

Background

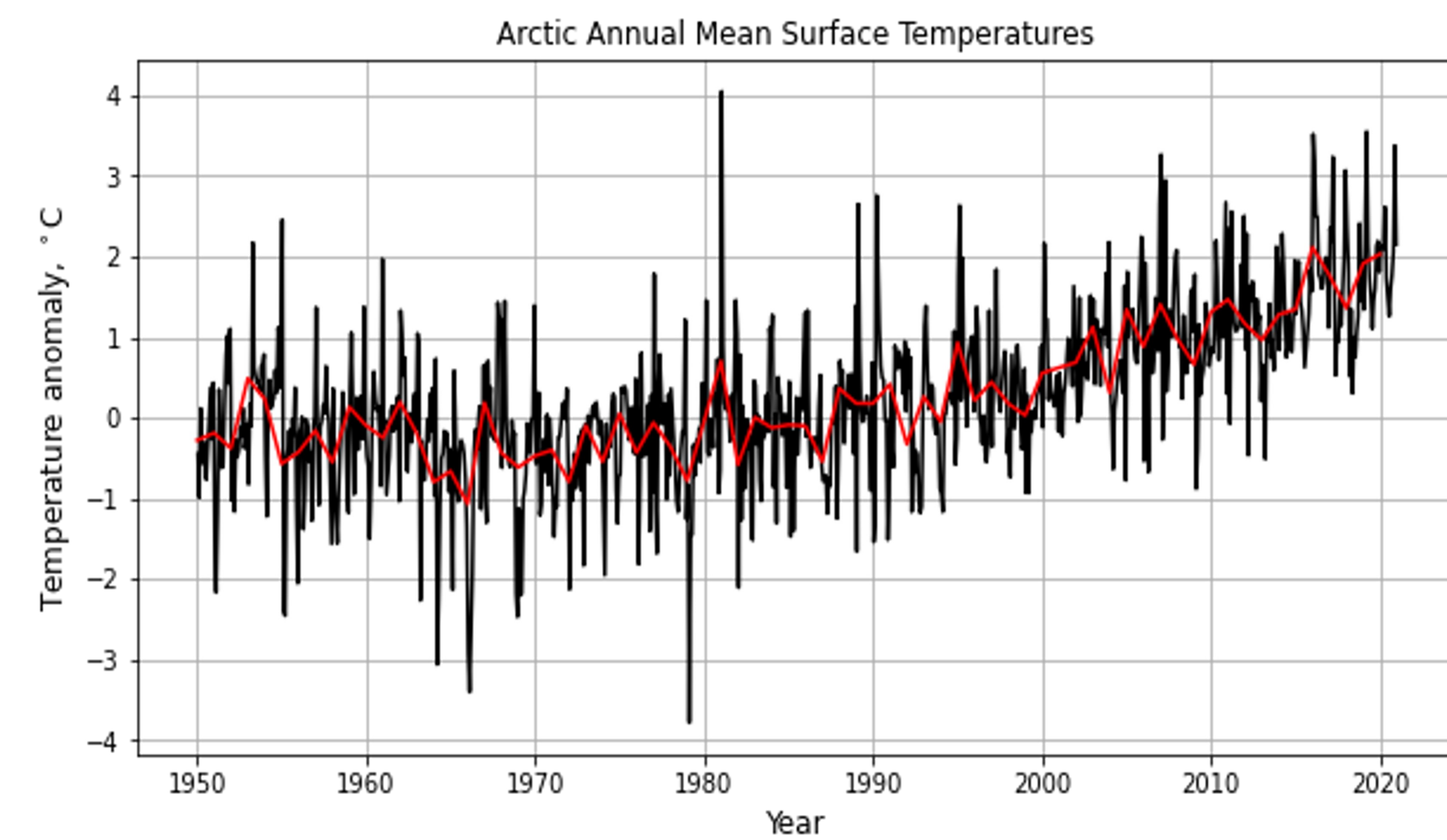


Figure 1:
NOAA surface
temperature anomalies.
Monthly mean anomalies
(**black**)
Annual mean anomalies
(**red**).

Methods

- From CESM1, gather simulations **of daily minimum and maximum temperatures** from **Alert, Nunavut** and **Utqiagvik, Alaska** from **1920-2100**.
 - Alert has ice that does not melt out in summer.
 - Utqiagvik has ice that melts out in summer and refreezes in the winter.
- Calculate a 90th percentile threshold of minimum and maximum temperatures (**CTN90pct**, **CTX90pct**) based on a 15-day window, where the window in center is the day in question.
 - A heat wave is defined as three or more consecutive days above this 90th percentile threshold.**
- Calculate yearly values of HWN, HWD, and HWF.
 - HWD** – the length (in days) of the longest yearly event
 - HWF** – the sum of participating heat wave days per year
 - HWN** – the yearly number of heat waves

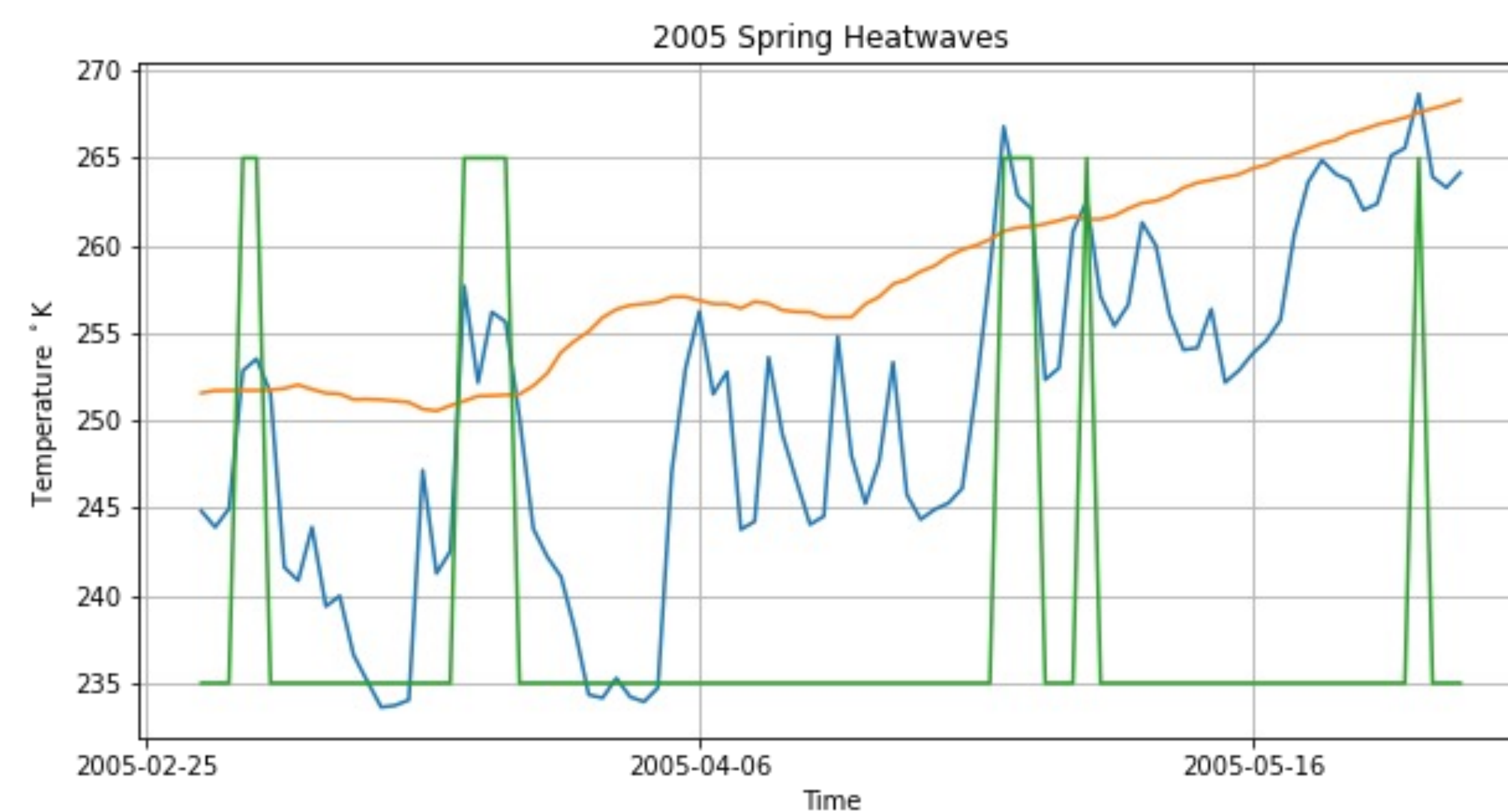


Figure 2:
Daily minimum
temperatures (**blue**)
with a 90th percentile
threshold (**orange**)
identifying heat waves
in Spring 2005. Days
above the threshold
(**green**) make up a
heat wave if three or
more occur
consecutively.

Locations

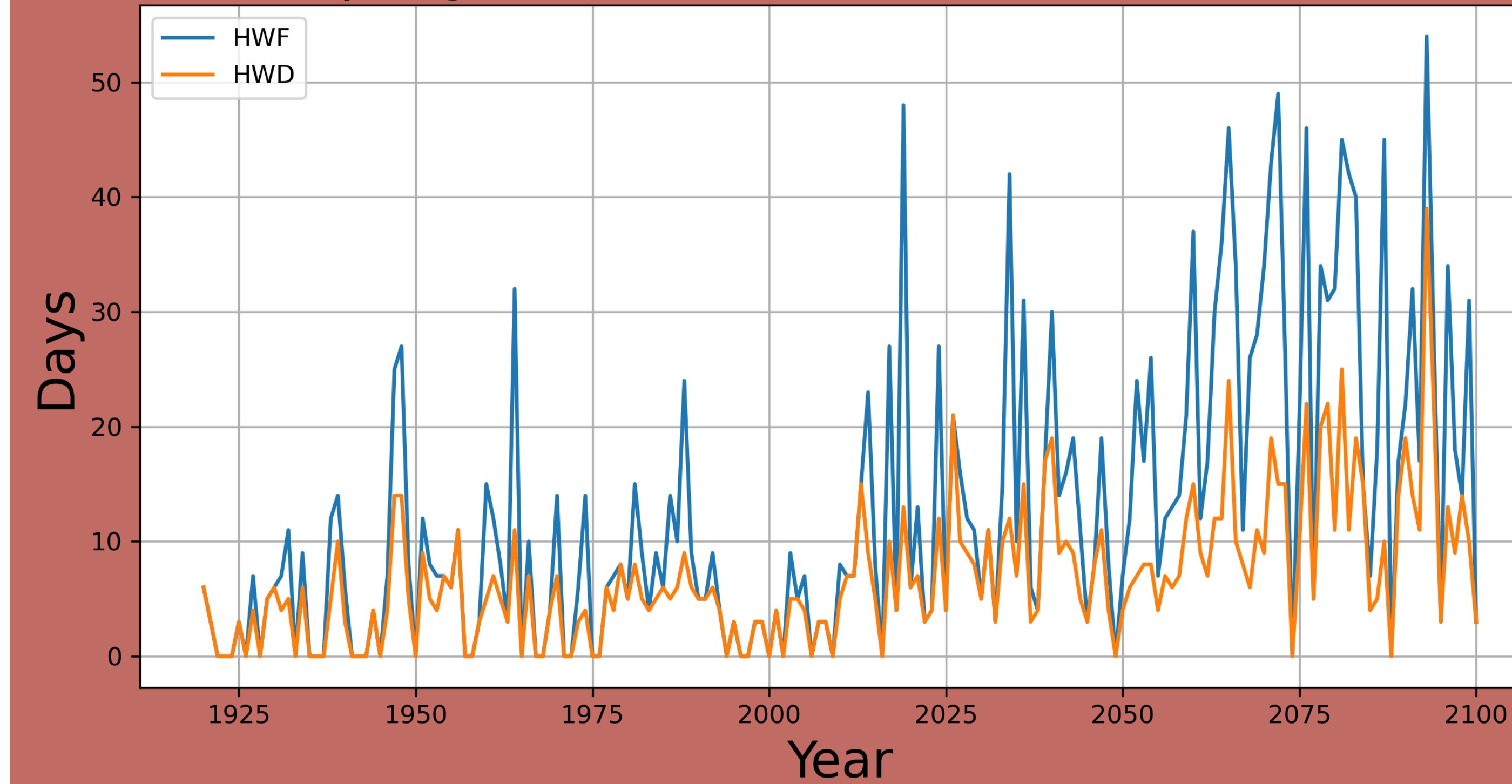


Alert, Nunavut
 ○ Lat: 82.4977° N
 ○ Long: -62.3559° W

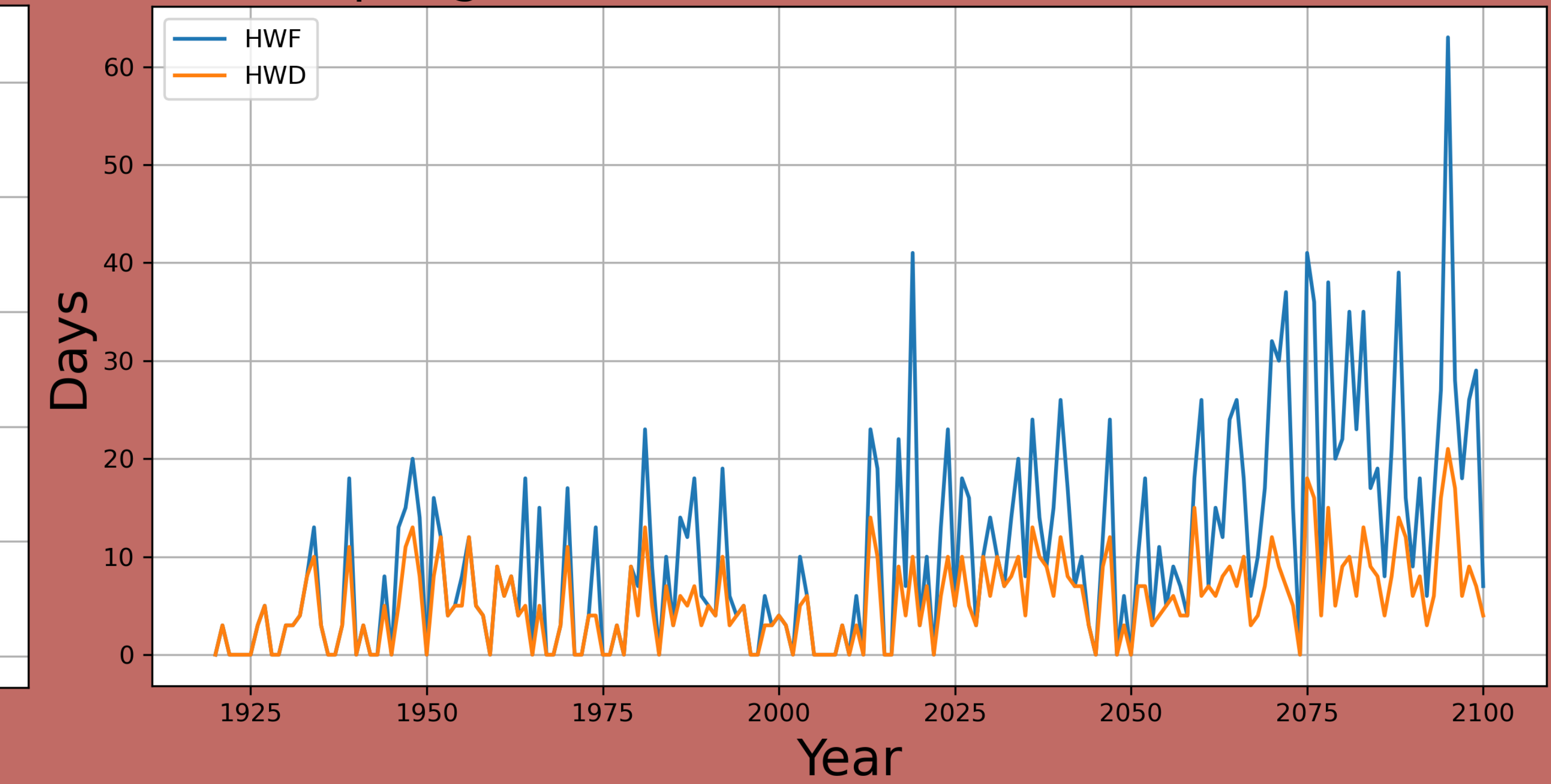
Utqiagvik, Alaska
 ○ Lat: 71.2888° N
 ○ Long: -156.7923° W

Arctic heat wave severity does not depend on sea ice regimes.

Spring Heatwaves in Alert, Nunavut (TMN)

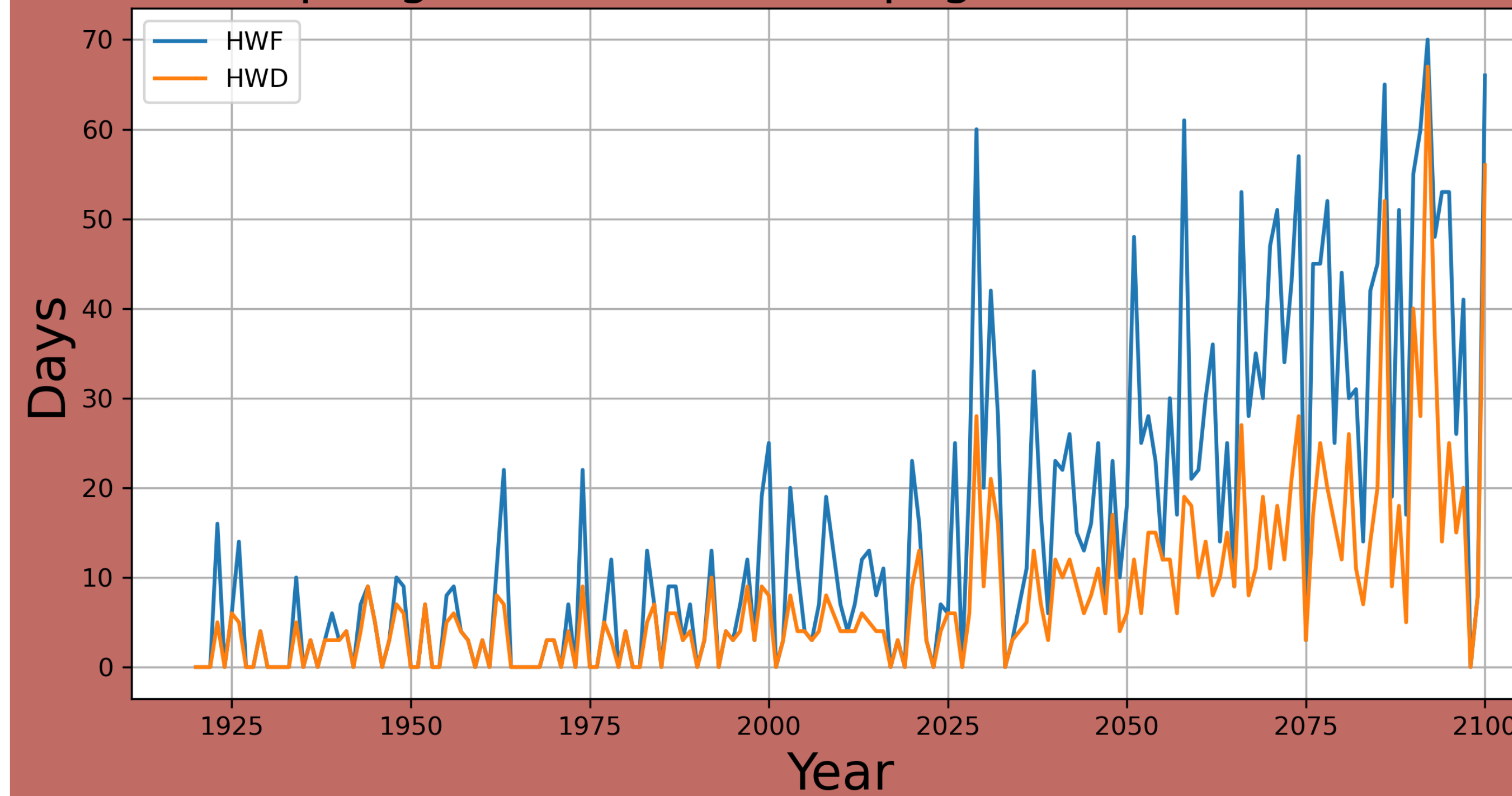


Spring Heatwaves in Alert, Nunavut (TMX)

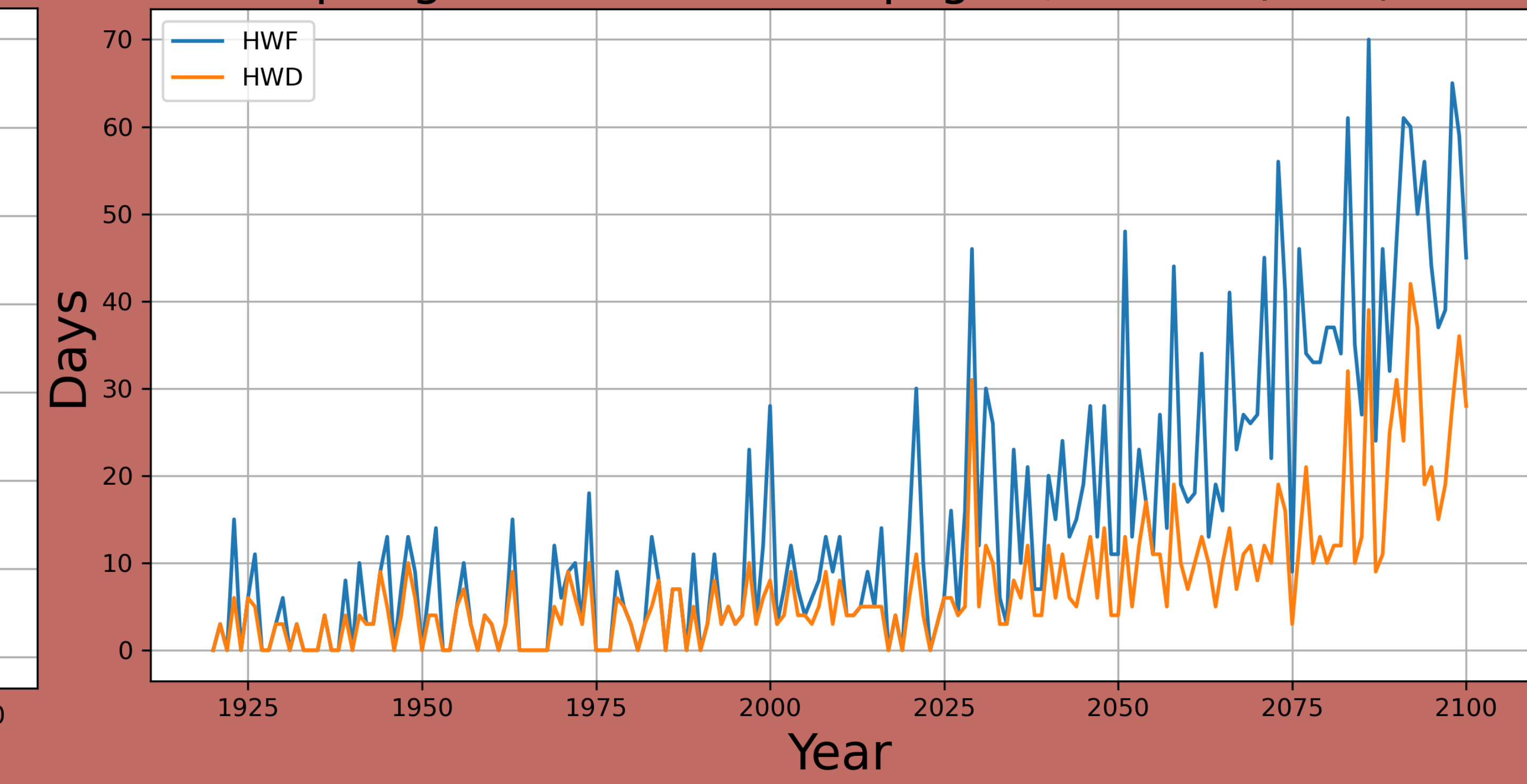


Figures 3/4:
Sum of participating
heat wave days per year
(**HWF**) and the length
(in days) of the longest
yearly event (**HWD**)
using spring daily
minimum (**TMN**) and
maximum (**TMX**)
temperatures in Alert,
Nunavut, respectively.

Spring Heatwaves in Utqiagvik, Alaska (TMN)



Spring Heatwaves in Utqiagvik, Alaska (TMX)



Figures 5/6:
Sum of participating
heat wave days per year
(**HWF**) and the length
(in days) of the longest
yearly event (**HWD**)
using spring daily
minimum (**TMN**) and
maximum (**TMX**)
temperatures in
Utqiagvik, Alaska,
respectively.

Key Points

- Regardless of location-specific thresholds, as the climate warms, heat waves increase.
- Maximum spring temperatures approach 0°C near the end of the 21st century, increasing the likelihood of a heat wave initiating sea ice melt.

Future Work

- Detect heat waves across the Arctic and quantify changing heat wave intensity.
- Use an absolute temperature threshold to calculate heat wave metrics (HWF, HWD, HWN): How does the frequency of these extreme events change?

References

- Perkins, S. E., and L. V. Alexander, On the Measurement of Heat Waves, *Journal of Climate*, 26 (13), 4500–4517.
- Stroeve, J. C., T. Markus, L. Boisvert, J. Miller, and A. Barrett, Changes in Arctic melt season and implications for sea ice loss, *Geophysical Research Letters*, 41 (4), 1216–1225.

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