

Climate Patterns and Change in the Vicinity of Toolik Lake

National Oceanic and
Atmospheric Administration

January 16, 2025

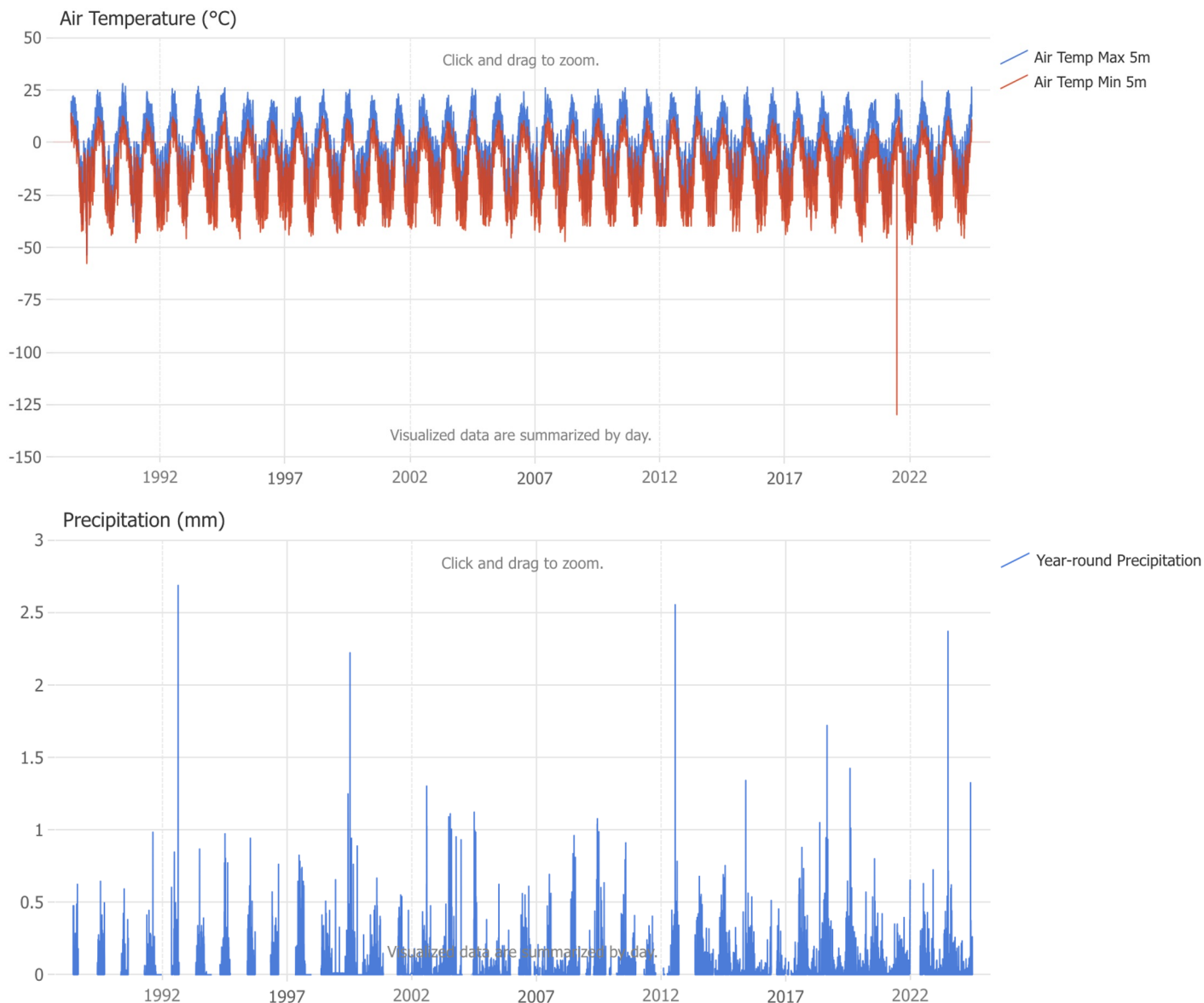
Jessica Cherry, Regional Climate Services Director
for Alaska, National Centers for Environmental
Information

Outline

- This is a VERY SHORT talk on a complicated story
- I'll work with the Alaska Center for Climate Assessment and Policy to schedule a longer version soon
- Two topics:
 - Climate trends and variability over the period of record for Toolik Lake research
 - Long-term climate trends and variability on Alaska's North Slope

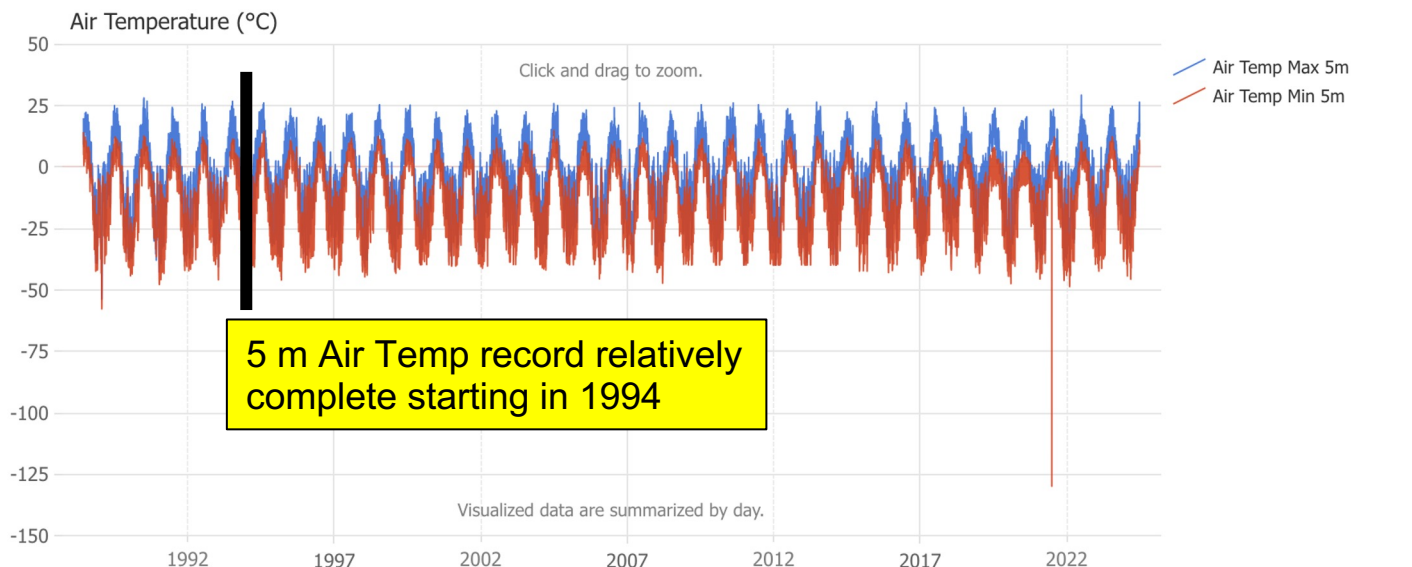


Photo credit: Amy Tidwell



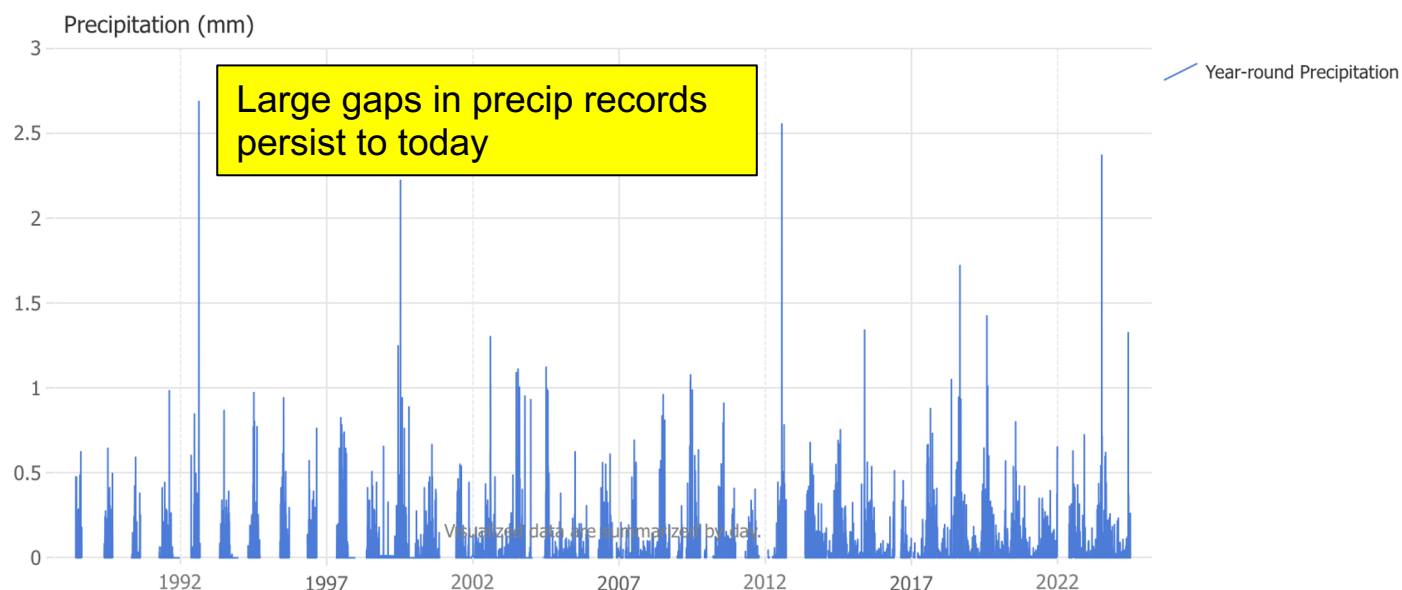
The Essential Challenges of Detecting Physical Climate Changes at Toolik Lake's Meteorological Station:

- Missing Data
- Short Record
- Signal-to-Noise

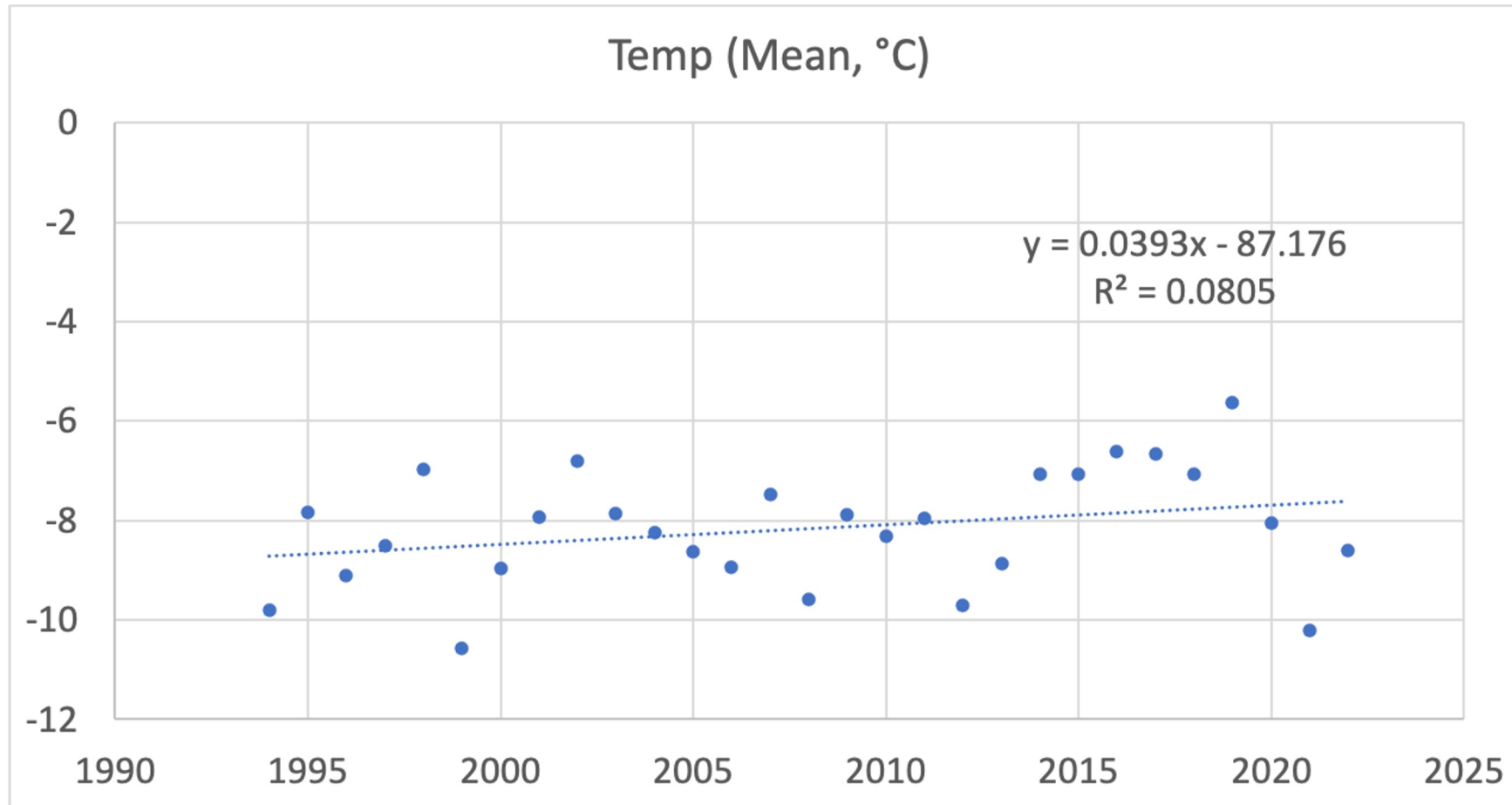


The Essential Challenges of Detecting Physical Climate Changes at Toolik Lake's Meteorological Station:

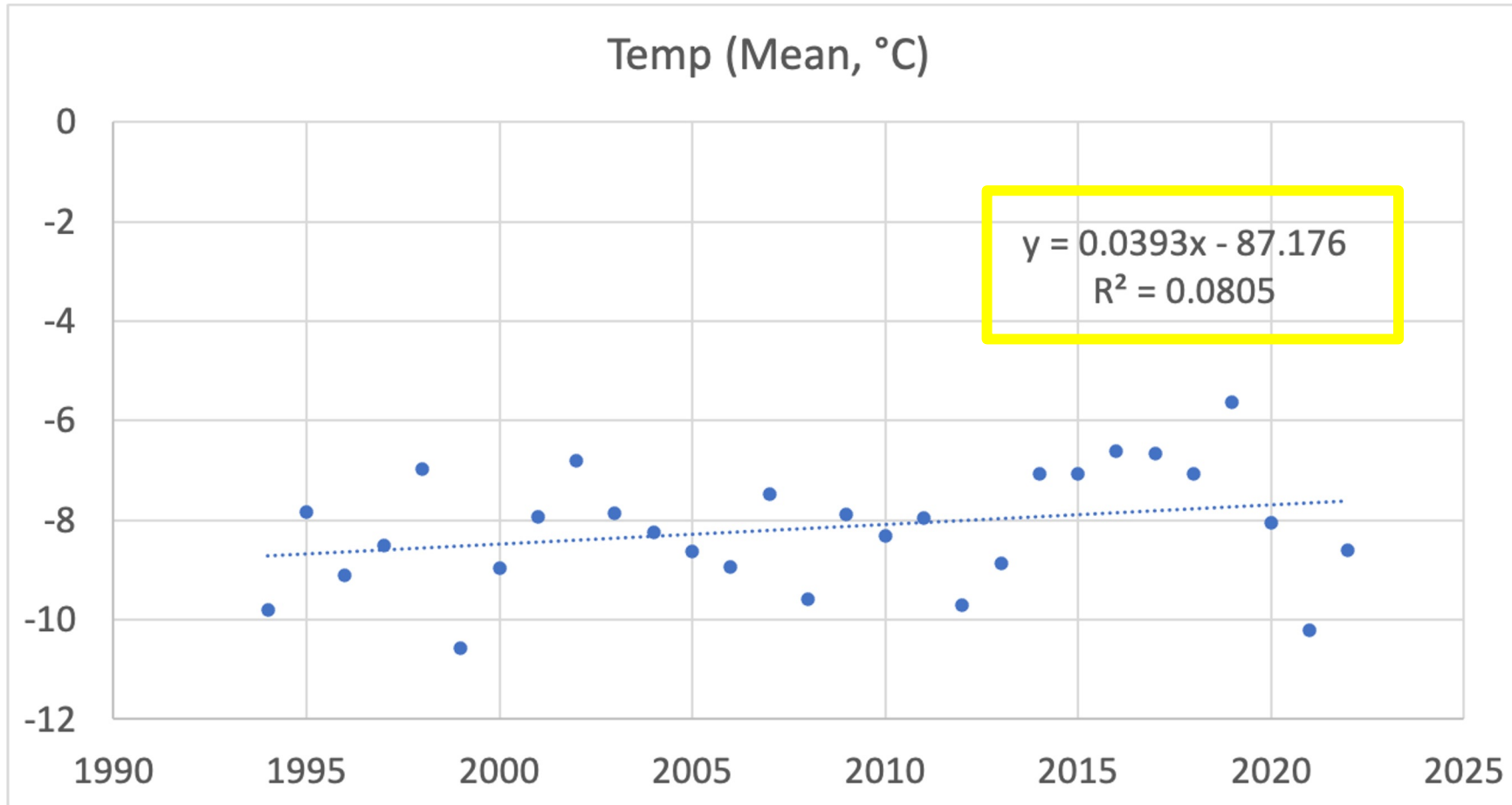
- Missing Data
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Toolik Met Station: Annual Mean Air Temp at 5 m

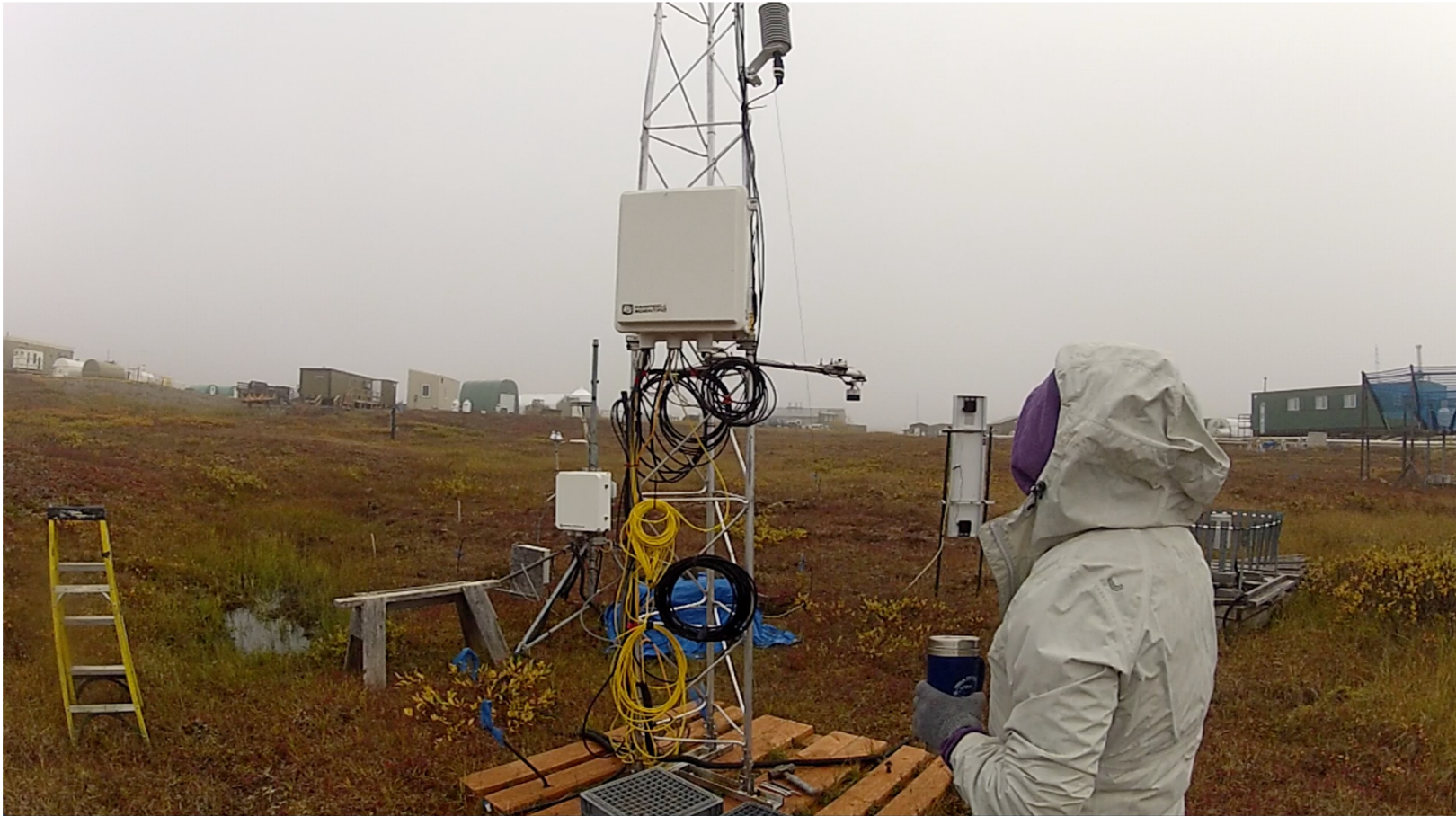


Toolik Met Station: Annual Mean Air Temp at 5 m

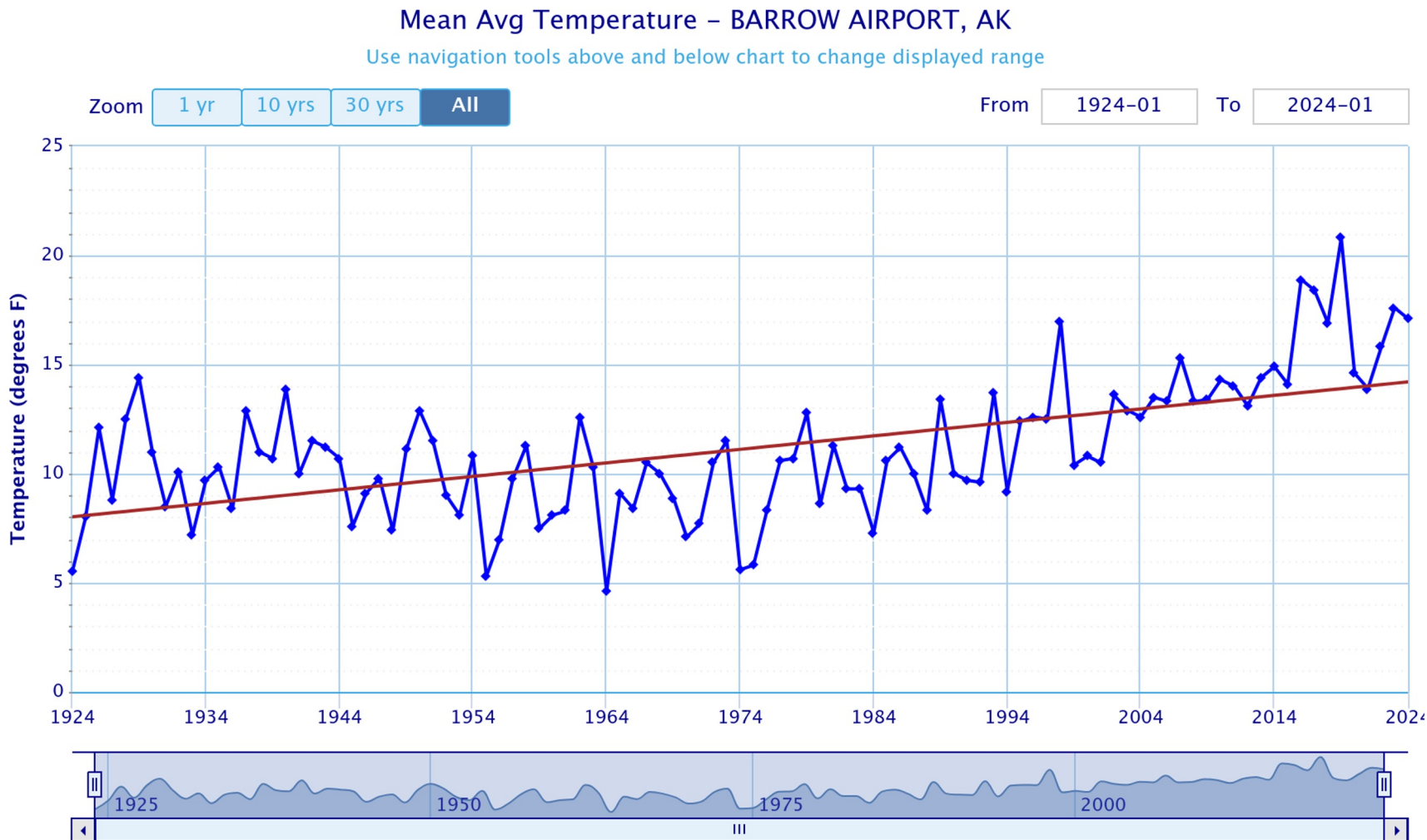


So what's going on?

We thought the Arctic is rapidly changing?



Meanwhile at Barrow/Utqiagvik Airport...

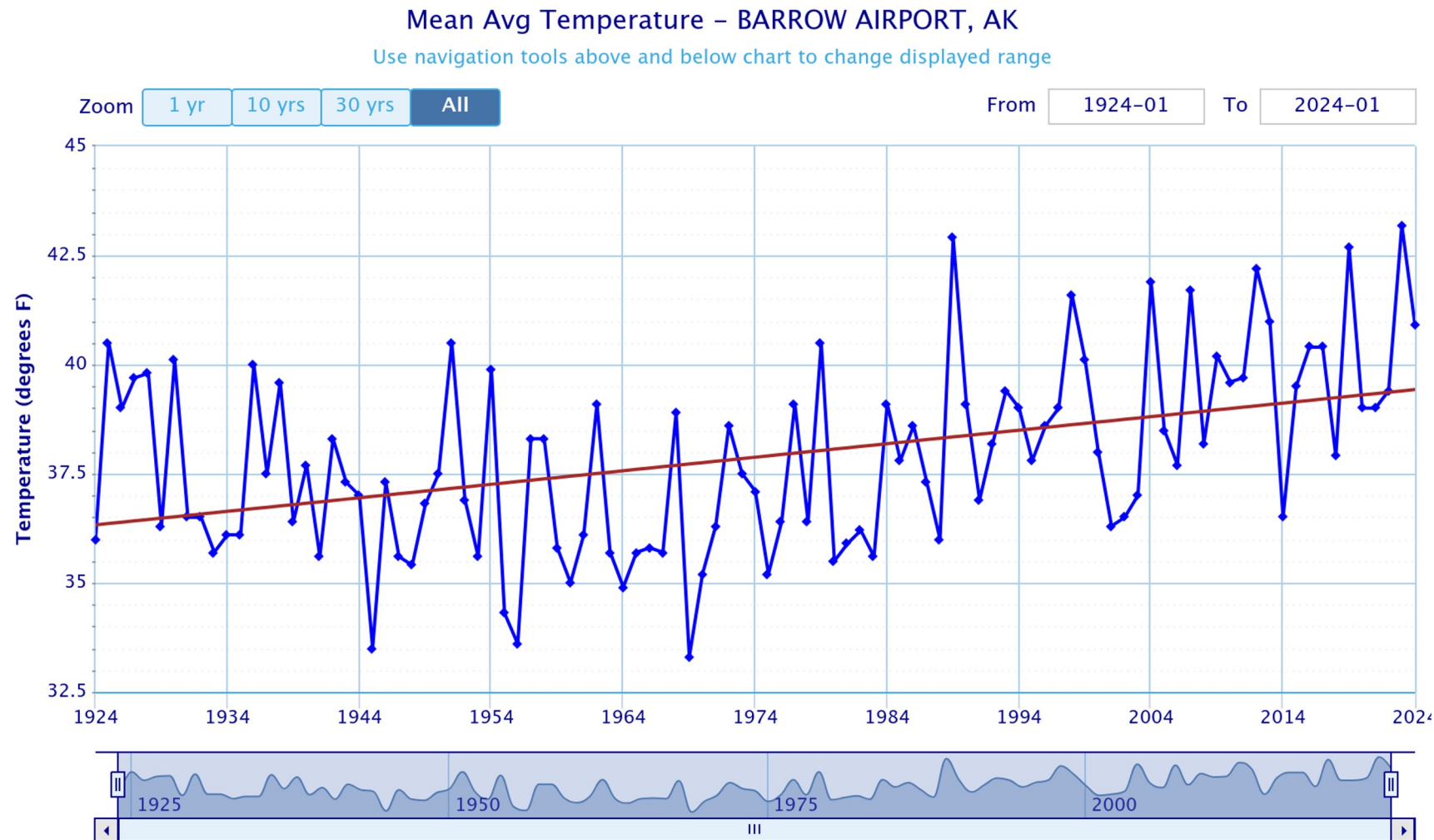


Annual Jan-Dec
Average Air
Temperature

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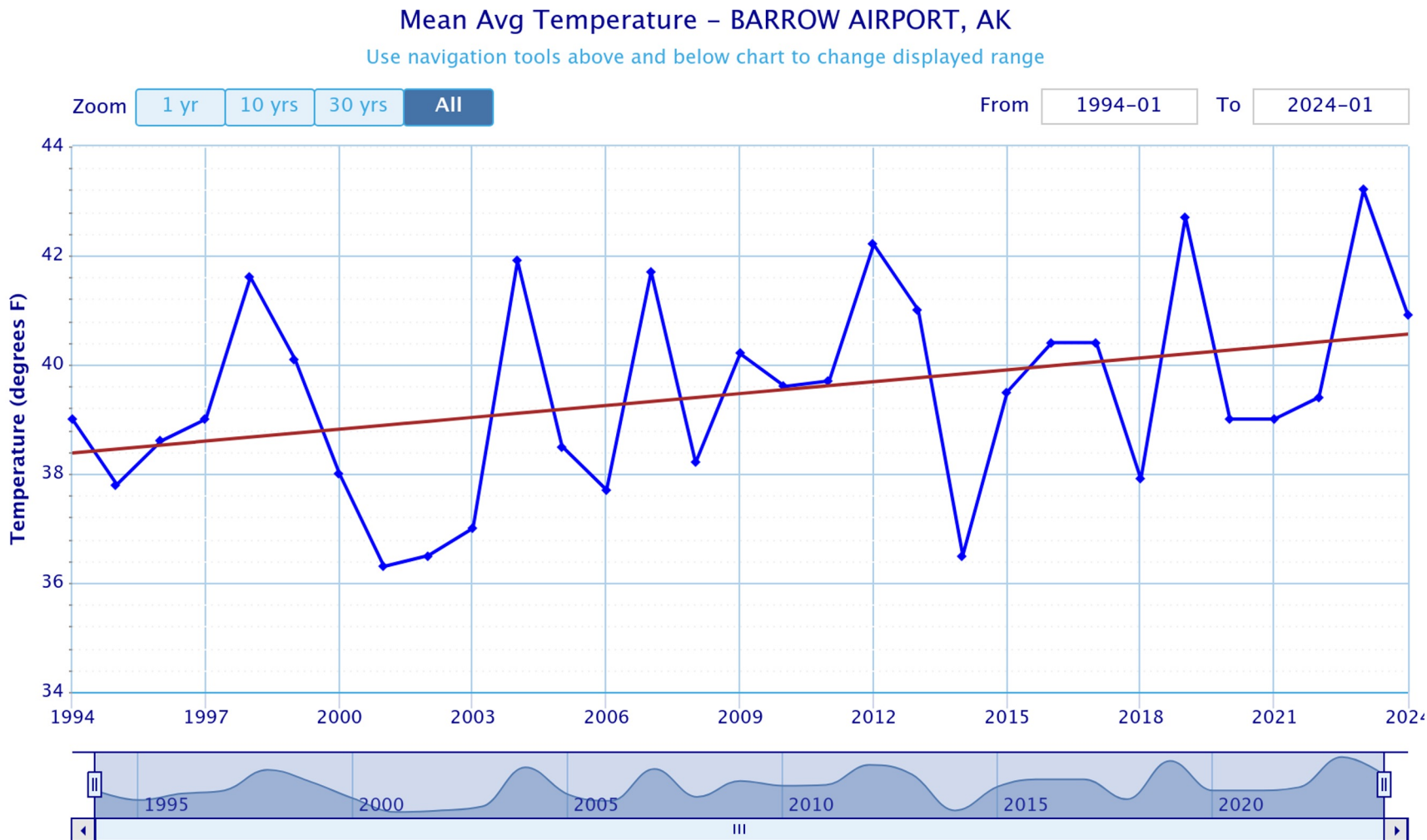
Meanwhile at Barrow/Utqiagvik Airport...



Summer Jun-Aug
Average Air
Temperature

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Meanwhile at Barrow/Utqiagvik Airport...

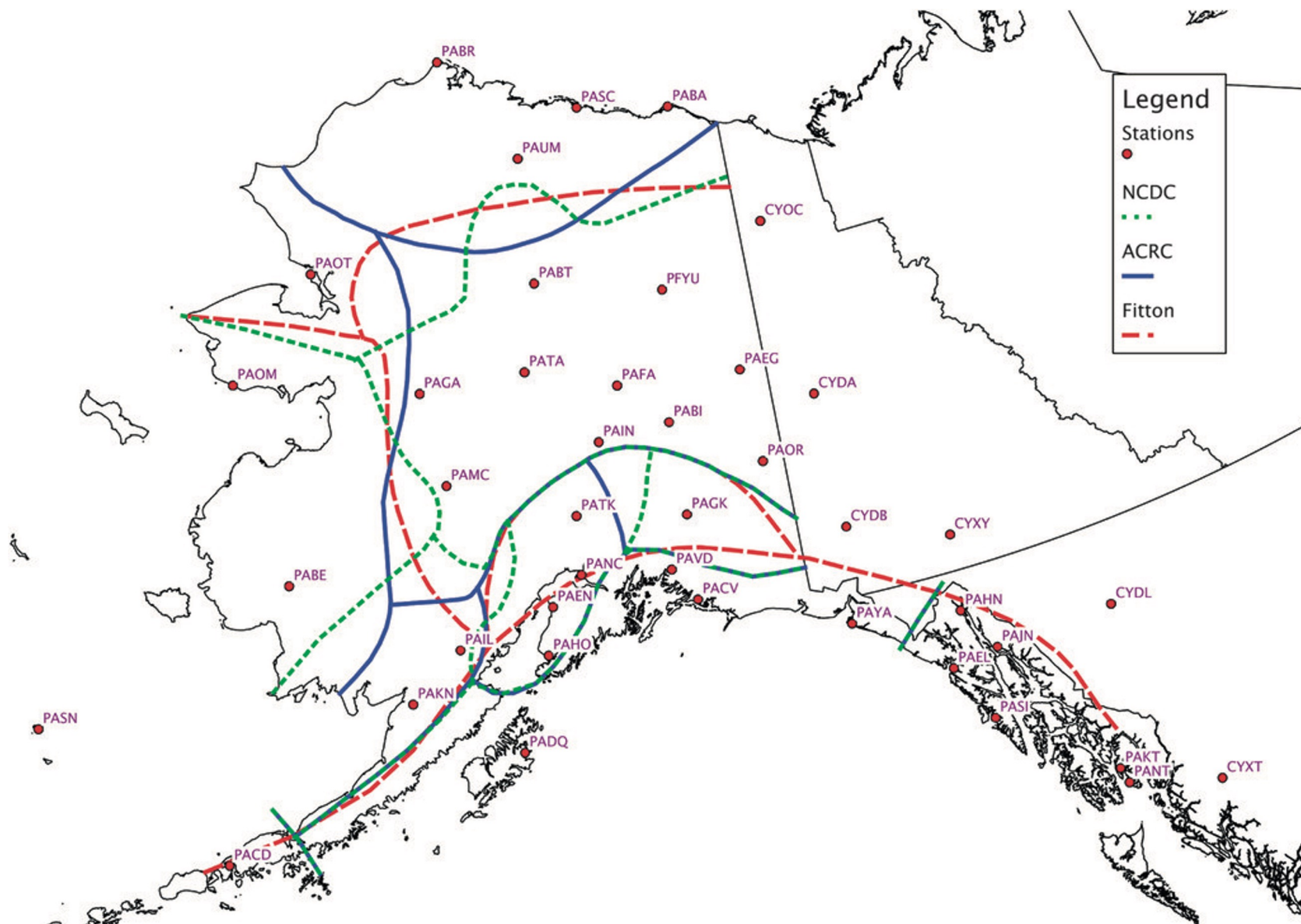


Summer Jun-Aug
Average Air
Temperature
Since 1994

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Spatial Data Products

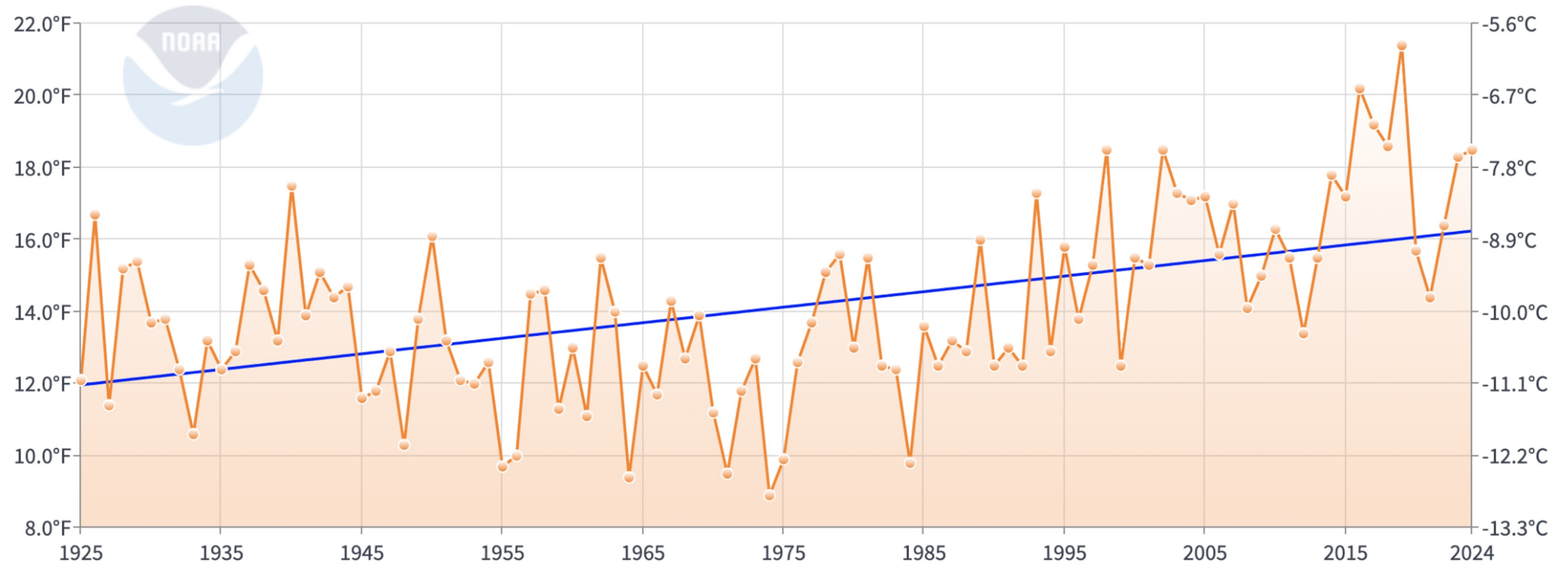
Looking at NCEI's Climate-at-a-Glance Product
and
ECMWF Reanalysis 5 (ERA5)



Bieniek et al.,
2012

Alaska, Climate Division 1 Average Temperature

January-December

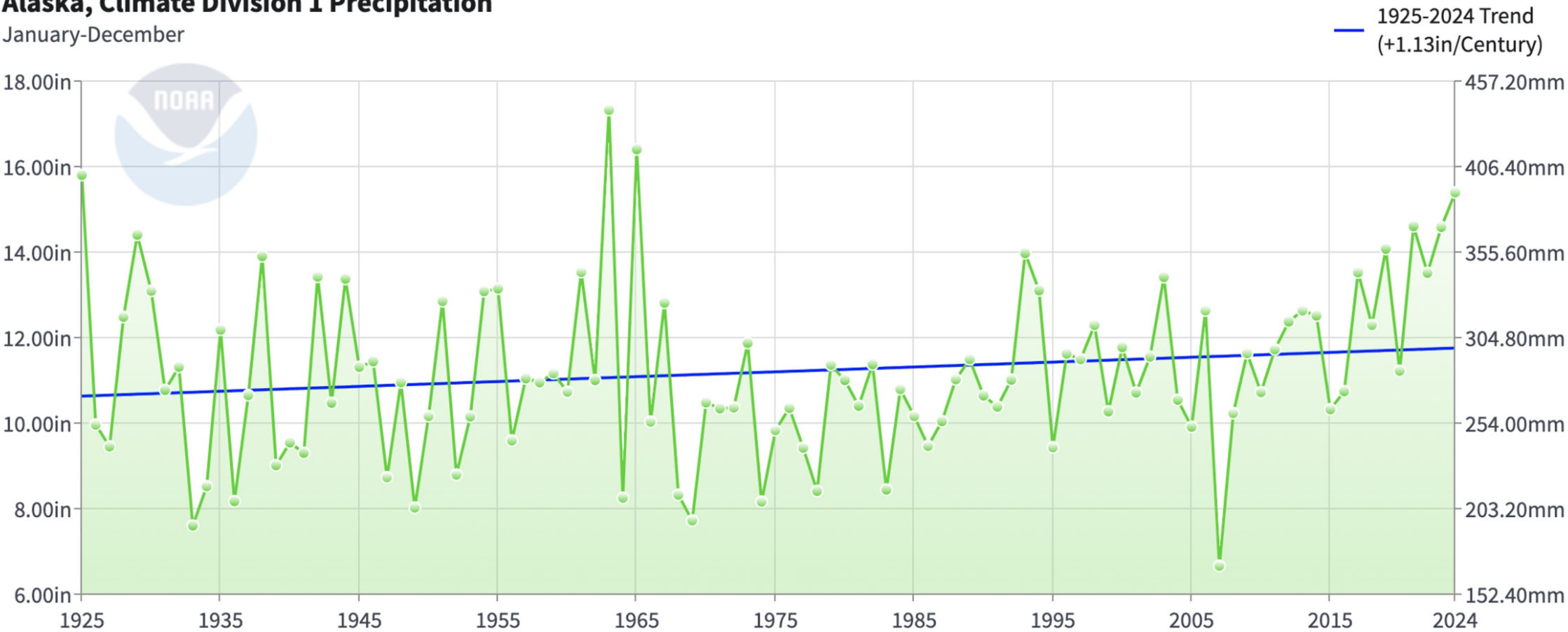


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NCEI's Climate-at-a-Glance

Alaska, Climate Division 1 Precipitation

January-December

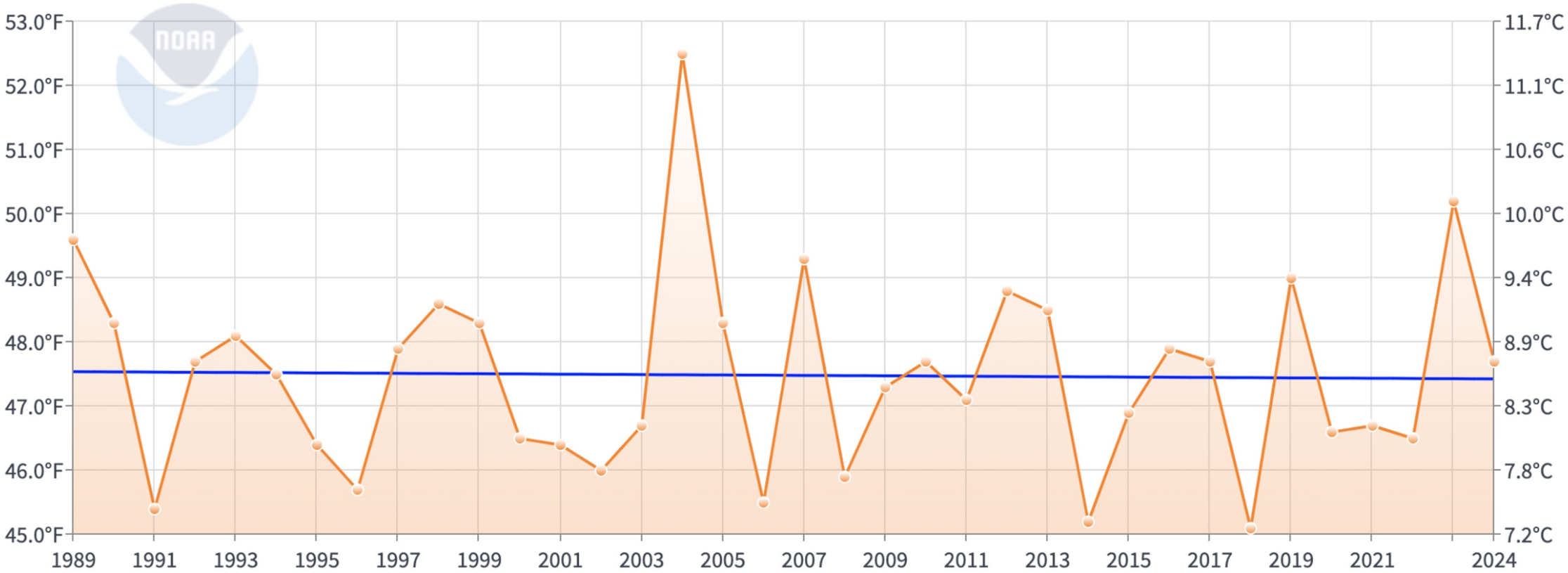


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Alaska, Climate Division 1 Average Temperature

June-August

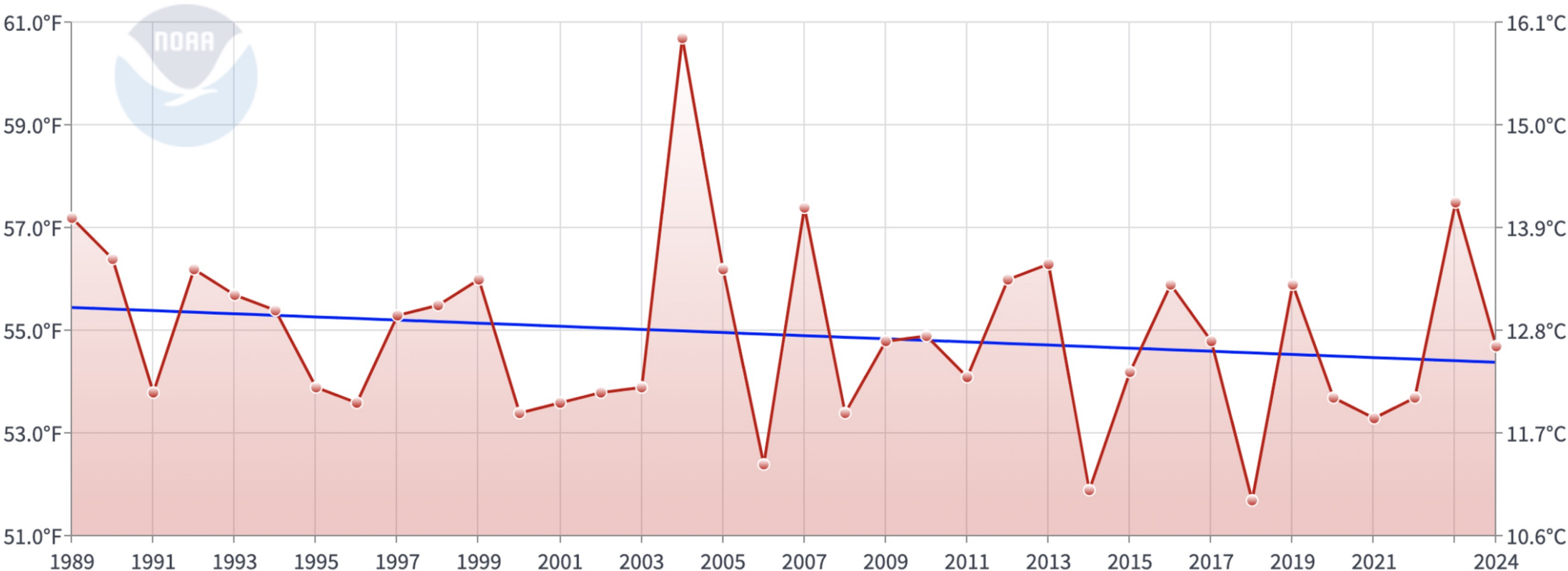


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Alaska, Climate Division 1 Maximum Temperature

June-August

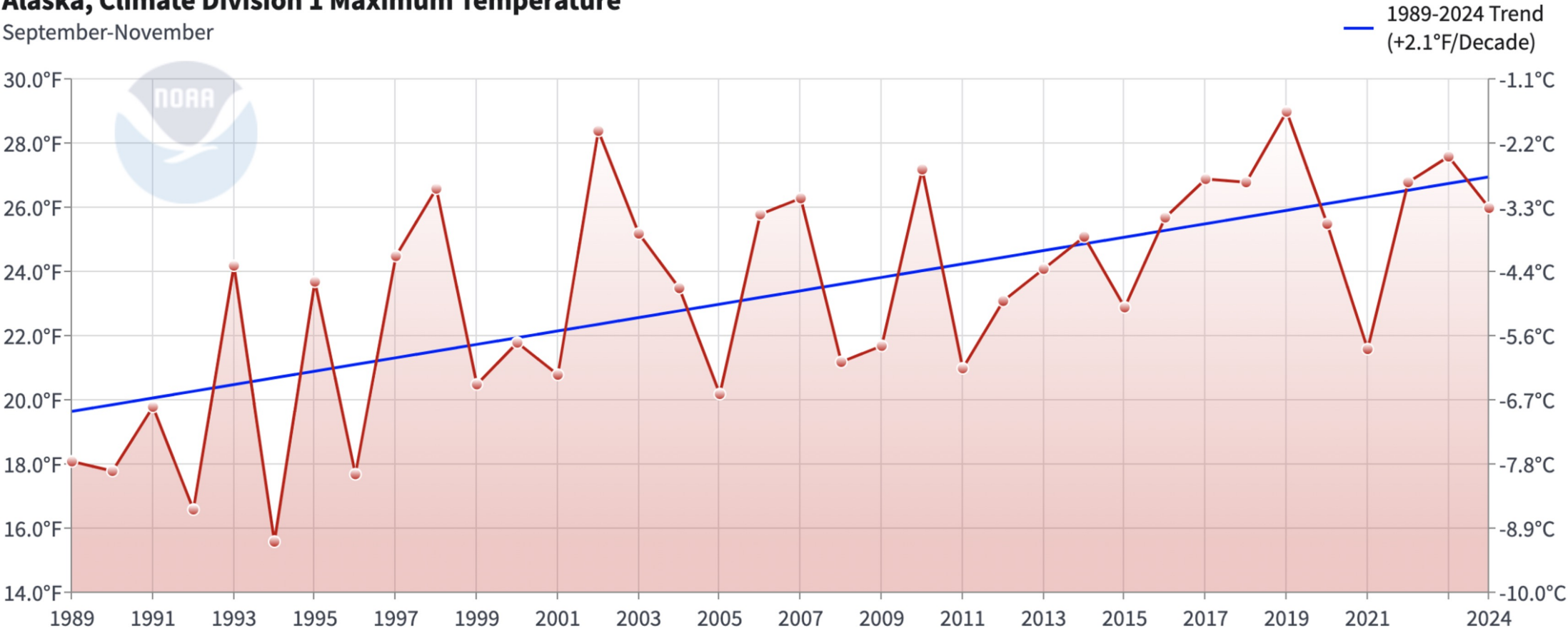


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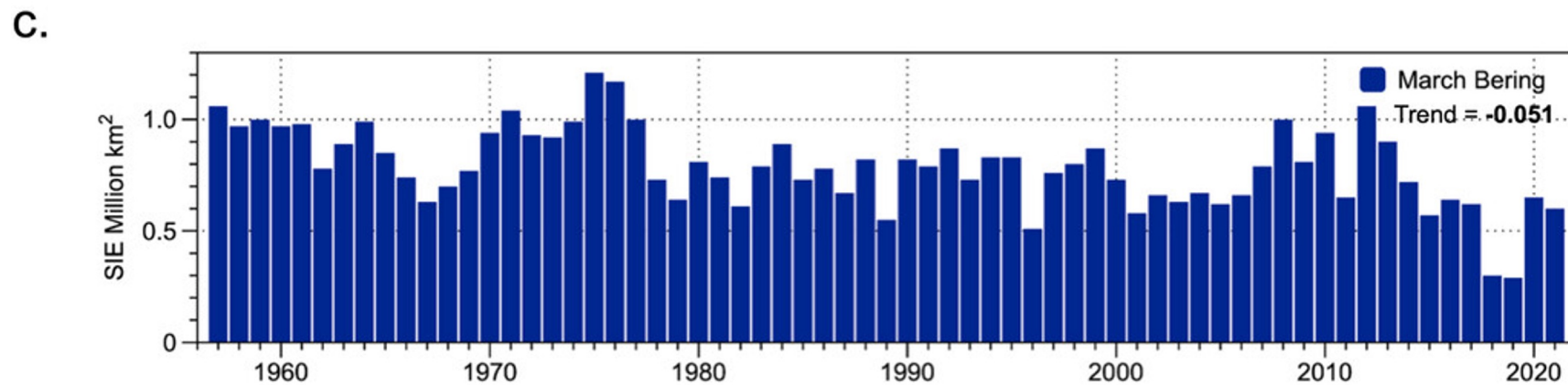
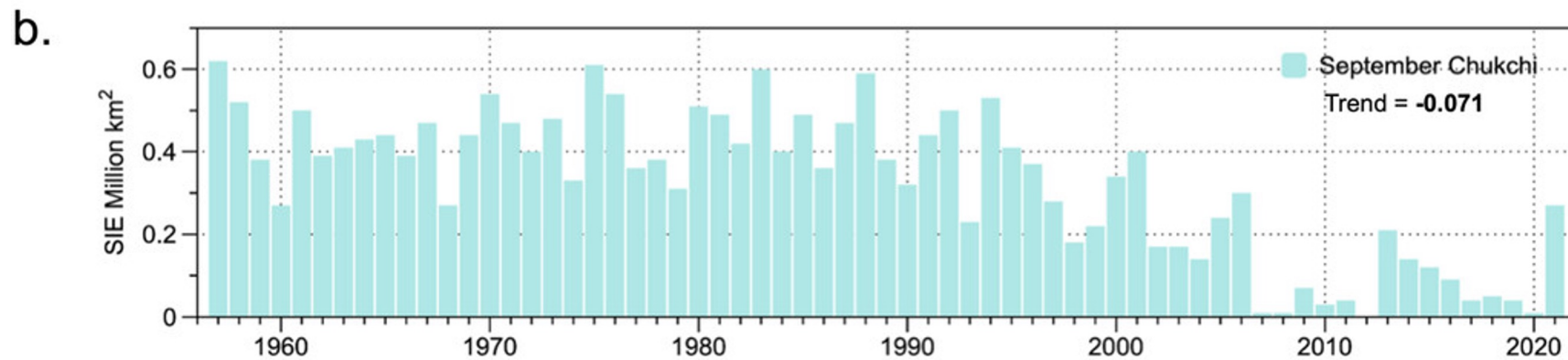
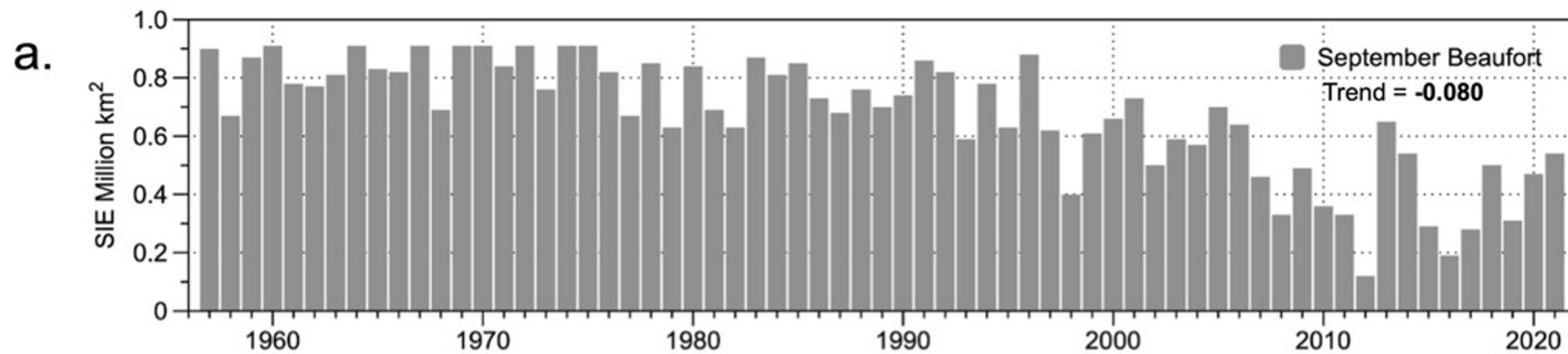
Alaska, Climate Division 1 Maximum Temperature

September-November



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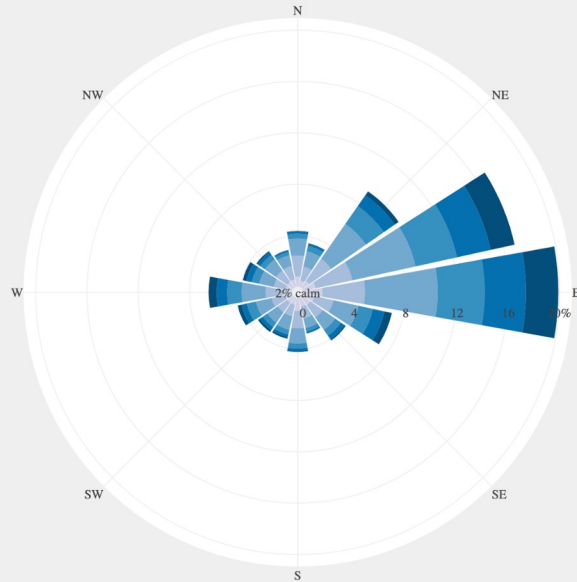


Ballinger et al., 2022

WIND ROSES

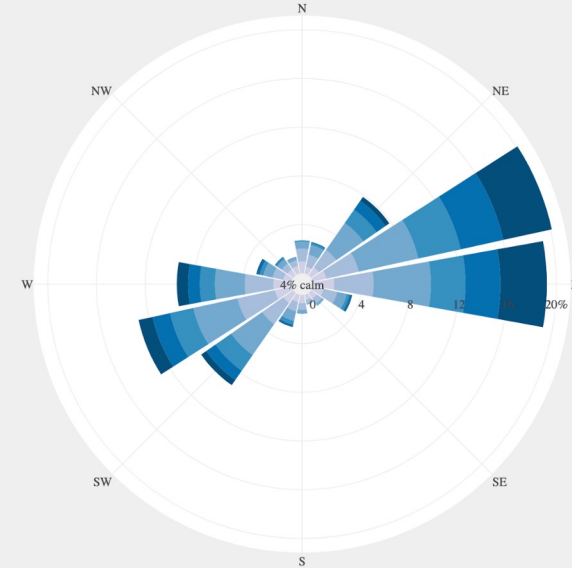
Wind Speed/Direction Distribution for Wiley Post-Will Rogers Memorial Airport, 1980-present

- 0-5.2 kts
- 5.2-8.7 kts
- 8.7-12.2 kts
- 12.2-15.7 kts
- 15.7-19.1 kts
- 19.1+ kts



Wind Speed/Direction Distribution for Deadhorse Airport, 1980-present

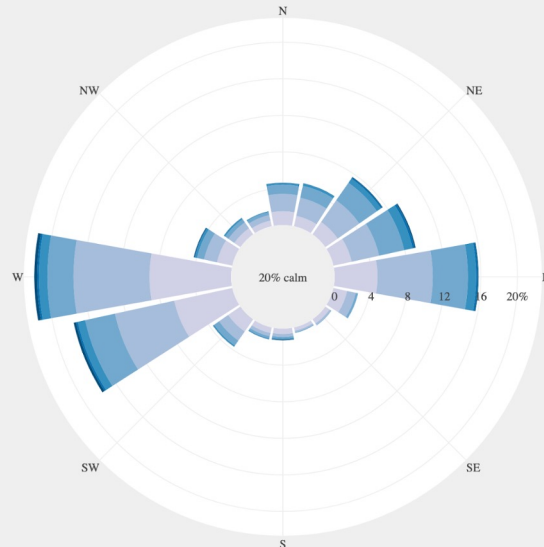
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Deadhorse

Wind Speed/Direction Distribution for Umiat Airport, 1980-present

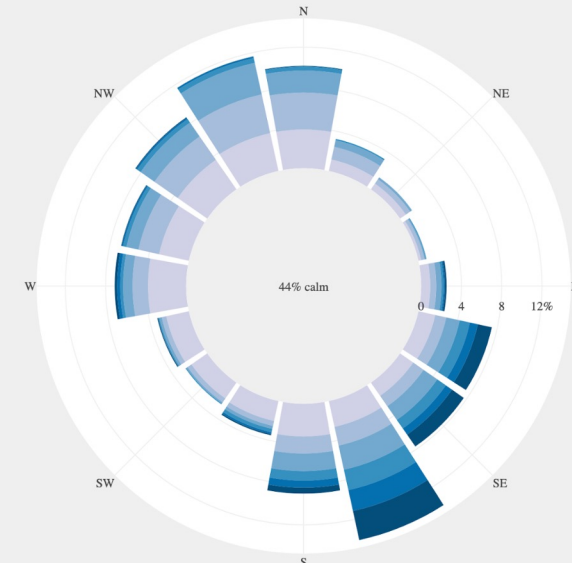
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Umiat

Wind Speed/Direction Distribution for Galbraith Lake Airport, 1980-present

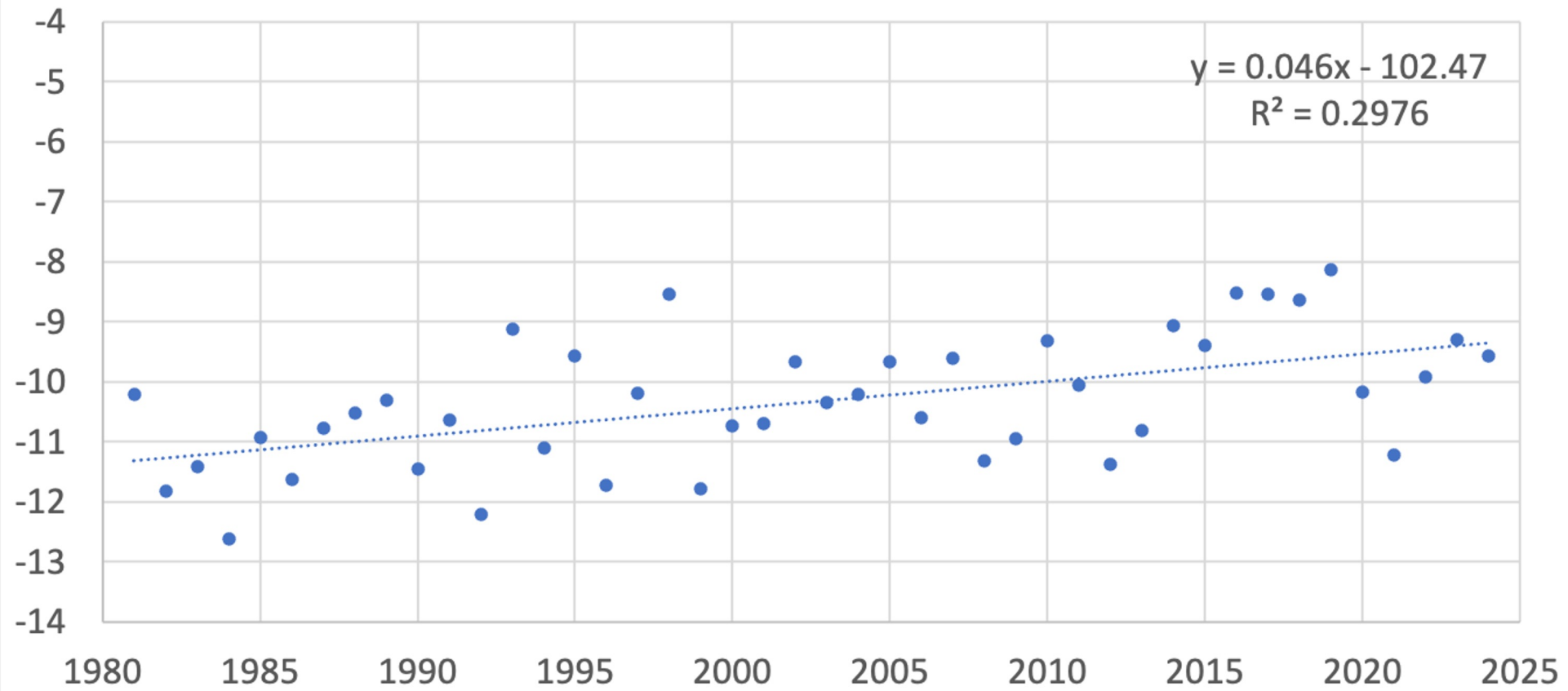
- 0-5.2 kts
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Galbraith

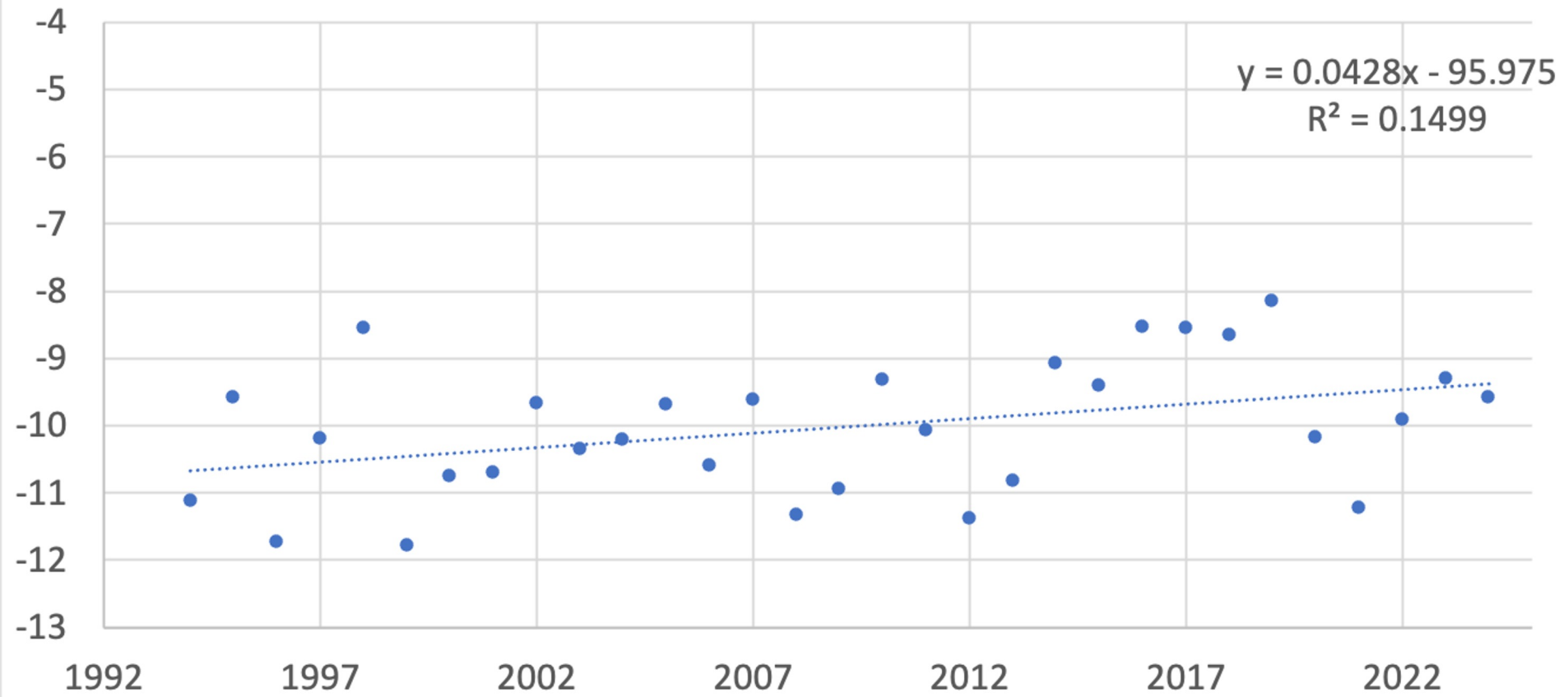
Scenarios
Network
for Alaska
Planning
(SNAP)

Average Annual Air Temp ERA5 extracted for Sag River Basin (1981-2024)



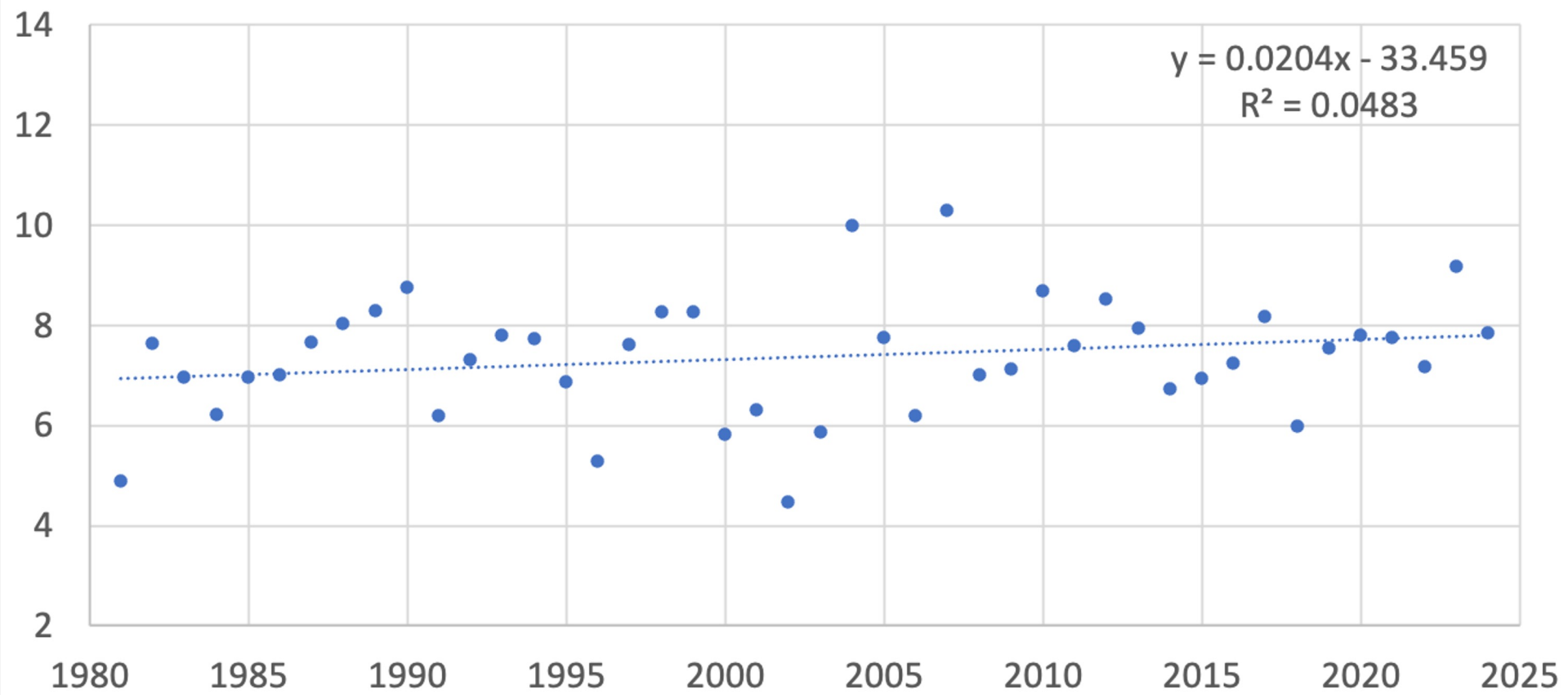
Data extracted by R. Busey

Average Annual Air Temp ERA5 extracted for Sag River Basin (1994-2024)



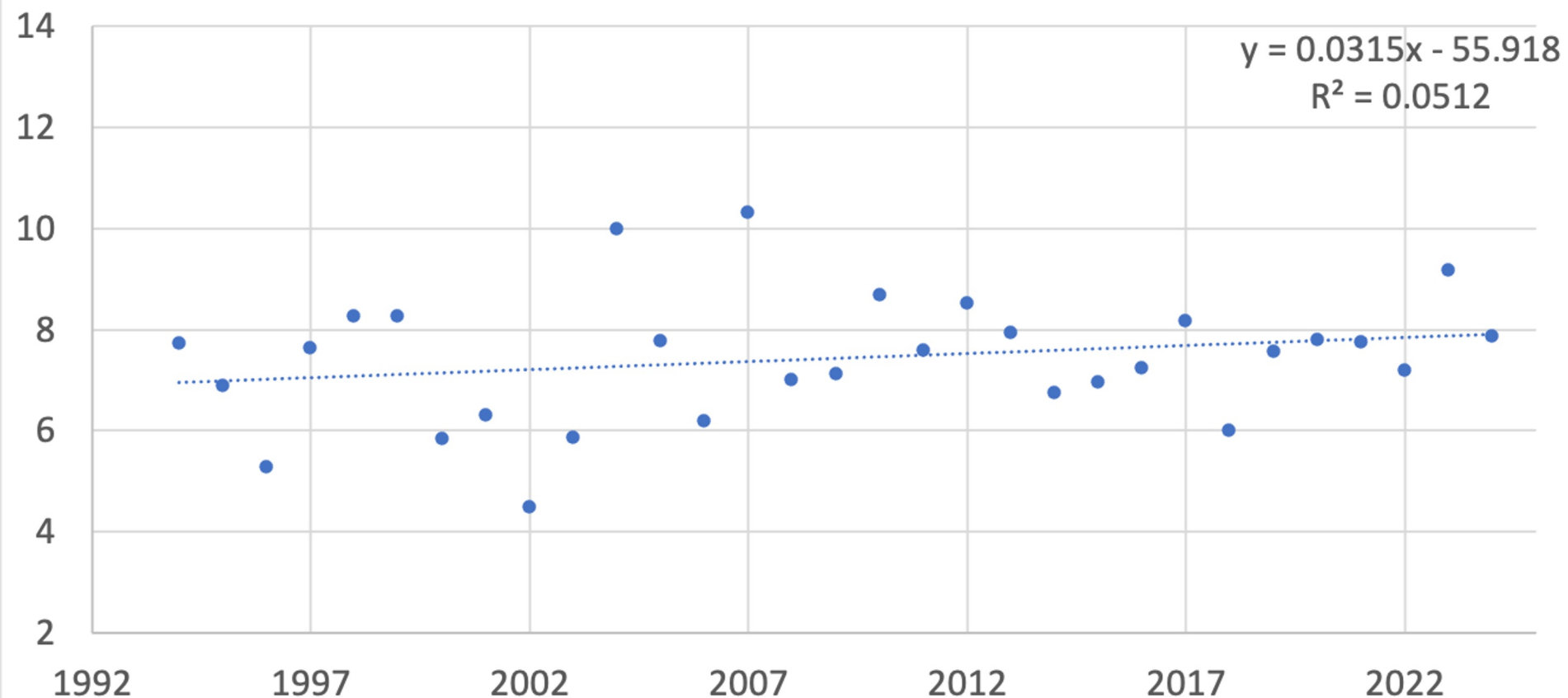
Data extracted by R. Busey

Average Summer (JJA) Air Temp ERA5 extracted for Sag River Basin (1981-2024)



Data extracted by R. Busey

Average Summer (JJA) Air Temp ERA5 extracted for Sag River Basin (1994-2024)



Data extracted by R. Busey

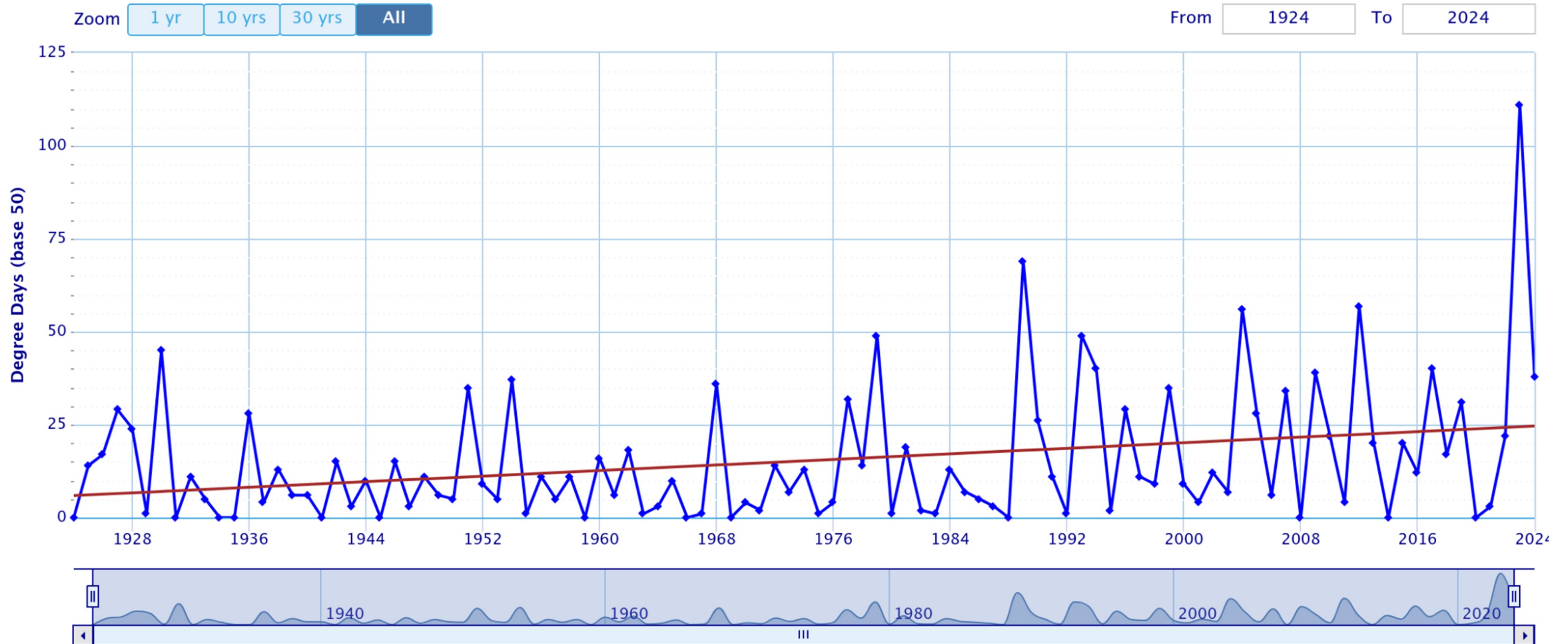
To Summarize:

- Data quality is/was a challenge for automated instrumentation
- Spatial data coverage for Arctic Alaska is very sparse and as the small number of stations have come and gone or moved, there are impacts on spatially distributed datasets
- Newer data from NOAA's Climate Reference Network and the National Ecological Observation Network installations over the past decade will help fill out the picture with time, changes to NRCS data adds some confusion at TLK
- There is a lot of interannual variability and there is also memory in the climate system on decadal+ time scales
- Evidence that Growing Degree Days (base 50) have increased in some years over the past century
- Memory of the warmer years in the tundra biome



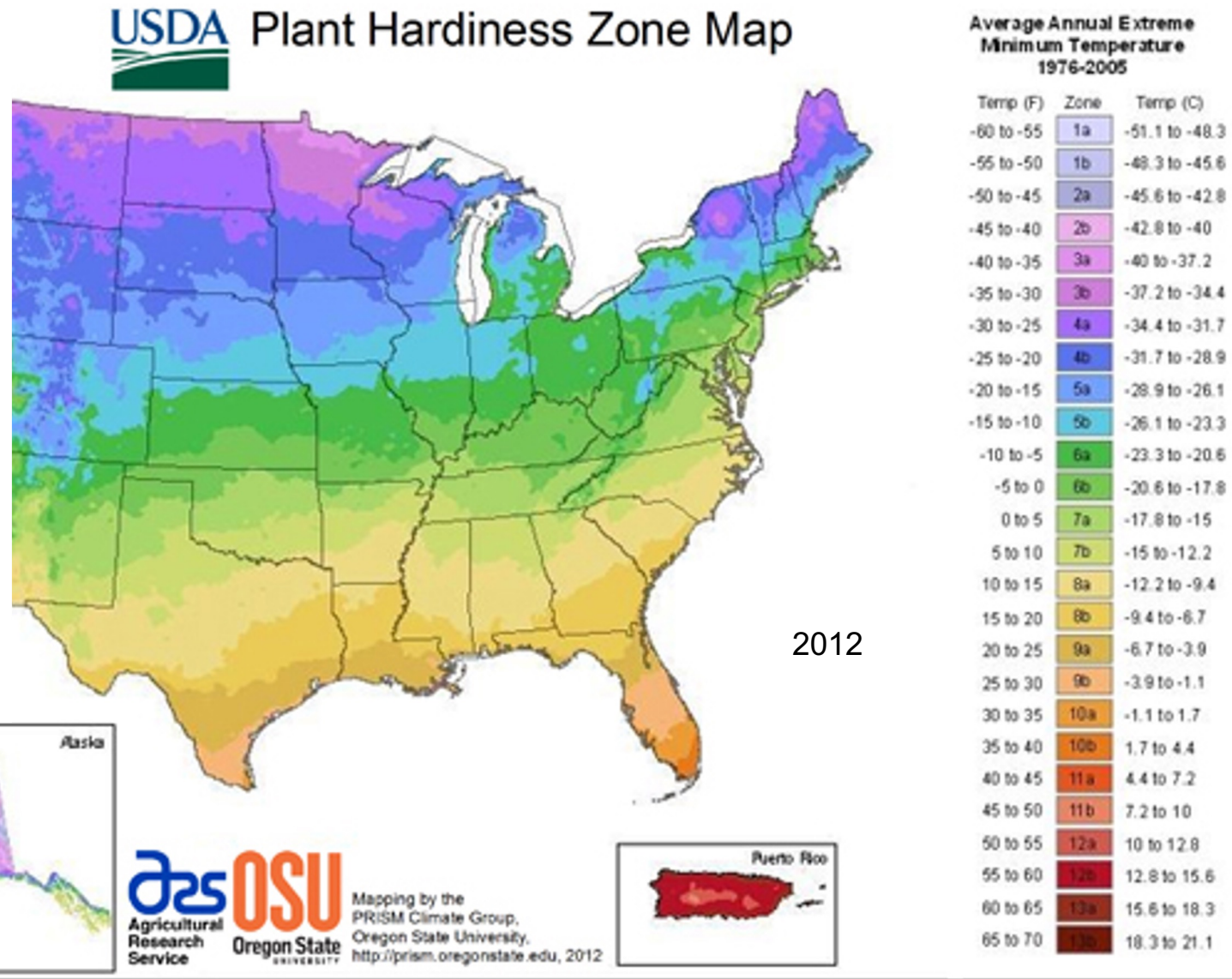
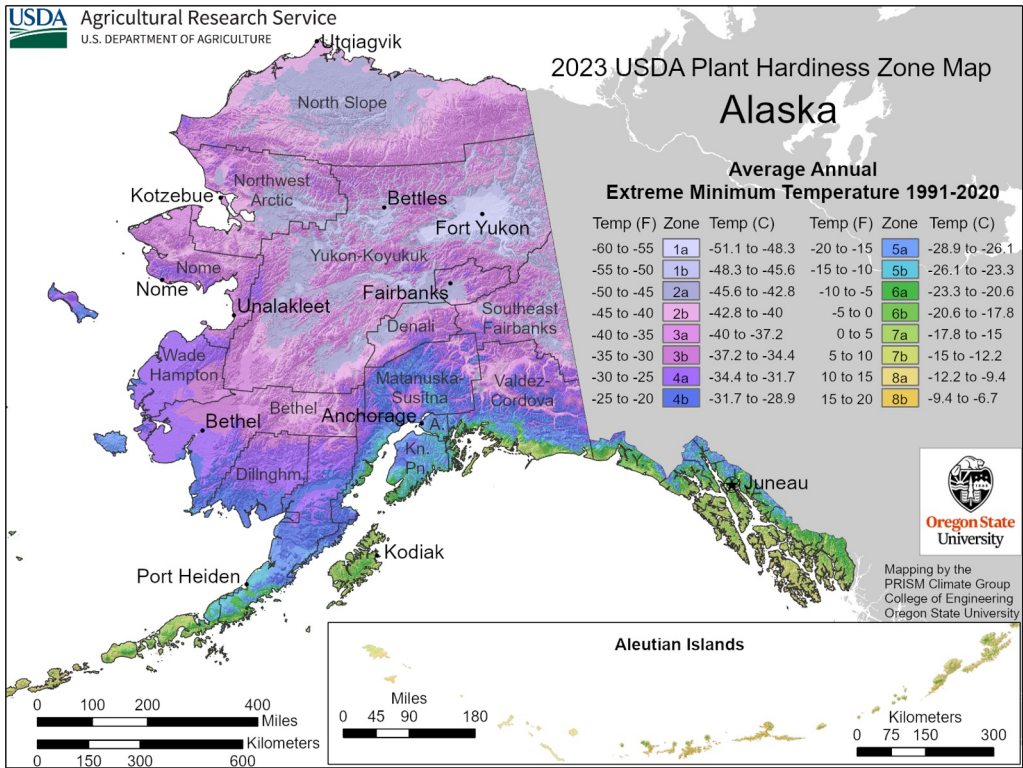
Total GDD – Jun through Aug – BARROW AIRPORT, AK

Use navigation tools above and below chart to change displayed range



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Questions?

Jessica.Cherry@noaa.gov

