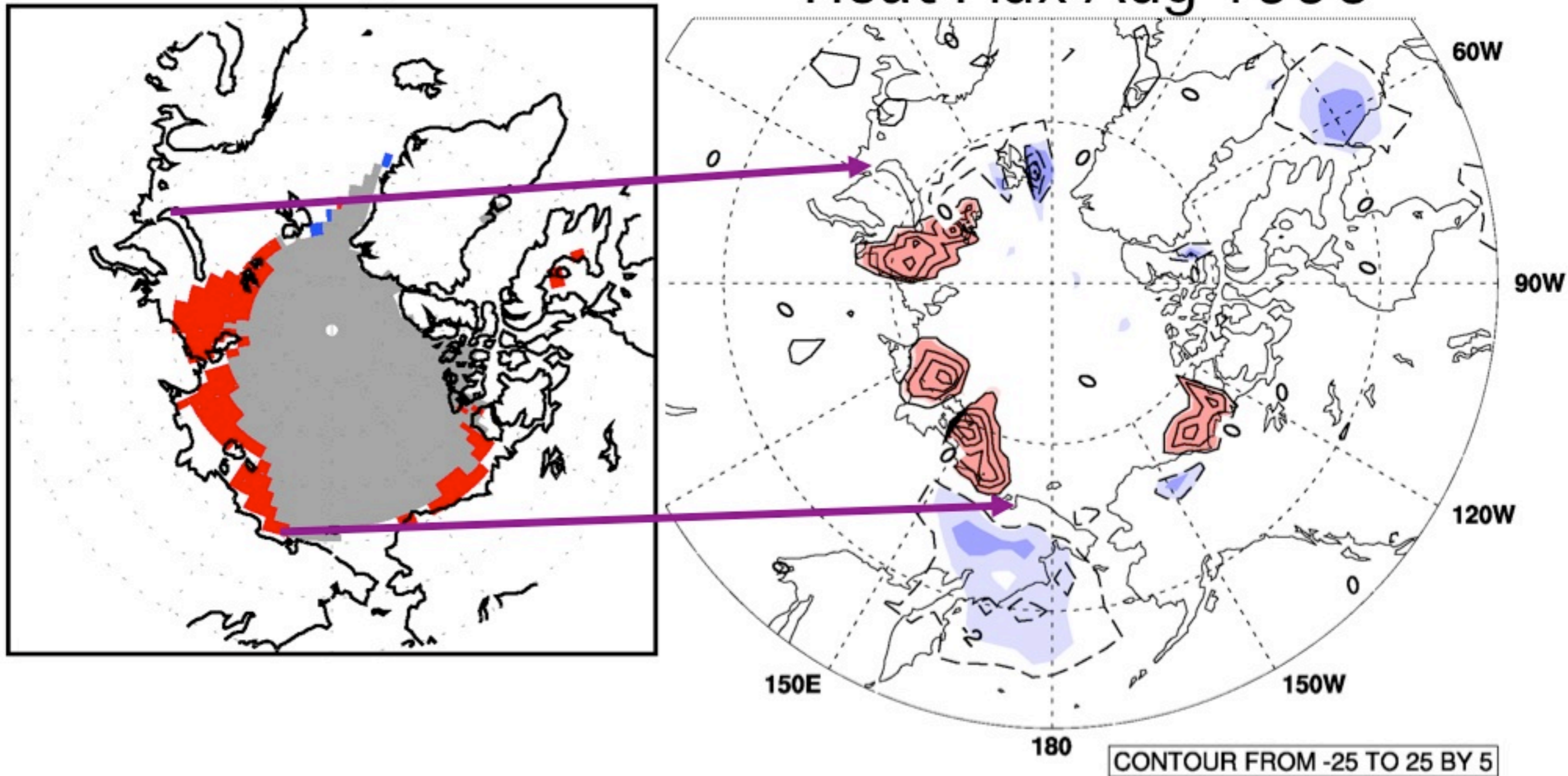
Teaching

- Climate and Climate Change
- Atmospheric Dynamics I
- Climate Journal Club

Research

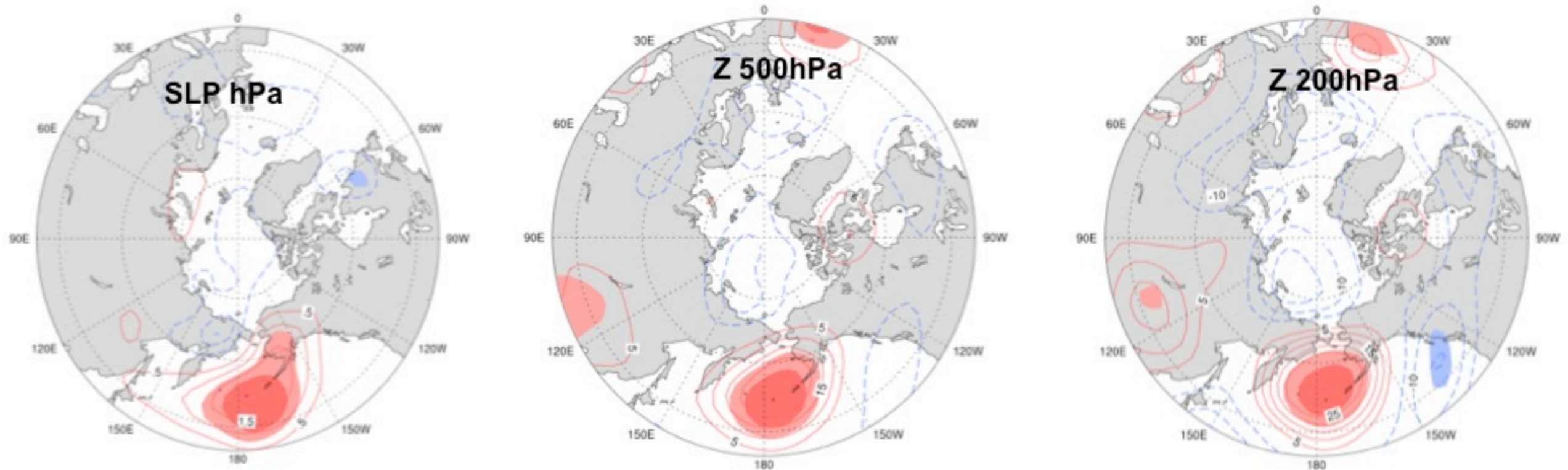
- Impact of Sea Ice on Atmosphere (Using Global Climate Models)
- Multi-decadal Climate Variability
- Connecting Climate to Glaciers
- Connecting Climate to Vegetation Changes

Remove ice => more heat fluxes to
atmosphere from ocean
Heat Flux Aug 1995



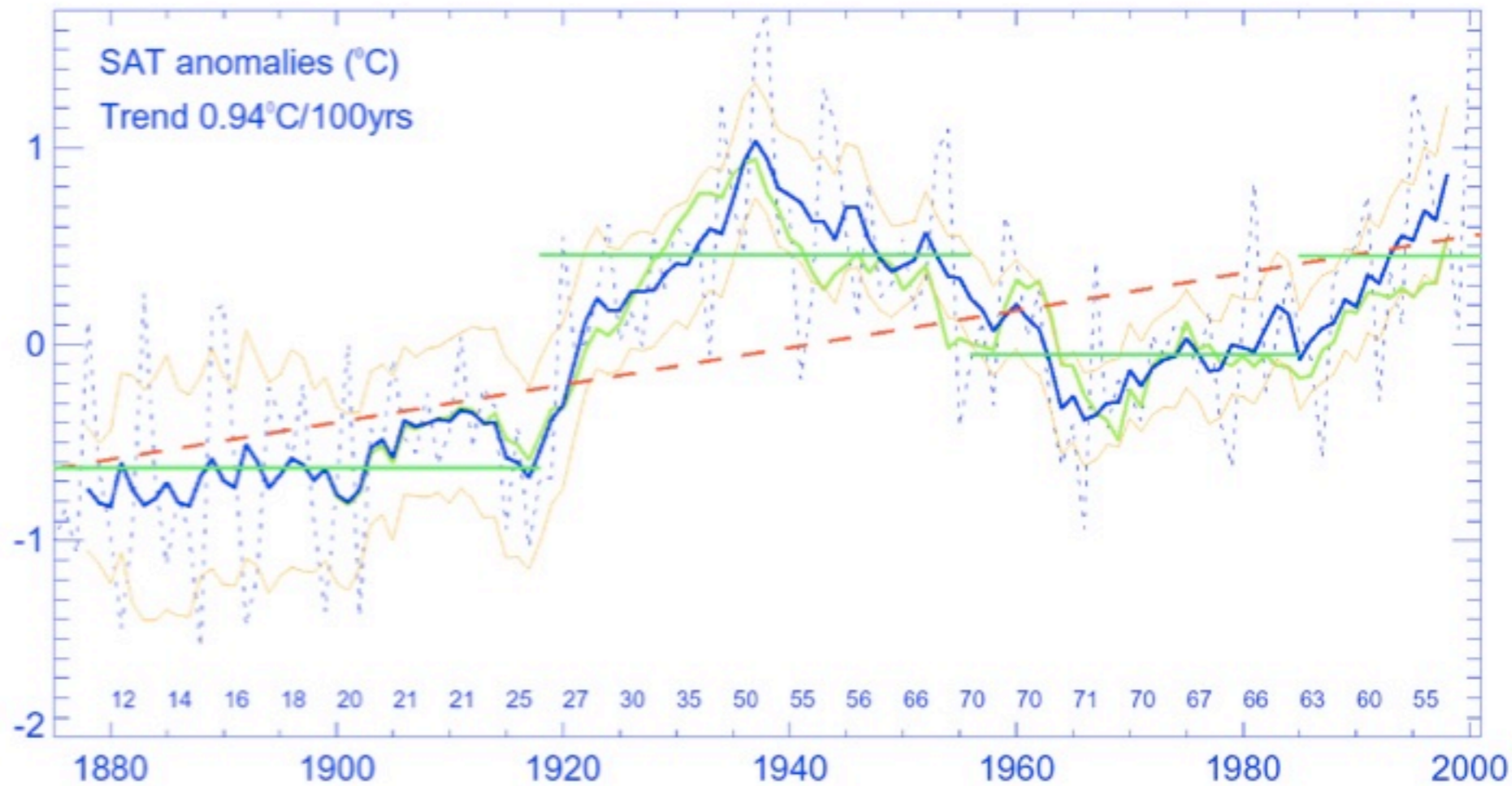
~50% Sensible, ~30% Latent, ~20% Longwave, C.I. 5 W/m²

Atmospheric Response: Expanded Pacific Subtropical High



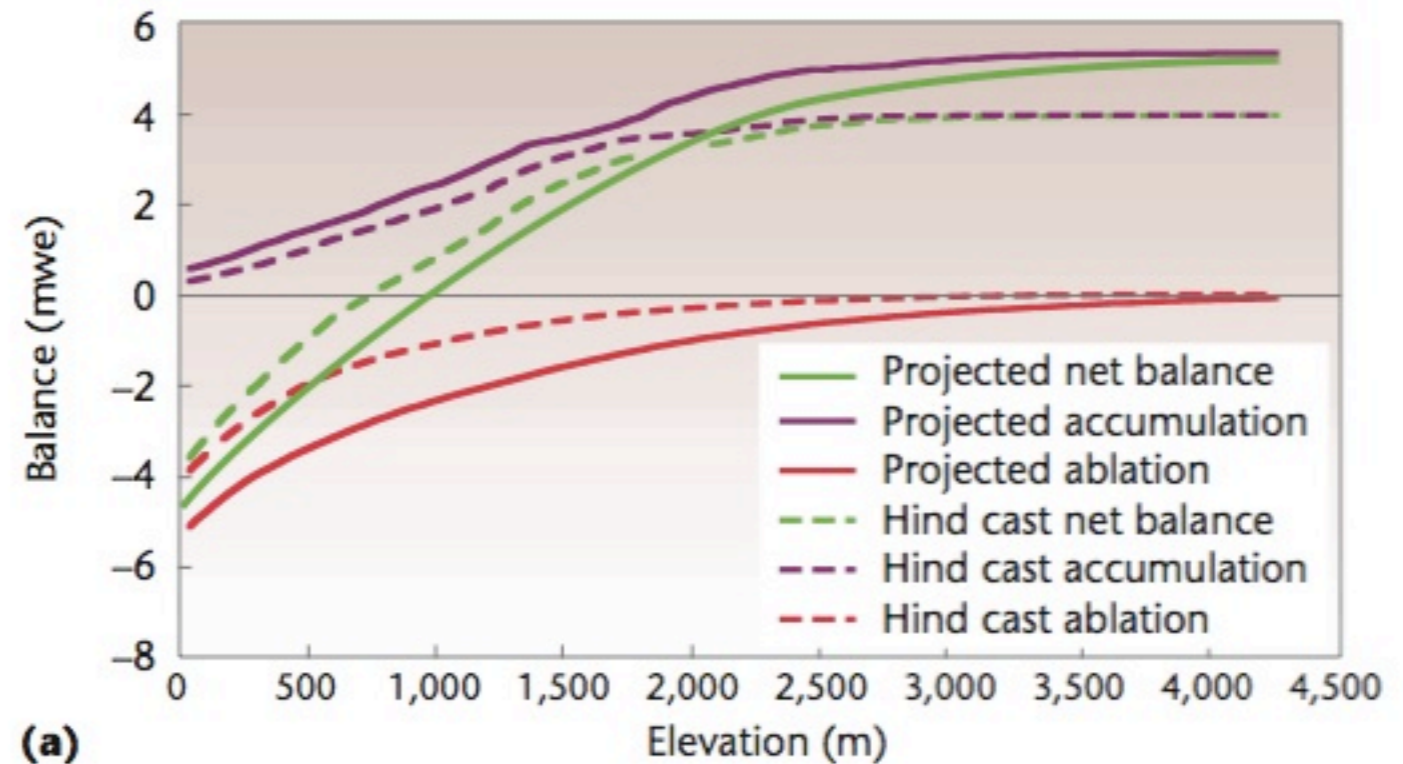
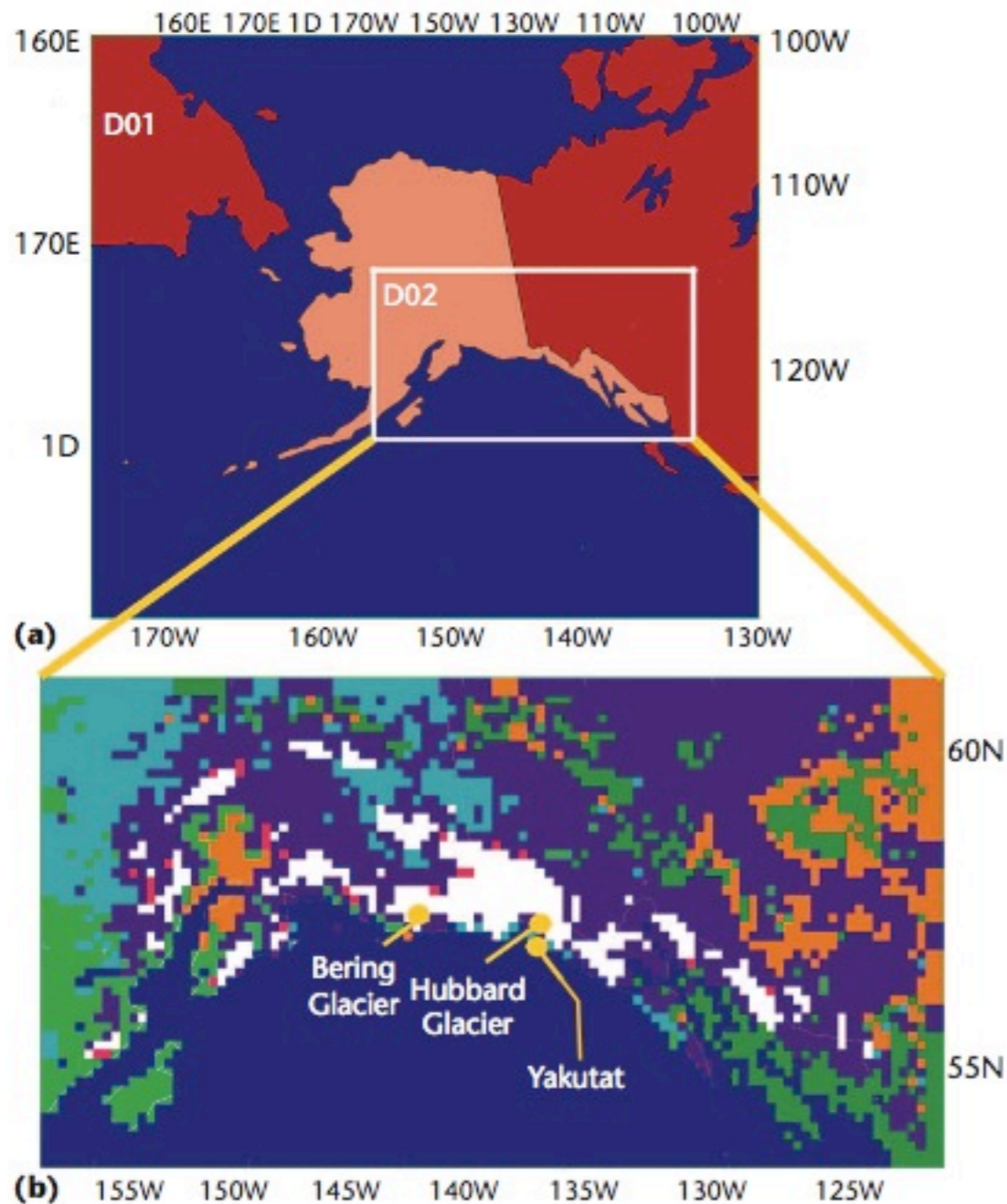
- SLP & Heights reduced over the Arctic
- Anomalous high over the North Pacific

Trend of Time Series is Complicated by Natural Cycles



- Multi-decadal climate cycles in Arctic and North Atlantic

Hierarchical Modeling to Simulate Glacier Mass Balance



Hubbard Glacier in the Present and a Future Forecast

The Arctic is Greening - why?

NDVI - Normalized Difference Vegetation Index

NDVI is increasing over Alaska (and Arctic) tundra

Summers are getting warmer

Why? Because ice is decreasing?

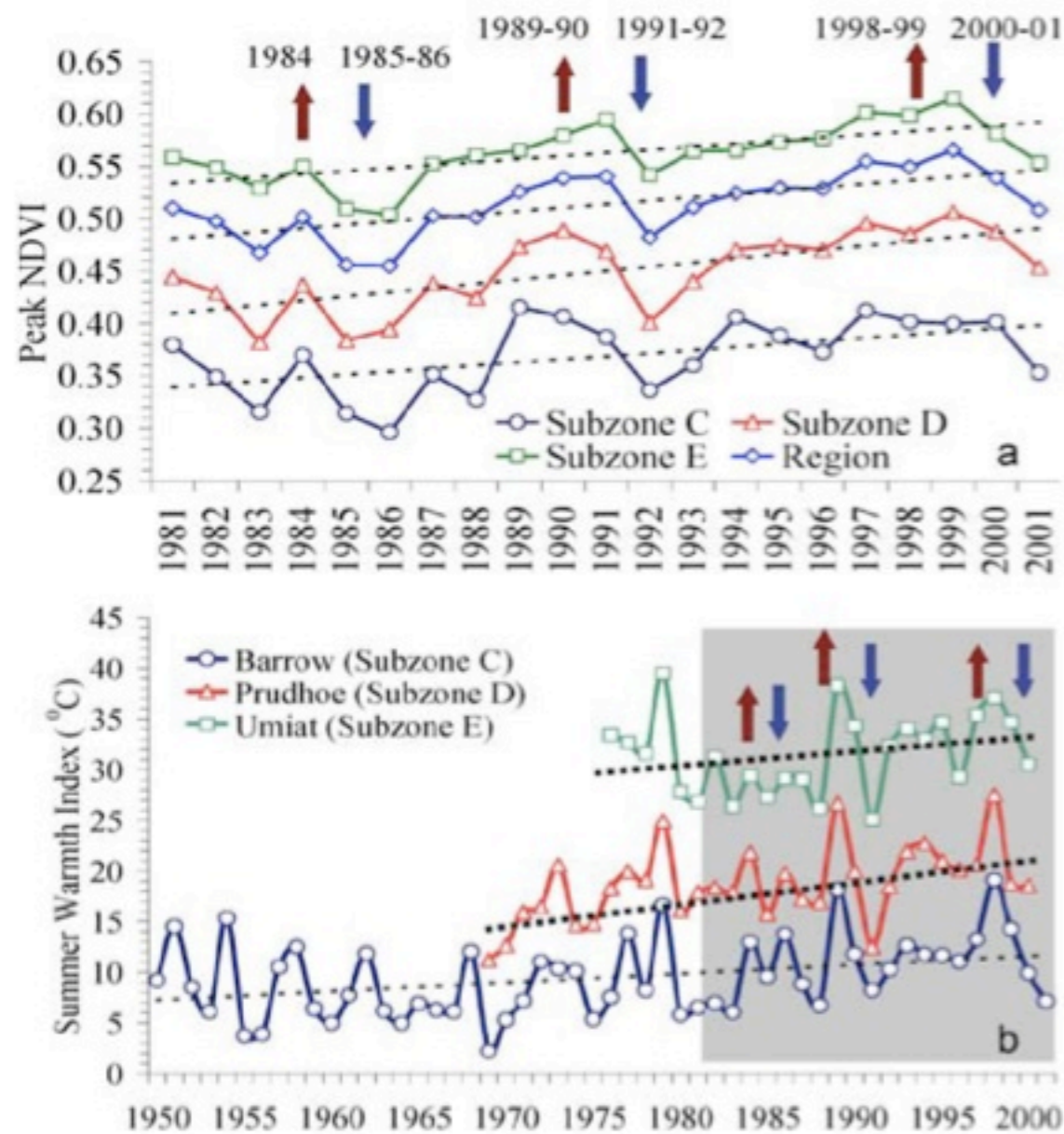
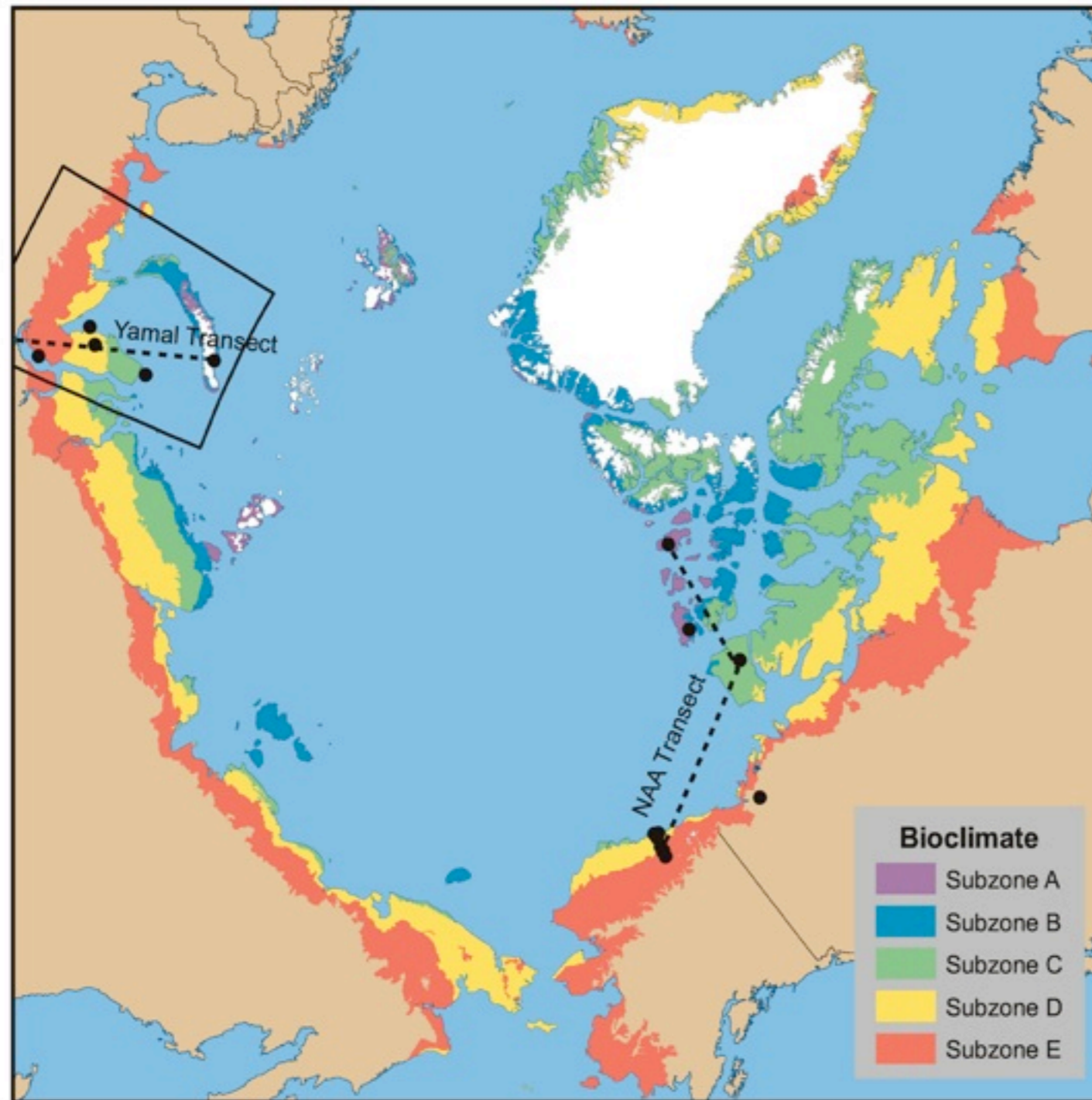


Figure 2. Time series of peak NDVI derived from 8-km resolution AVHRR data from 1981 to 2001 (a) and SWI over the past 22–50 years (b) among bioclimate subzones. Dashed lines are linear regressions. The shaded area highlights the period of SWI covered by NDVI data.

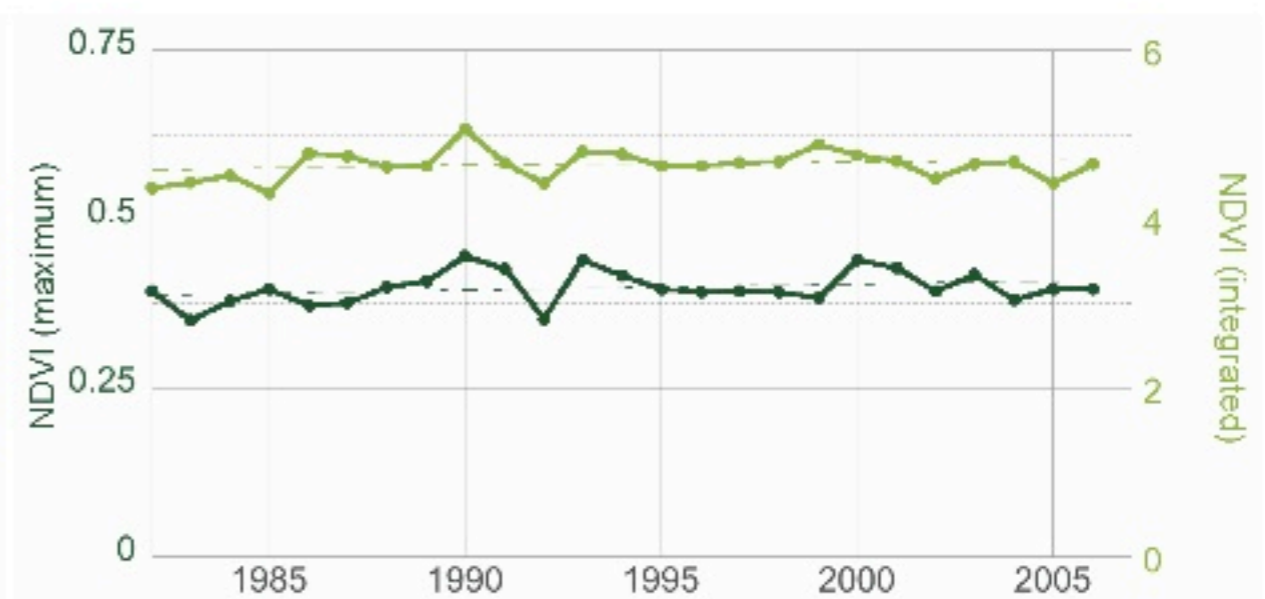
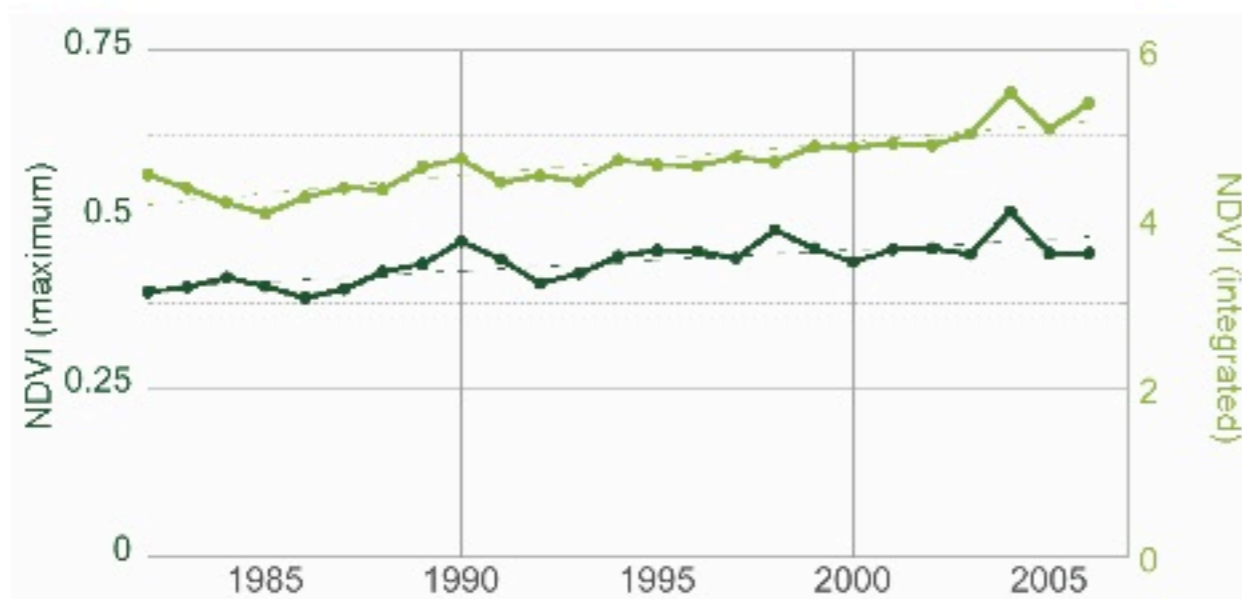
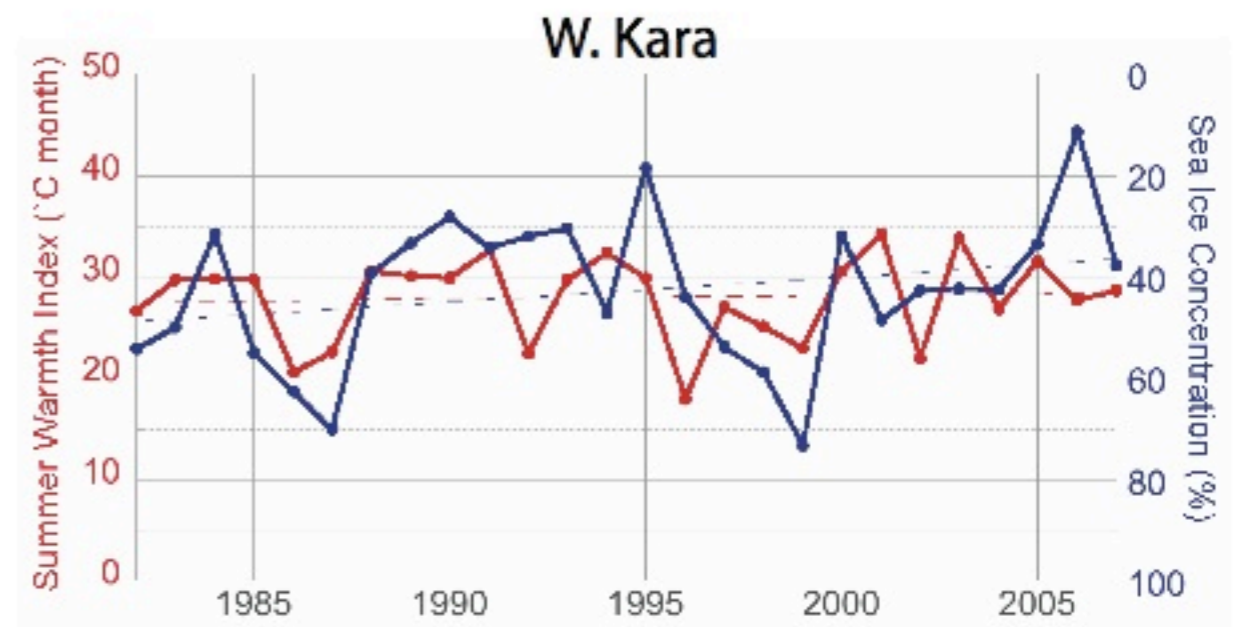
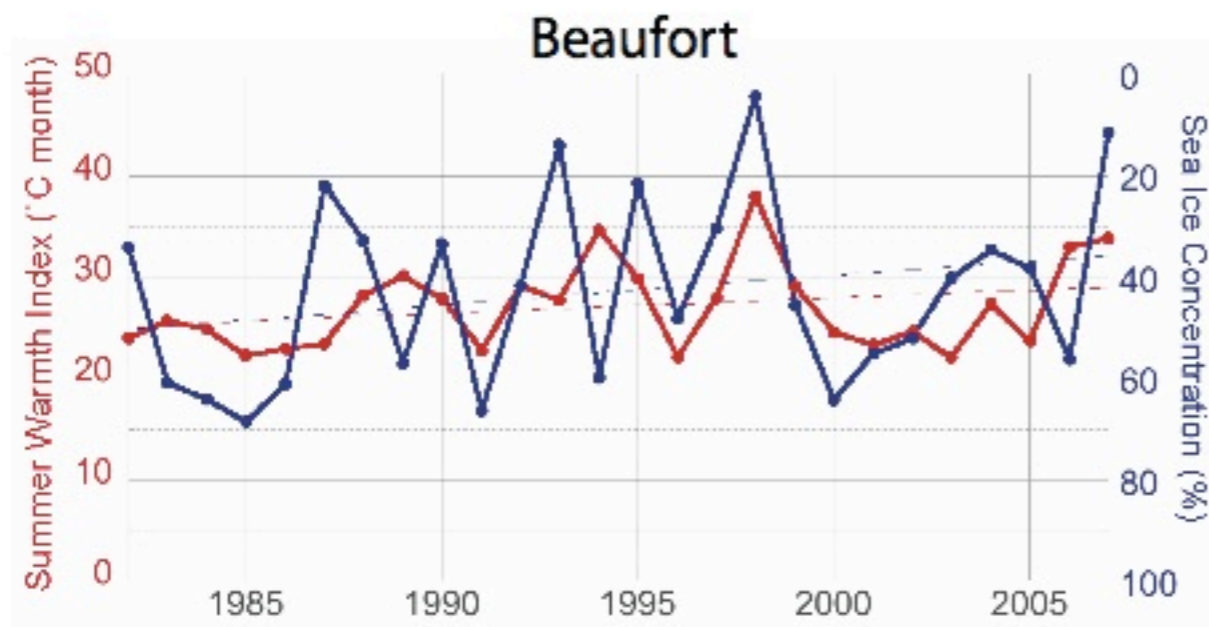
Tundra Vegetation Divisions in Arctic



- **Subzone A:** Cushion forbs, mosses, lichens
- **Subzone B:** Prostrate dwarf shrubs
- **Subzone C:** Hemi-prostrate dwarf shrubs, sedges
- **Subzone D:** Erect dwarf shrubs, sedges, mosses
- **Subzone E:** Low shrubs, tussock sedges, mosses

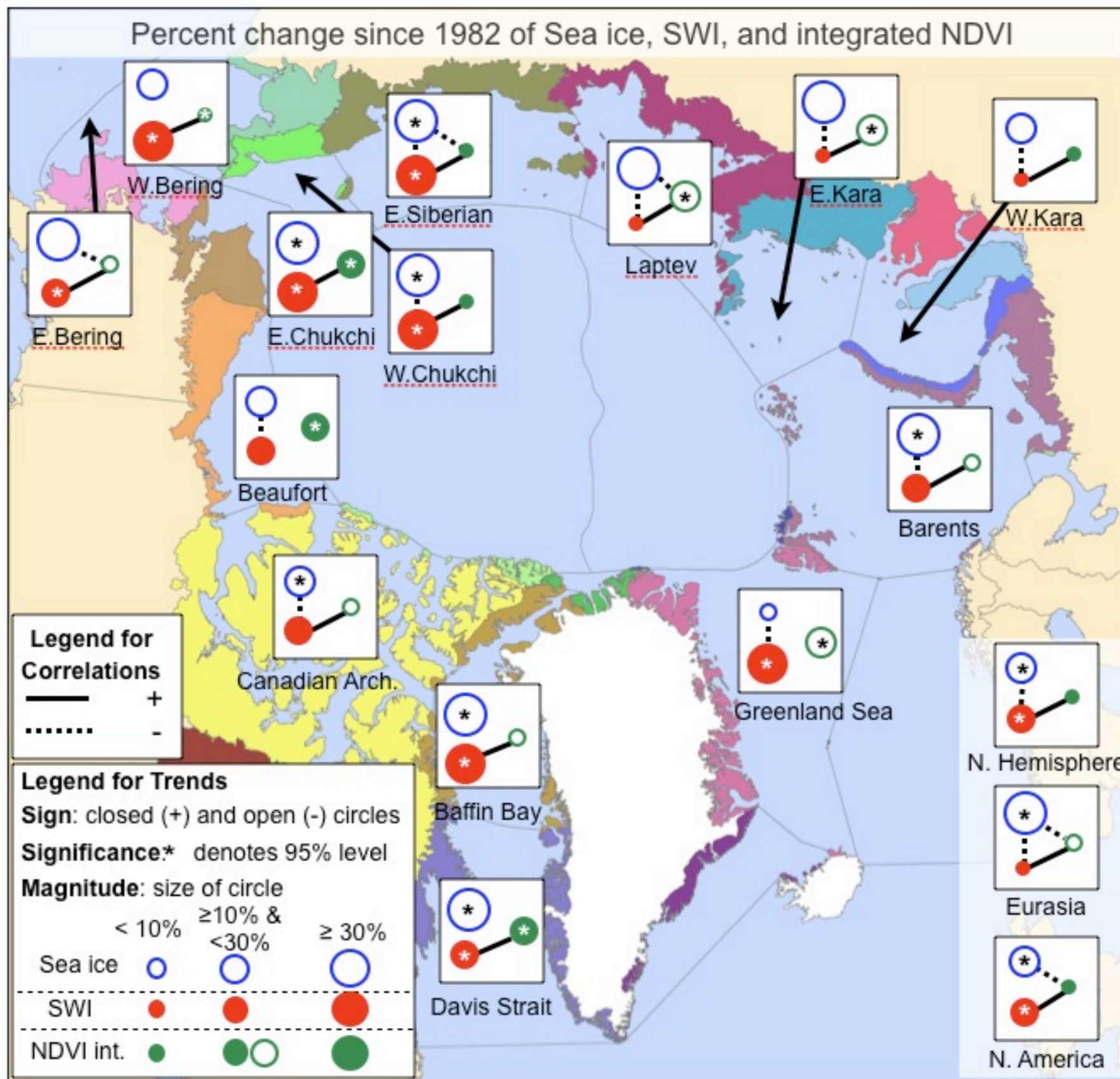
Bioclimate Subzone Map showing transects where ground observations taken

Alaska versus Russia



Alaska region greening more than North-eastern Europe

Variable changes across Arctic



Laborovaya: Subzone E



[Photo: Skip Walker 2007]



Nadym

- Lichen woodland, & boreal forest
- Within Yamal oil fields area so it is not grazed by reindeer
- Landuse is a very important component of understanding greening

[Photo of Howie Epstein by Skip Walker 2007]

Green Cabin: Subzone C



[Photo: Skip Walker 2007]



Isachson

- **Subzone A**

How is Multi-disciplinary Science done?

- Good Question!
- Spend a good deal of time talking
- Level of trust needed to hammer out ideas
- Regular discussions are really important
- An open mind as to how things should be done and how they work!

What helped me to end up here?

- BS Mechanical Engineering
- US Peace Corps Teacher in Kenya, 83-85
- MS and PhD in Atmospheric Science

What do you need to study to be an Atmospheric Scientist?

- Math, Physics, Chemistry, Oceanography, Computer Science, & Geology. Plus Writing & Speaking skills.
- Undergraduate - Meteorology, Physics, or Engineering with graduate work in Atmospheric Sciences

Summary

- Analyzing data from models and long term observations.
- Spend a good deal of time developing and revising stories on how/why things are happening (so requires some creativity)
- Have to be willing to change your mind as you learn more on your own or from others