ALASKA CLIMATE

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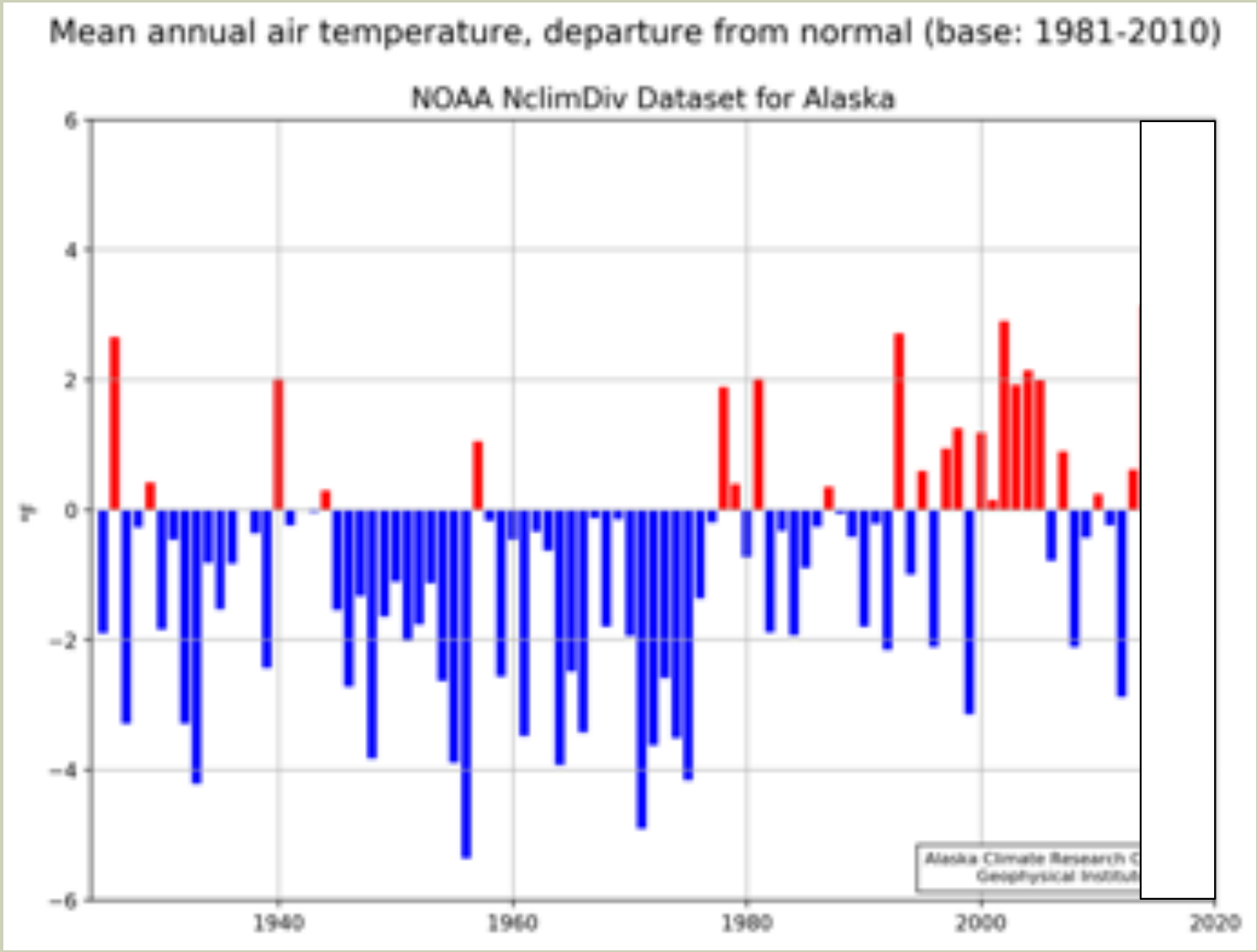
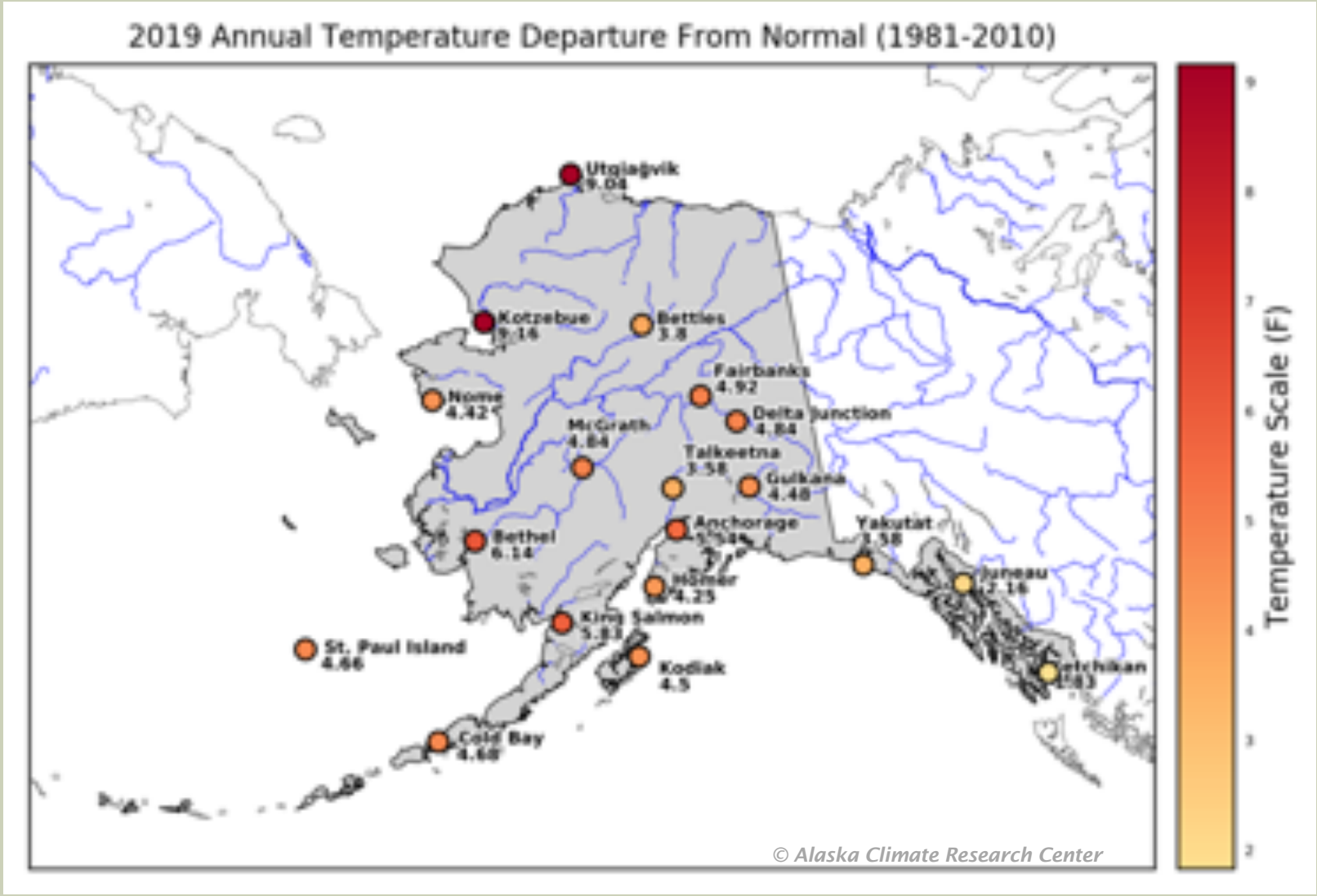
TEMPERATURE CHANGE IN ALASKA

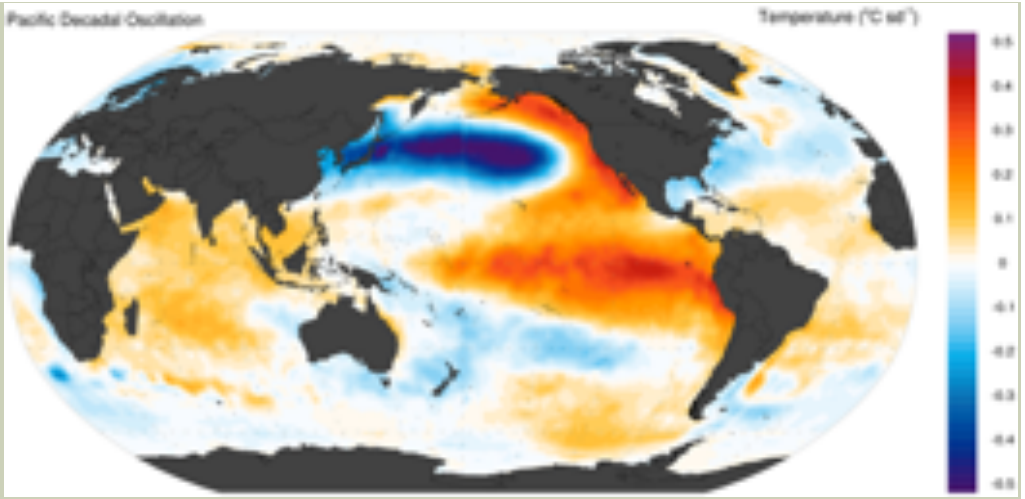


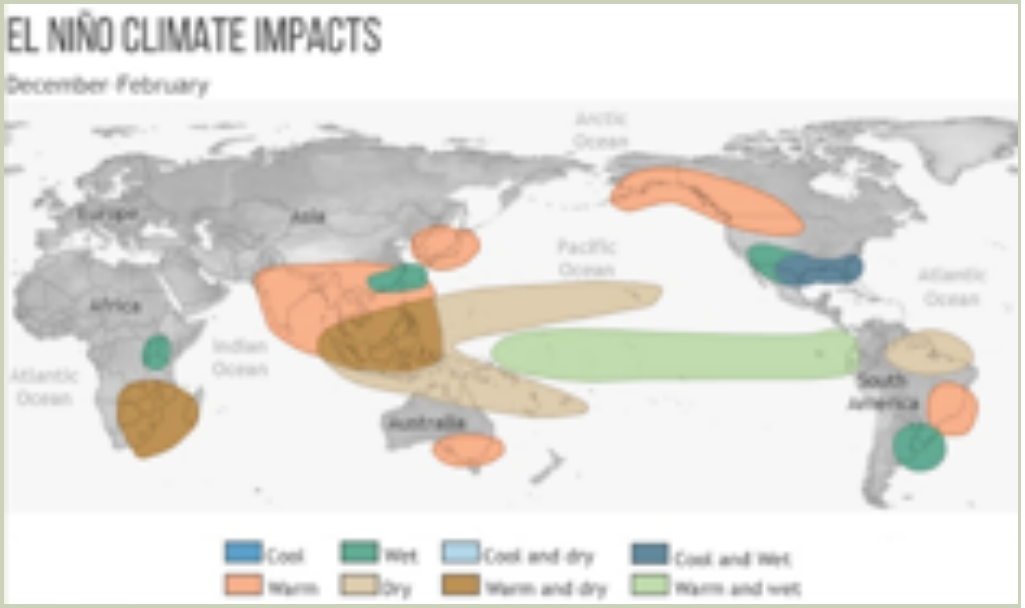
ALASKA TEMPERATURES IN 2019



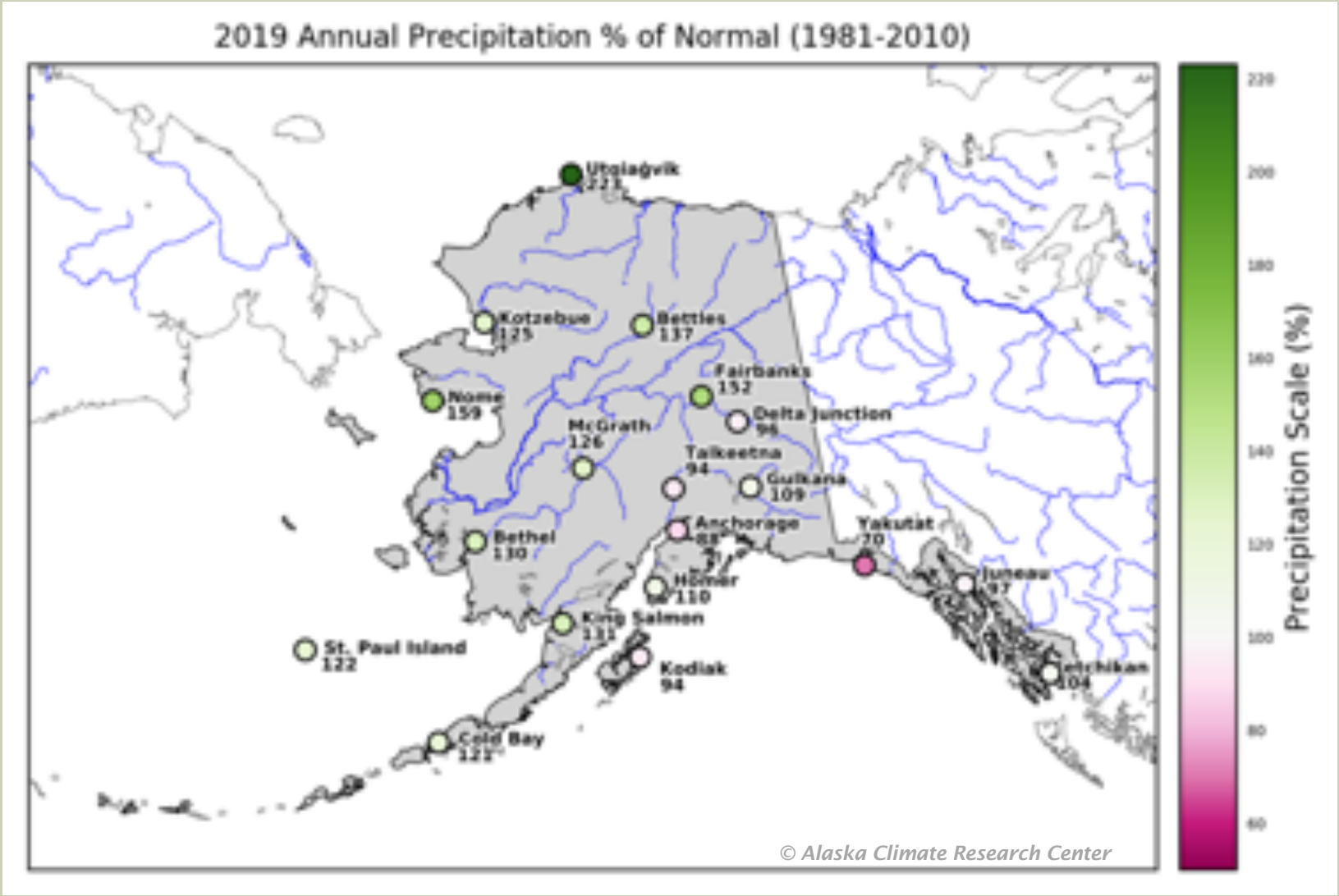
WHY SO WARM IN 2019?

- Positive Pacific Decadal Oscillation (PDO) – usually leads to warmer temperatures in Alaska.
- Weak El Niño associated with warm winters in Alaska.
- Less sea ice amplifies warming.
- Climate change.

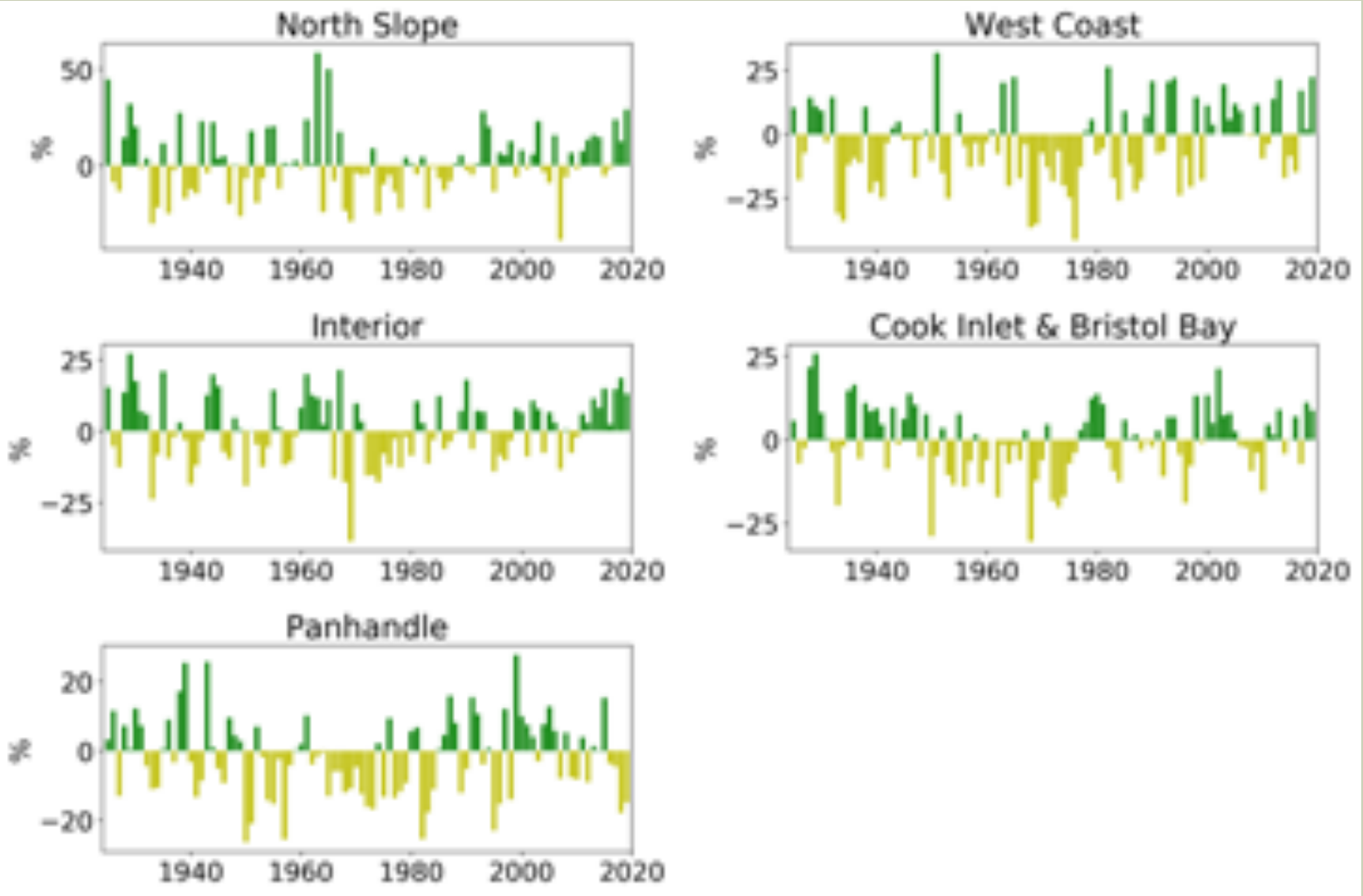




ALASKA PRECIPITATION IN 2019



CLIMATE REGIONS PRECIPITATION CHANGE

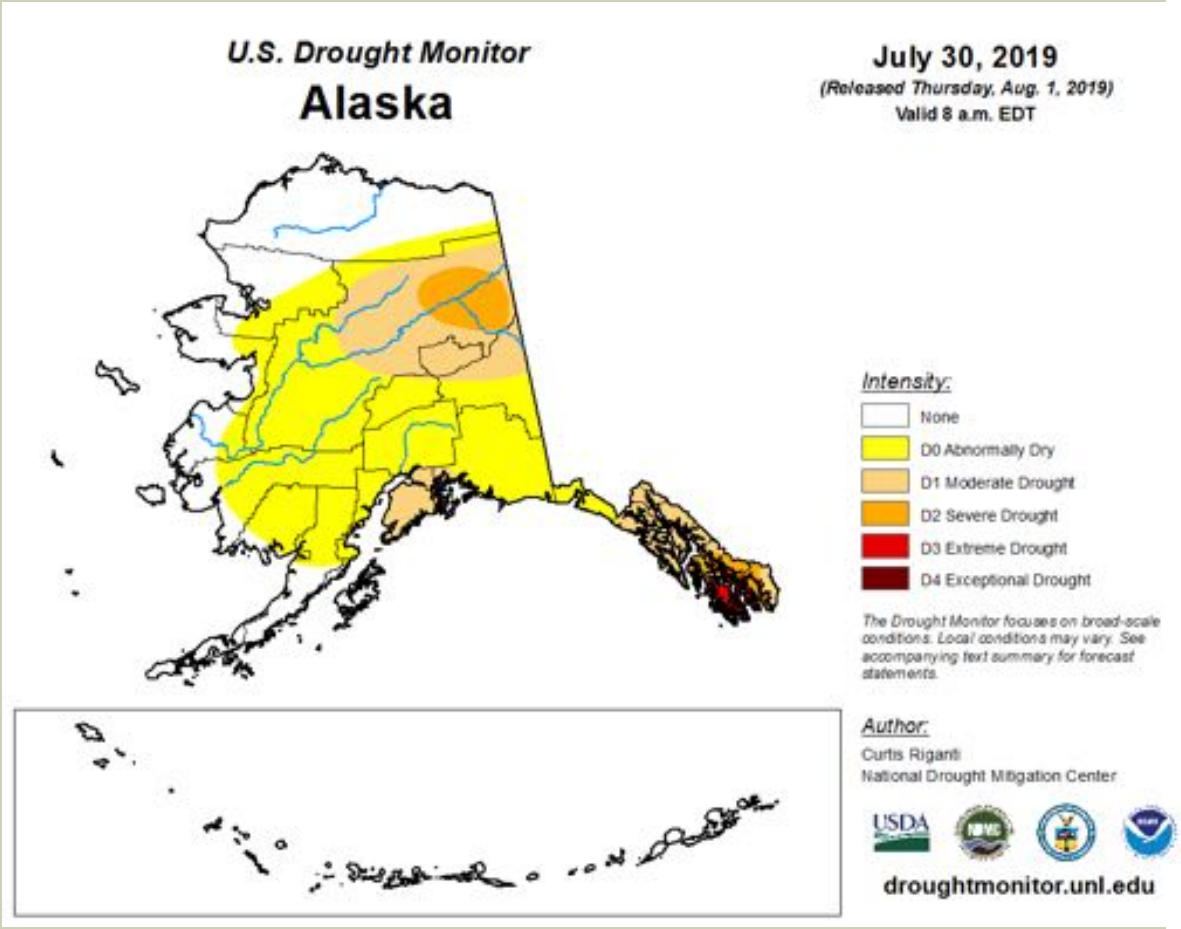


Time series of the percent difference annual precipitation departures from the mean for 5 climate regions.

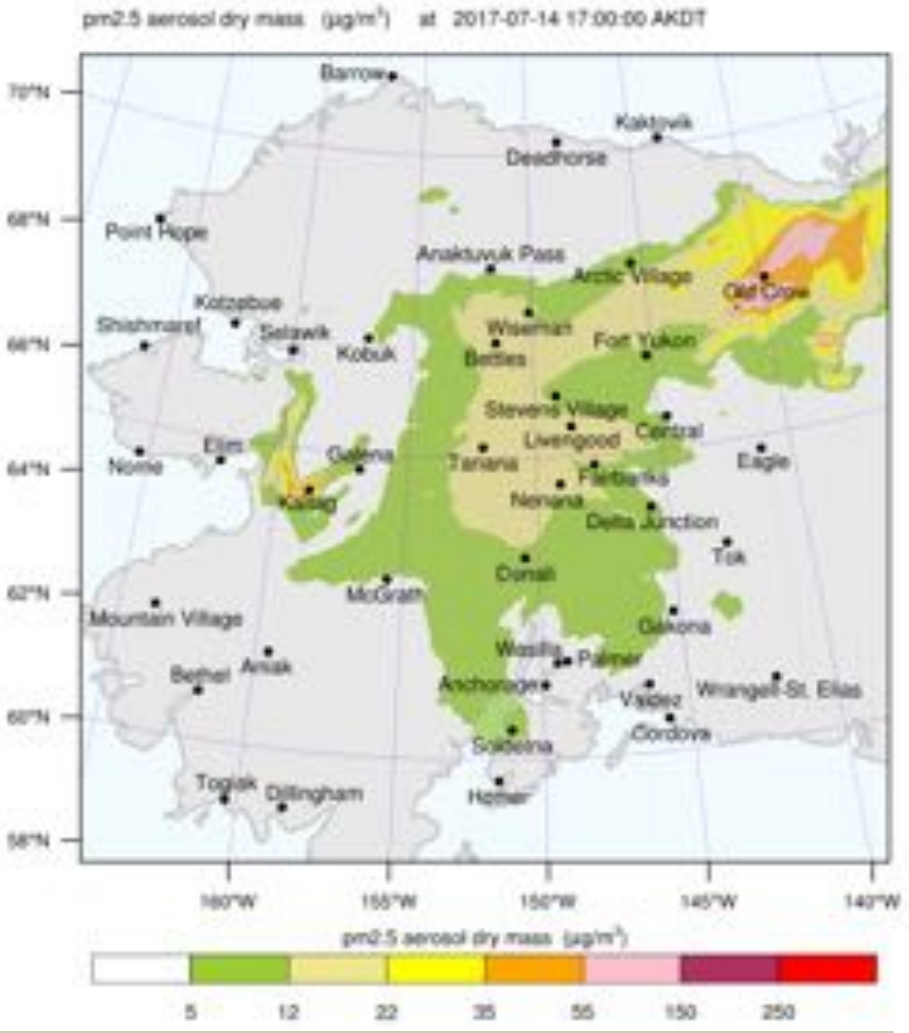
Source Alaska Climate Research Center.

DROUGHT

- 2019 drought conditions in Southeast Alaska were the most significant observed in the nearly 20-year history of the drought monitor.
  - May: Extreme drought (D3) conditions.
  - July: Moderate to severe drought was observed in parts of the northeast Interior, fueling wildfires
  - August: Extreme drought conditions in the region of Anchorage and in the Kenai Peninsula
  - The drought conditions near Juneau improved to Moderate Drought (D1) by the end of the year.



ANNUAL NUMBER OF FIRES OBSERVED IN ALASKA AND AREA BURNED



- Kenai Peninsula fires uncommon.
- Bad Air Quality. Anchorage was US city with poorest air quality in Summer 2019.
- Evacuations: Neighborhoods in NW Fairbanks, Levelock, Anderson Subdivision near Anderson, Between Willow & Talkeetna (>50 homes burned in McKinley Fire), Campbell Creek Science Center & Manoog's Isle Trailer Park in Anchorage (briefly).

CLIMATE CHANGE IN ALASKA AND THE ARCTIC

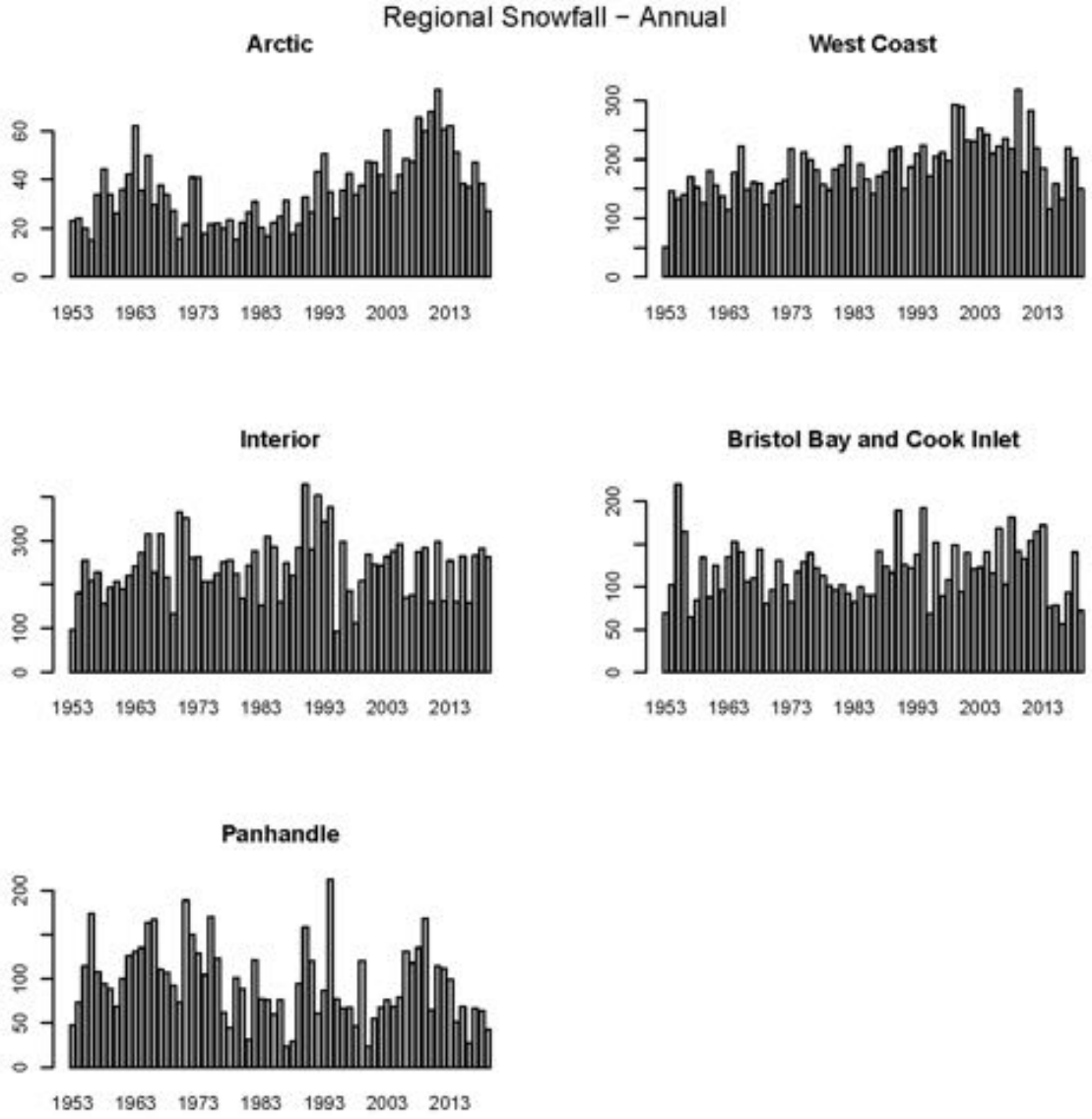
- Tundra vegetation under stress from extraordinary warm winter weather.
- Insects cause damage beyond their usual range due to milder winters.
- Wildfires

FEATURE CLIMATE

Climate change made the Arctic greener. Now parts of it are turning brown.

Warming trends bring more insects, extreme weather and wildfires that wipe out plants

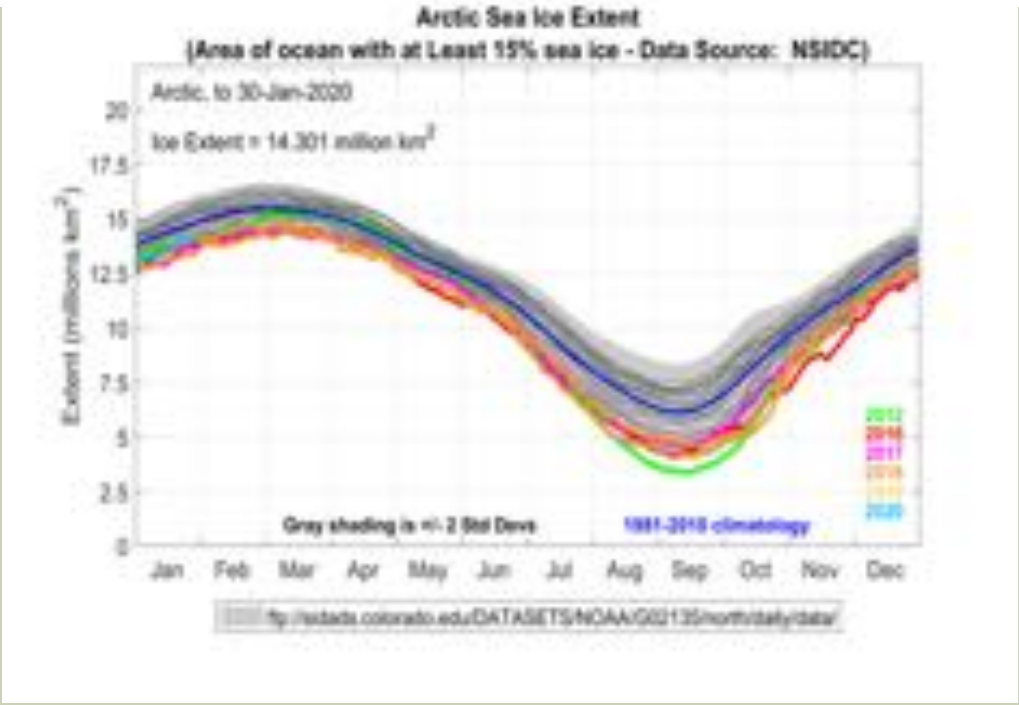
CLIMATE REGIONS SNOWFALL CHANGE

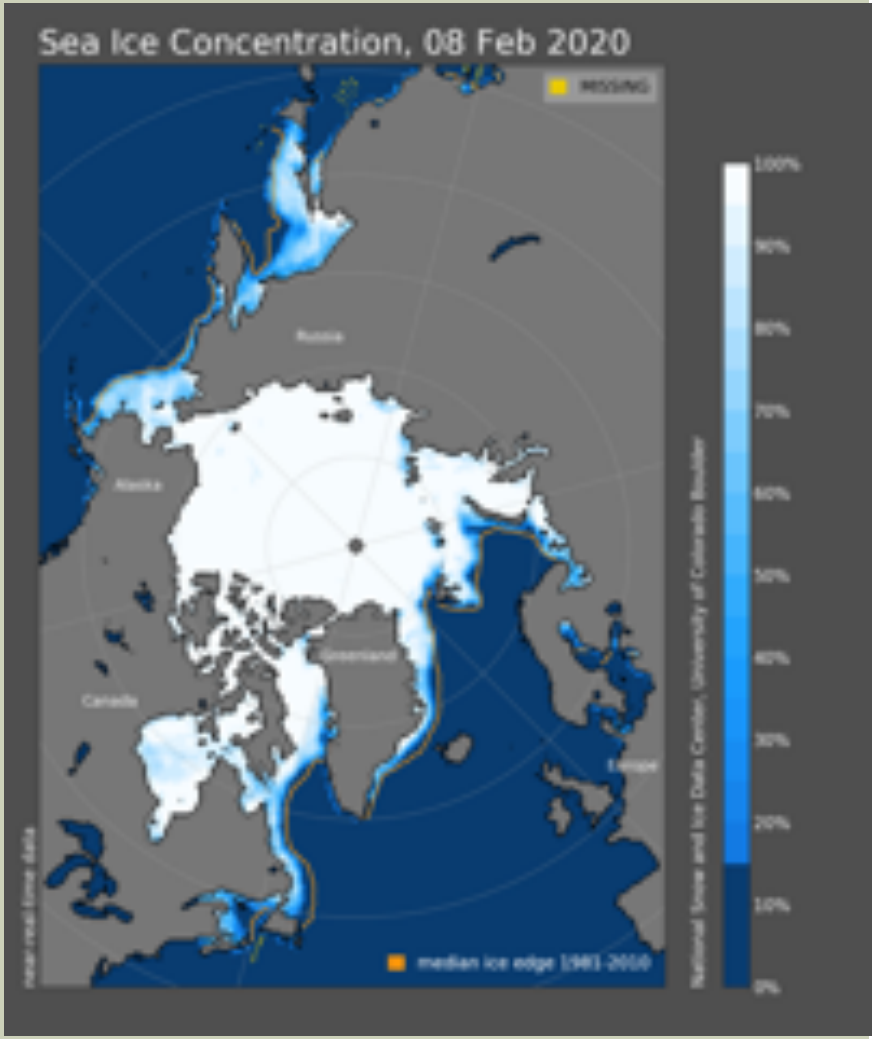


Time series of the average monthly snowfall per year for 5 climate regions.

Source: Alaska Climate Research Center

ARCTIC SEA ICE UPDATES





- Marked decrease in sea-ice extent in the Bering Sea during the last 2 years.
- Warmer water temperatures.
- Impacts on travel, hunting/fishing, and safety.

Plot Compiled by: Howard J. Diamond, PhD; Climate Science Program Manager at NOAA's Air Resources Laboratory Data Source: National Snow & Ice Data Center (NSIDC; https://nsidc.org/.

http://akclimate.org/

THAWING PERMAFROST

- Newtok losing battle to keep infrastructure from sinking into melting permafrost/eroding coast.
- Started move to Mertarvik in October 2019 with a goal of relocating everyone by 2023.
- Out of 31 Alaska Native villages identified as being threatened by flooding and erosion in 2009, 12 are considering partial or total relocation.

Newtok after 2005 Flood © 2005 Stanley Tom

ARCTIC PLANT PHOTOSYNTHETIC CAPACITY

Rogers, A., Serbin, S. P., Ely, K. S., Sloan, V. L., and Wullschleger, S. D. Terrestrial biosphere models underestimate photosynthetic capacity and CO2 assimilation in the arctic. New Phytologist 216, 1090-1103, doi:10.1111/nph.14740 (2017).

- Photosynthesis is poorly represented in Arctic terrestrial biosphere models.
- Arctic plants are often neglected.
- Measurements of the photosynthetic CO2 response and leaf nitrogen (N) in the dominant vascular type plants on the coastal tundra near Utqiagvik revealed a significant underestimation of the capacity for leaf-level CO2 assimilation in Arctic vegetation.

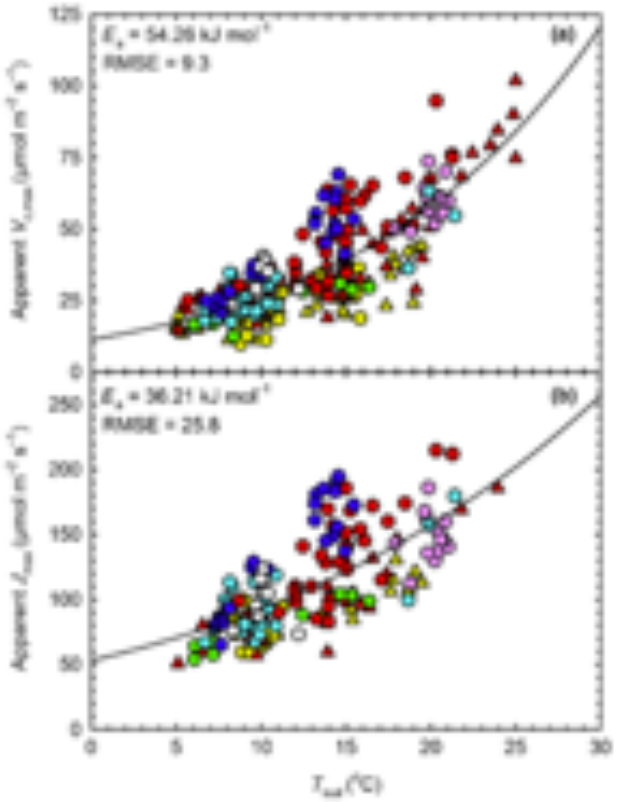
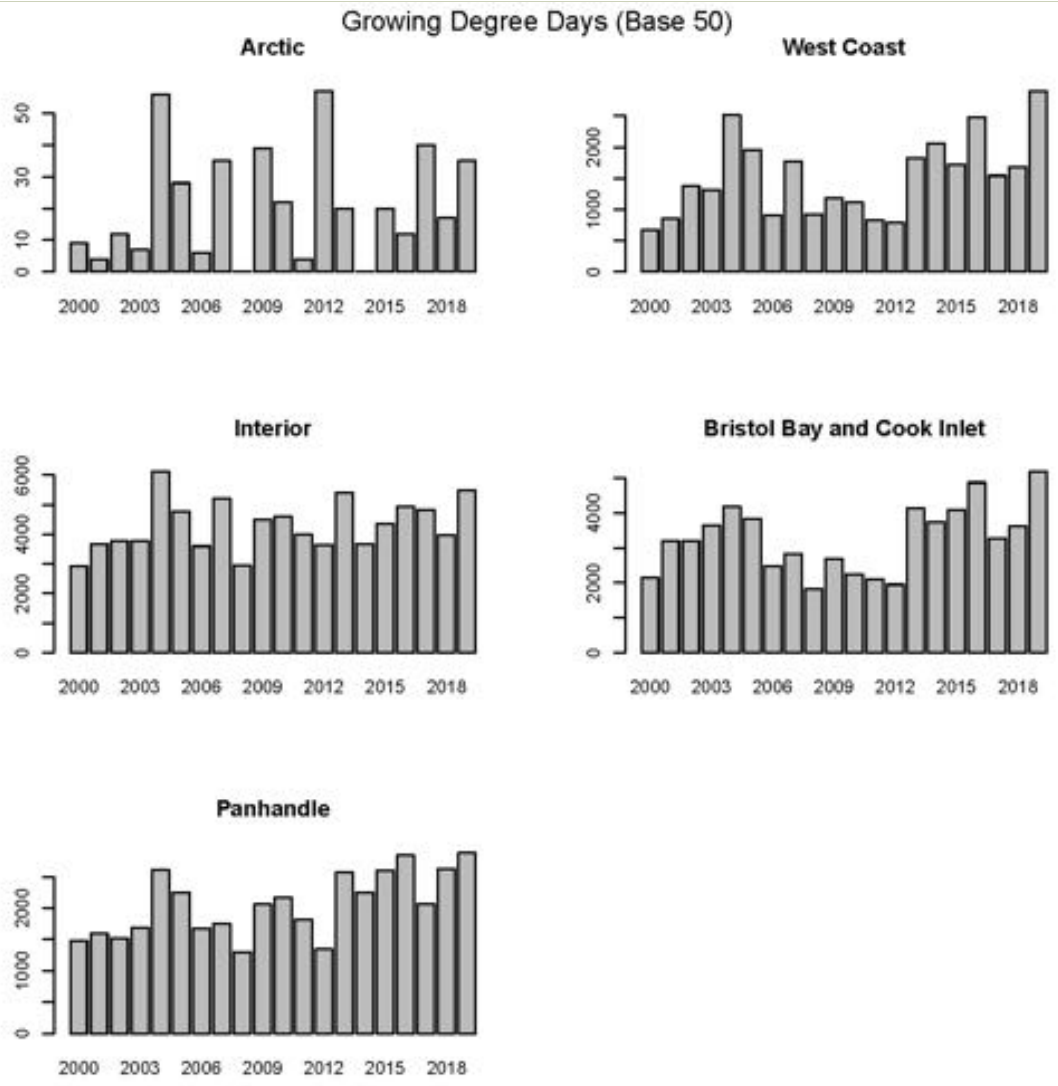


Fig. 1 Apparent maximum carboxylation rate ($V_{c,max}$, a) and apparent maximum electron transport rate (J_{max}, b) measured on individual ramets at ambient growth temperature (circles, seven species) and at multiple leaf temperatures on the same ramet (upward pointing triangles, two species) in Arctagrostis latifolia (pink), Dupontia fisheri (green), Arctophila fulva (blue), Carex aquatilis (cyan), Eriophorum angustifolium (yellow), Petasites frigidus (red) and Salix pulchra (white) growing on the Barrow Environmental Observatory, Barrow, Alaska. An Arrhenius temperature response (black line) was fitted to the data in order to calculate an activation energy (E_a) for both $V_{c,max}$ and J_{max}.

GROWING SEASON



- Summer heat accelerated Alaska peony harvest (Alaska Public Media)

CoCoRaHS

Community Collaborative Rain, Hail and Snow Network

CoCoRaHS is a grassroots volunteer network of backyard weather observers of all ages and backgrounds working together to measure and map precipitation (rain, hail and snow) in their local communities

- **by using low-cost measurement tools and an interactive web-site, stressing training and education**

- **the main aim is to provide high quality and high density precipitation data for education and research purposes**


Thank You!
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