Climate Change in Ontario – Practices to Mitigate Damage in Lavender

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Ontario

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Scorching Earth: Global warming to blame for all-time heat records being set worldwide, as experts warn stifling temperatures will continue to soar

Le Monde

ENVIRONMENT · CLIMATE CHANGE

Summer of 2023: The hottest ever recorded, with a litany of extreme weather events

Temperatures to pass 40C as devastating heatwave sweeps across much of Europe

Climate crisis made 40C heatwave 10 times more likely, say experts

Climate change is makir

Climate change: The record summer that scorched Asia

PHOTOGRAPHS: LEE MCLEAN/SW RICHARD SAKER/ THE GUARDIAN

Temperature record of 40.3C is 'a wake-up call about the climate crisis'

Continued from page 1

service reported emergency calls

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JULY 19, 2022 12:55PM ET

London Is Burning. Are We Ready to Listen to Climate Scientists Yet?

Yes, climate change is to blame for extreme heat waves. And no, this climate scientist won't apologize for holding those responsible to account

Climate Change in Ontario - Perceptions

- Summers are getting hotter
  - More heat waves
  - More drought
  - Highly variable weather
- Winters are getting warmer
  - Less snow cover
  - Sudden warm spells
  - Earlier springs, but similar frost dates

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Climate Change and Lavender

- Lavender is native to the Mediterranean region
  - Hot and dry summers
  - Cool and humid winters with moderate precipitation
  - Gravelly soil and deep root system
- Climate change could make it easier to grow lavender??
  - How should growers prepare?

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Climate Change in Ontario – My Perceptions

- Less summer heat in recent years
- Wetter summers
- Warmer falls
- Much warmer winters
- Highly variable spring weather
- **If these are true, lavender growing might be more difficult**

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Weather Stations

- Windsor (1940 to 2024)
- London (1883 to 2024) – station moved from city to airport in 1940s
- Delhi (1934 to 2024)
- Peterborough (1882 to 2024) – moved to low area in 1970
- Belleville (1921 to 2023) – right next to Bay of Quinte
- Ottawa (1892 to 2023) – Agriculture Experiment Station – middle of city

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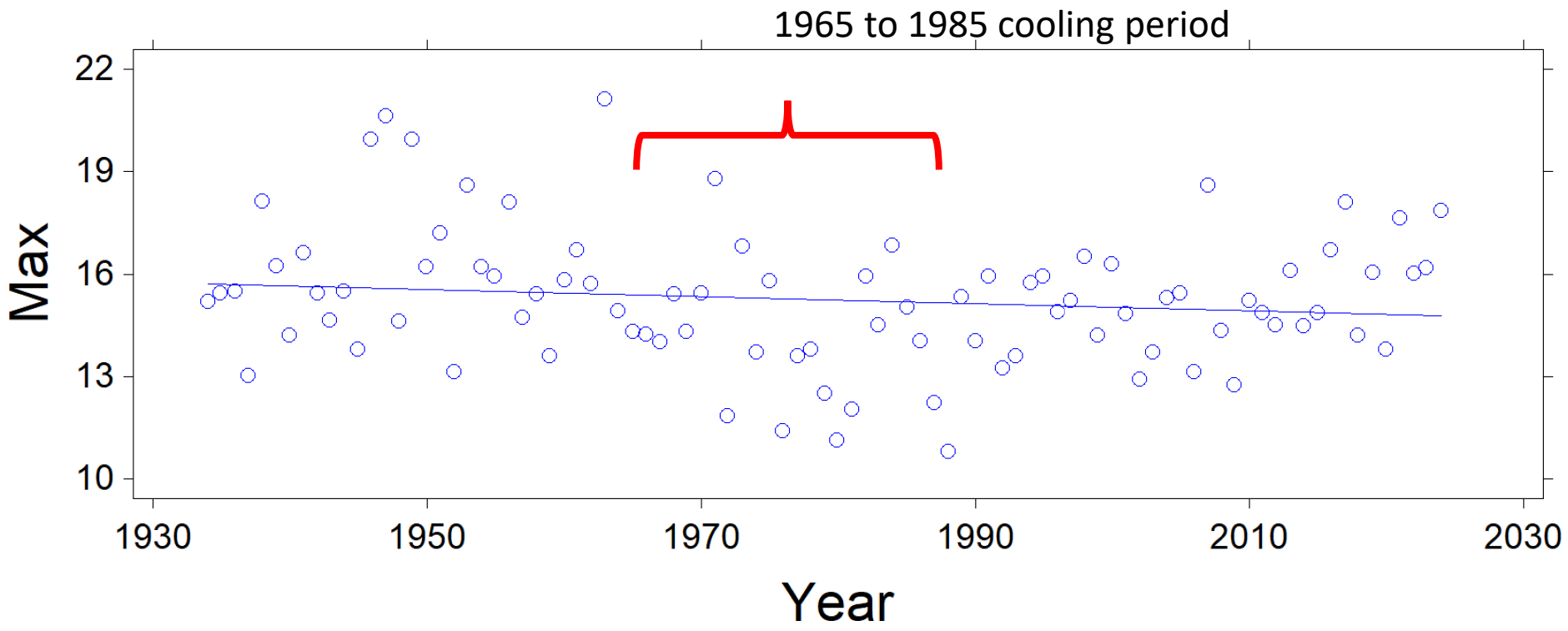
Methods

- Based on regression analysis
  - Find the line of best fit
  - Use that equation to calculate the differences over time
- Caveats
  - Adjustment for missing data at all locations
  - Interpretations assume the weather data was collected accurately
  - Time periods affect interpretation
    - Longer time is better but may extend beyond climate change era = flatter trend line
    - Shorter time = more climate change, but skewed results due to known 1965-1985 global cool-down

1965-1985 Cooling
Delhi – October Average High Temperature



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Annual Temperature Changes

- Windsor (1940 to 2024): +1.4°C
- London (1883 to 2024): +1.0°C
- Delhi (1933 to 2024): +0.8°C
- Peterborough (1890 to 2024): +0.4°C*
- Belleville (1921 to 2023): +2.0°C
- Ottawa (1890 to 2023): +2.3°C

* Affected by weather station move to low area in 1970

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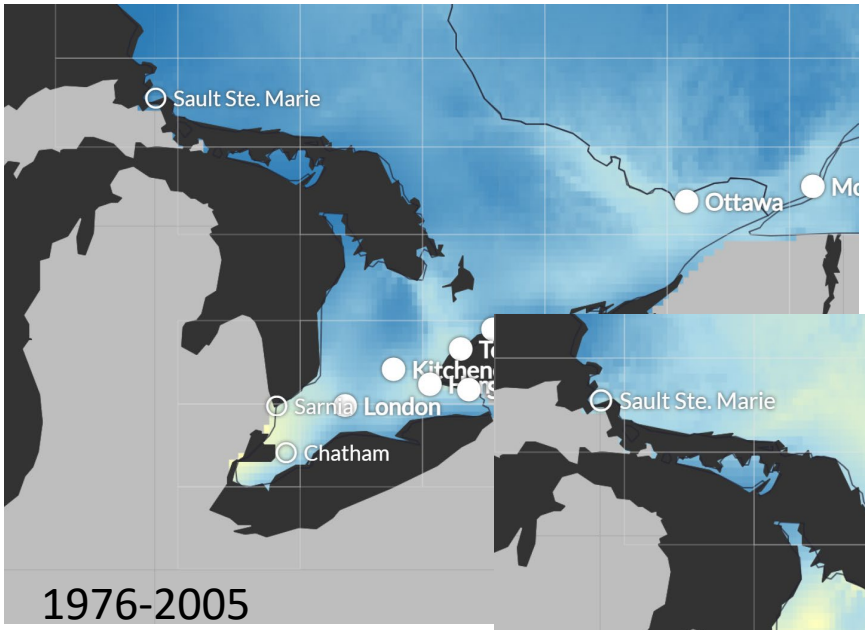
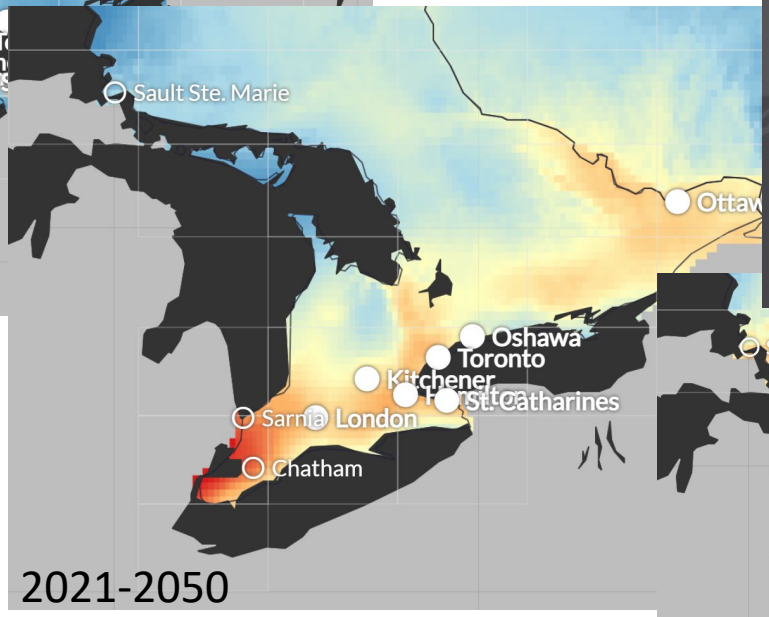
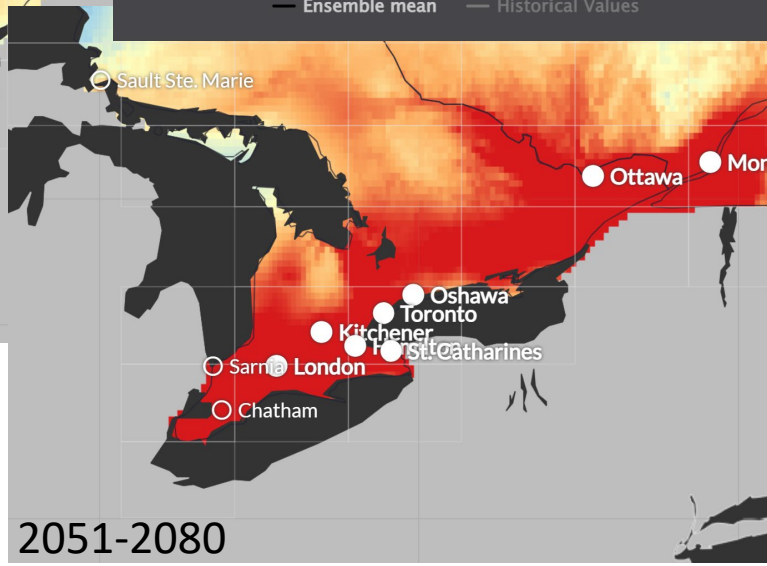
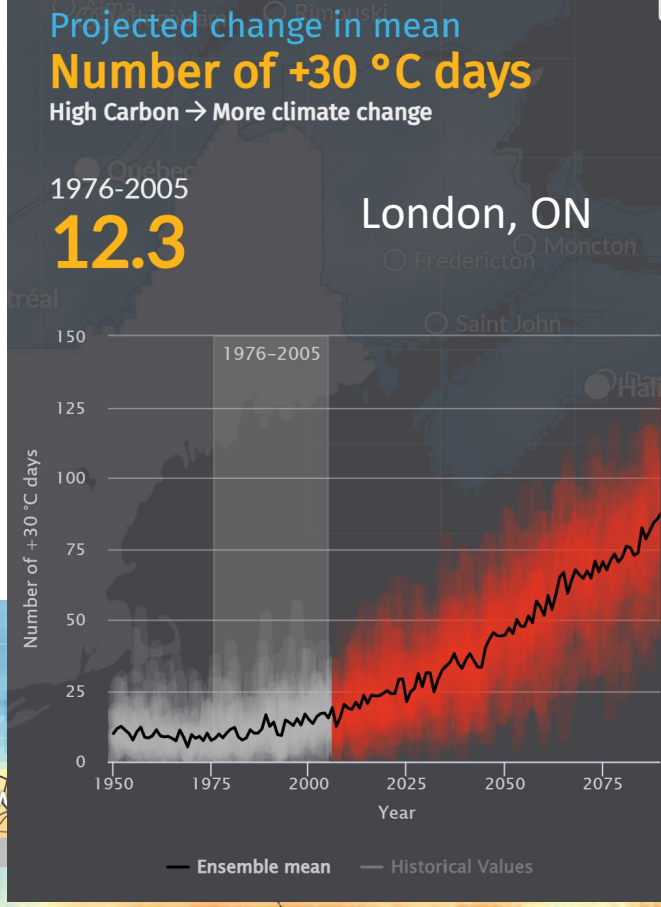
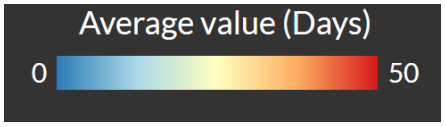
Climateatlas.ca











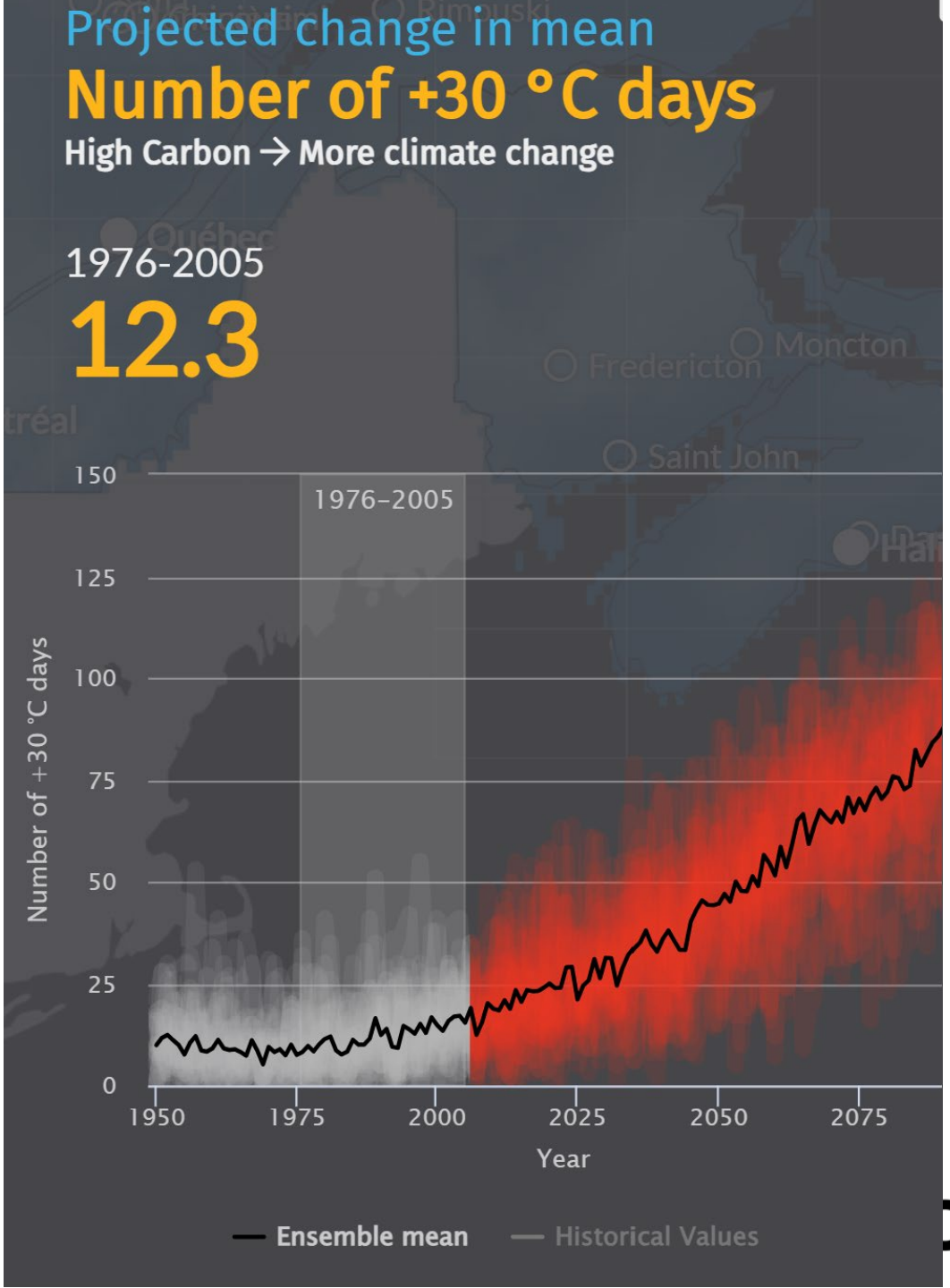
Projected change in mean

Number of +30 °C days

High Carbon → More climate change

1976-2005

12.3



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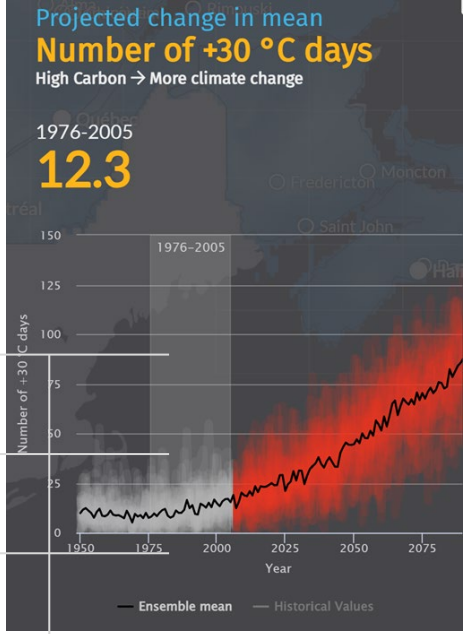
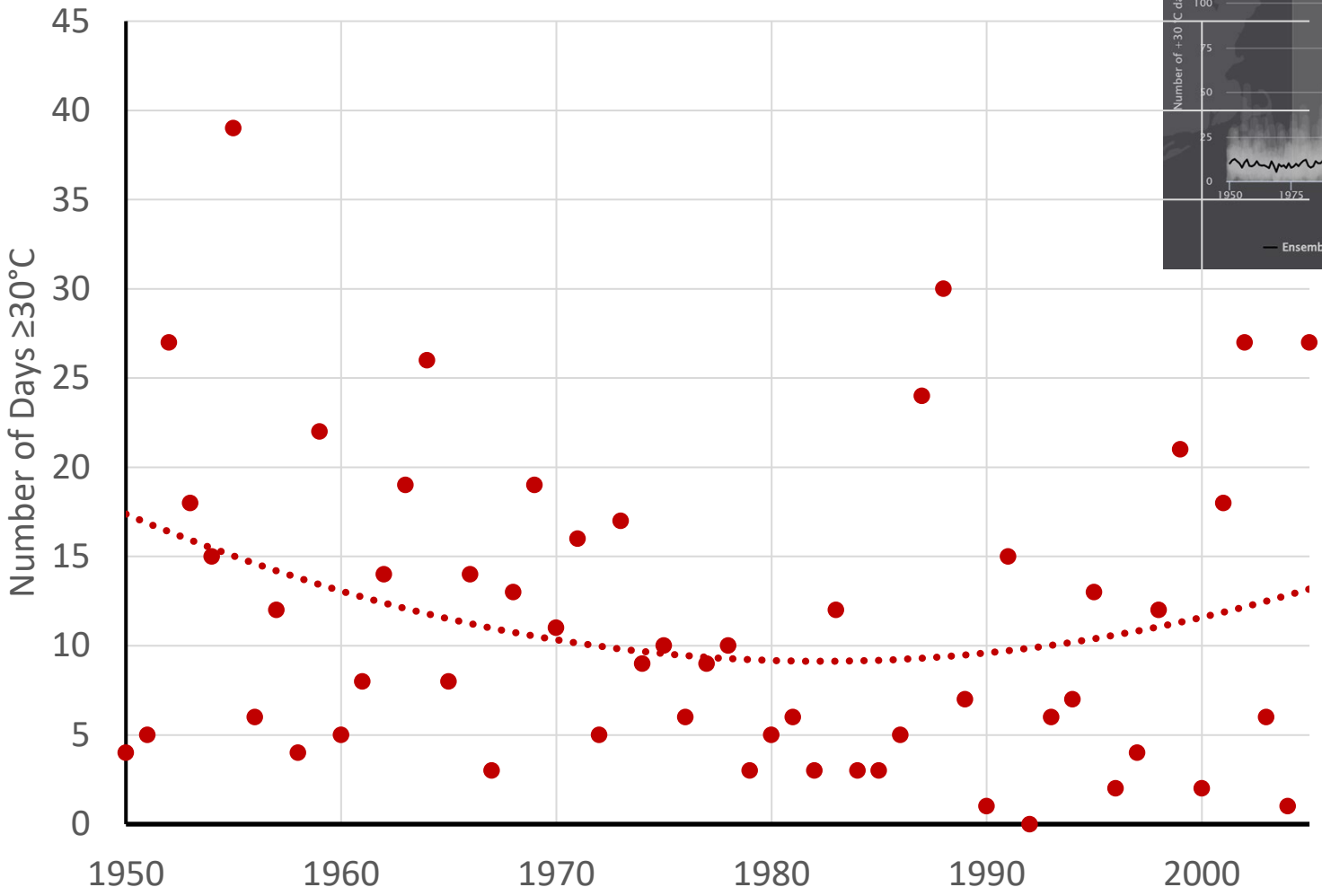
Number of Days ≥30°C – London – 1950 to 2005





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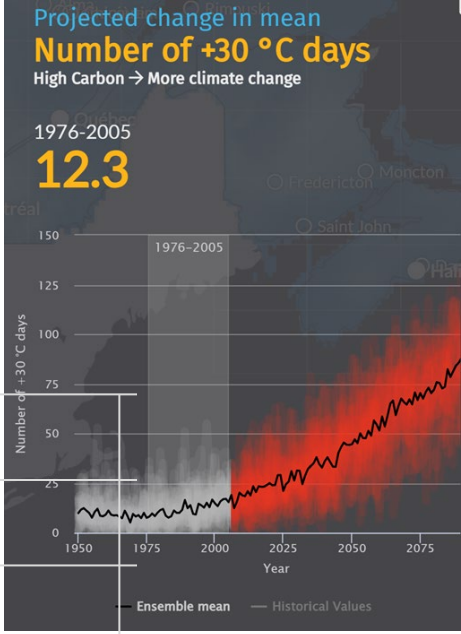
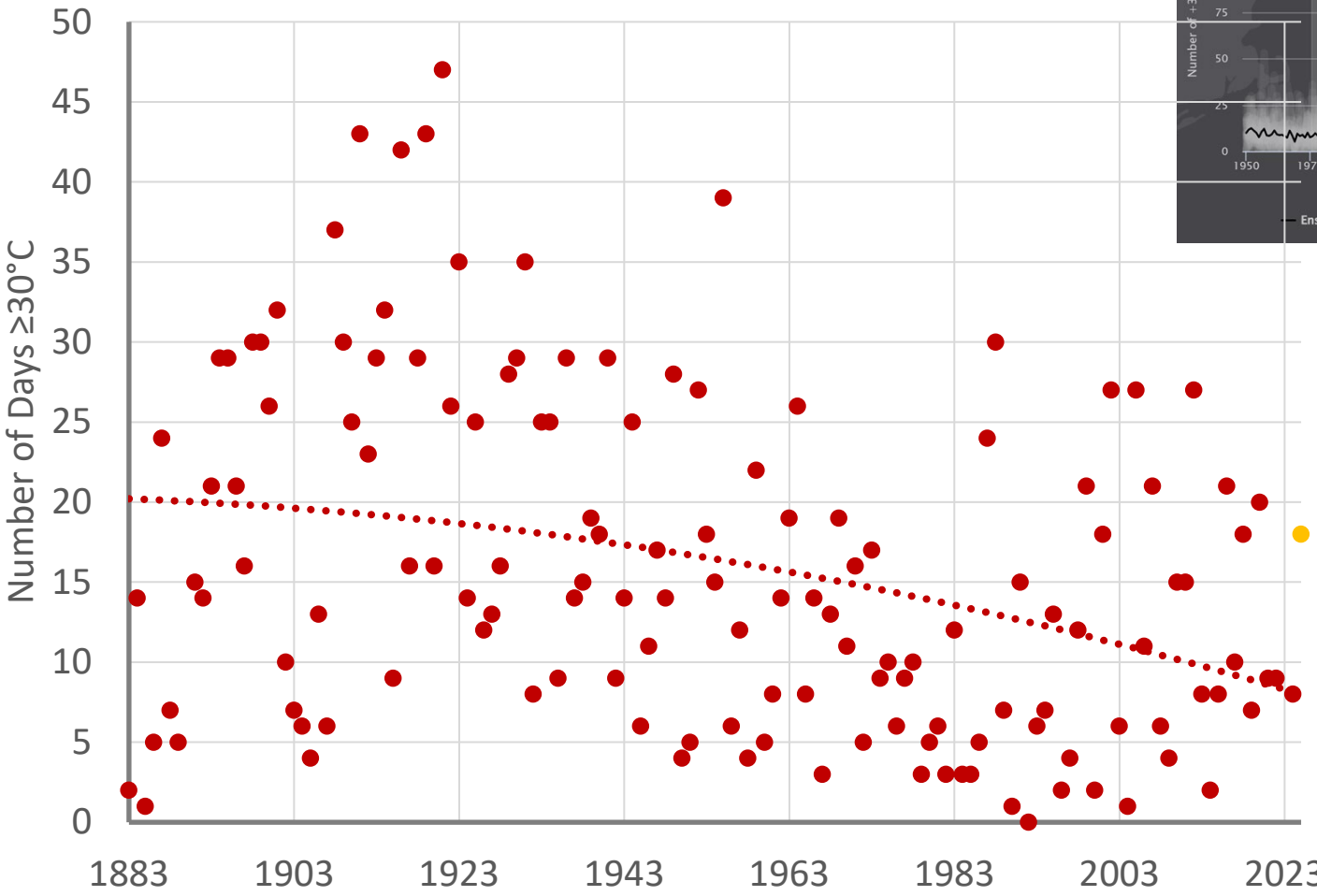
Number of Days ≥30°C – London – 1883 to 2025





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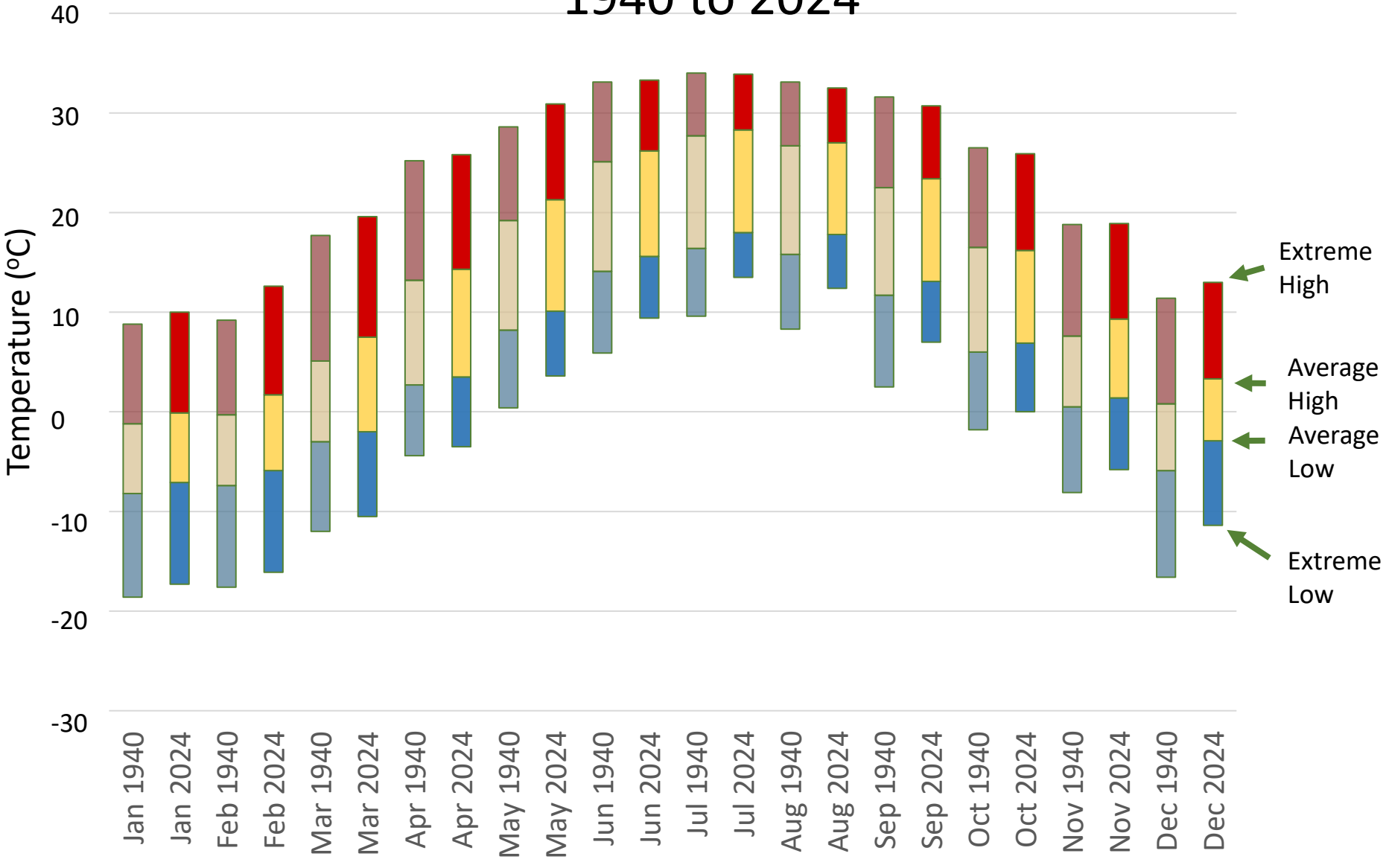
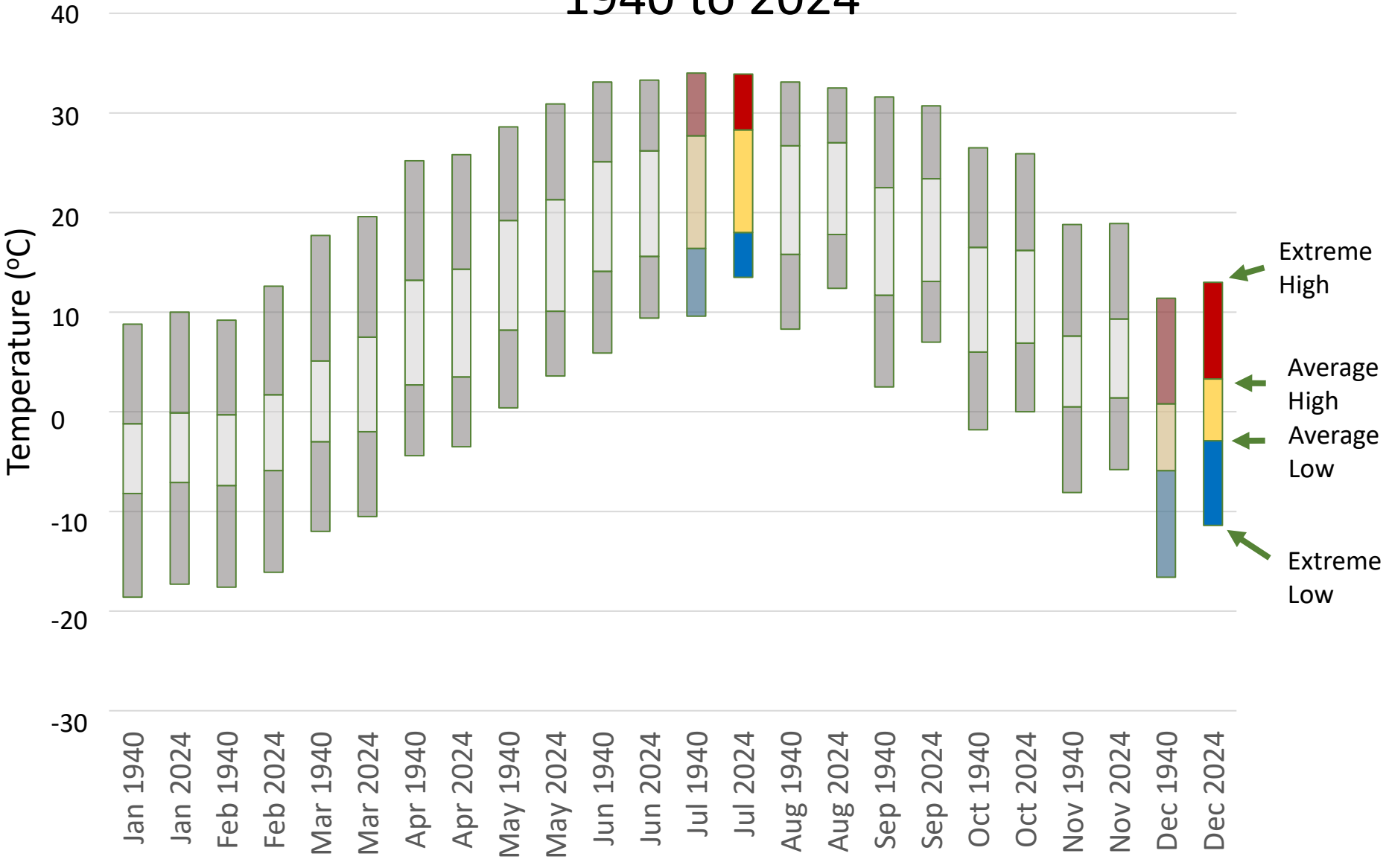
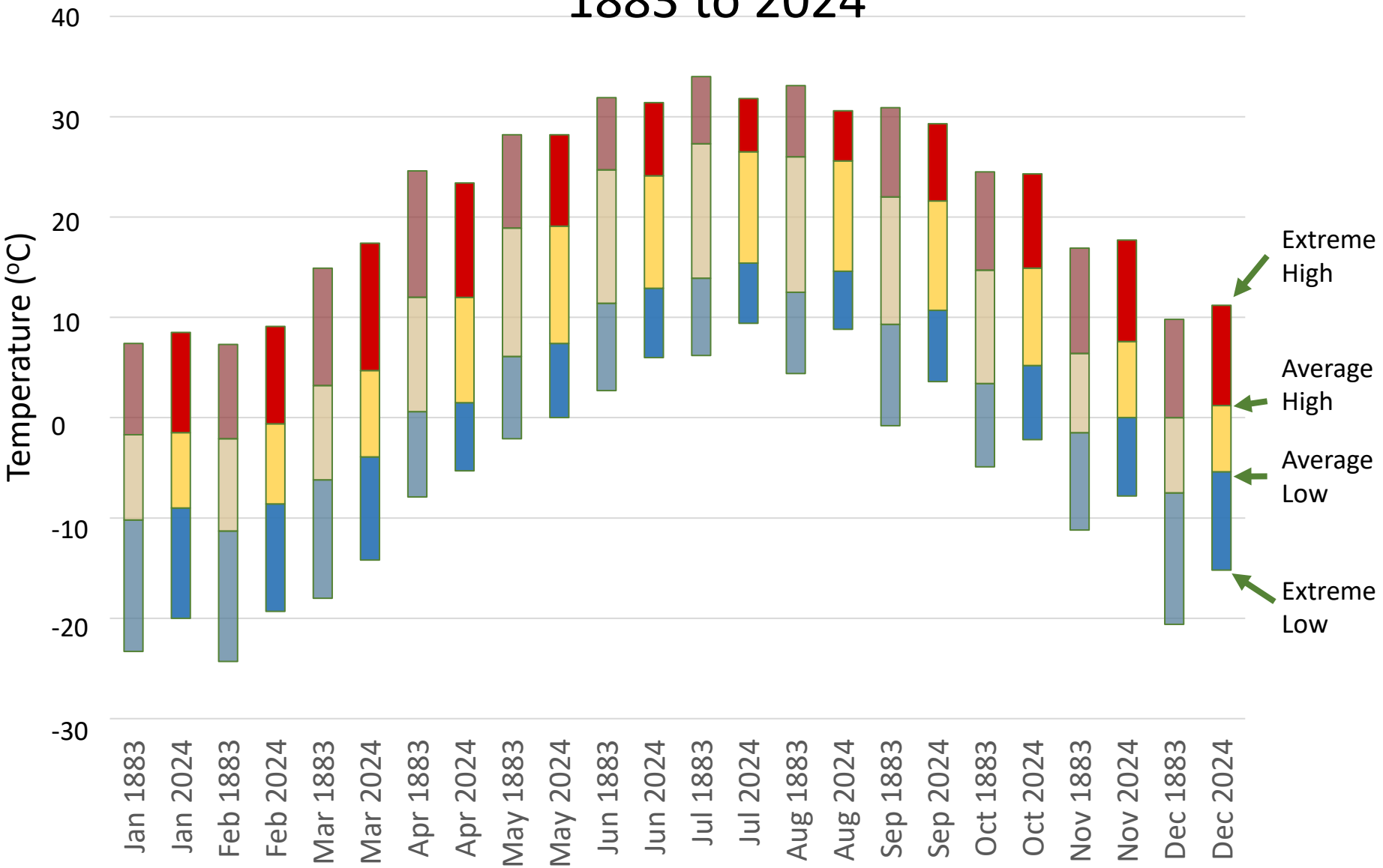
Windsor Monthly Temperature Comparisons 1940 to 2024

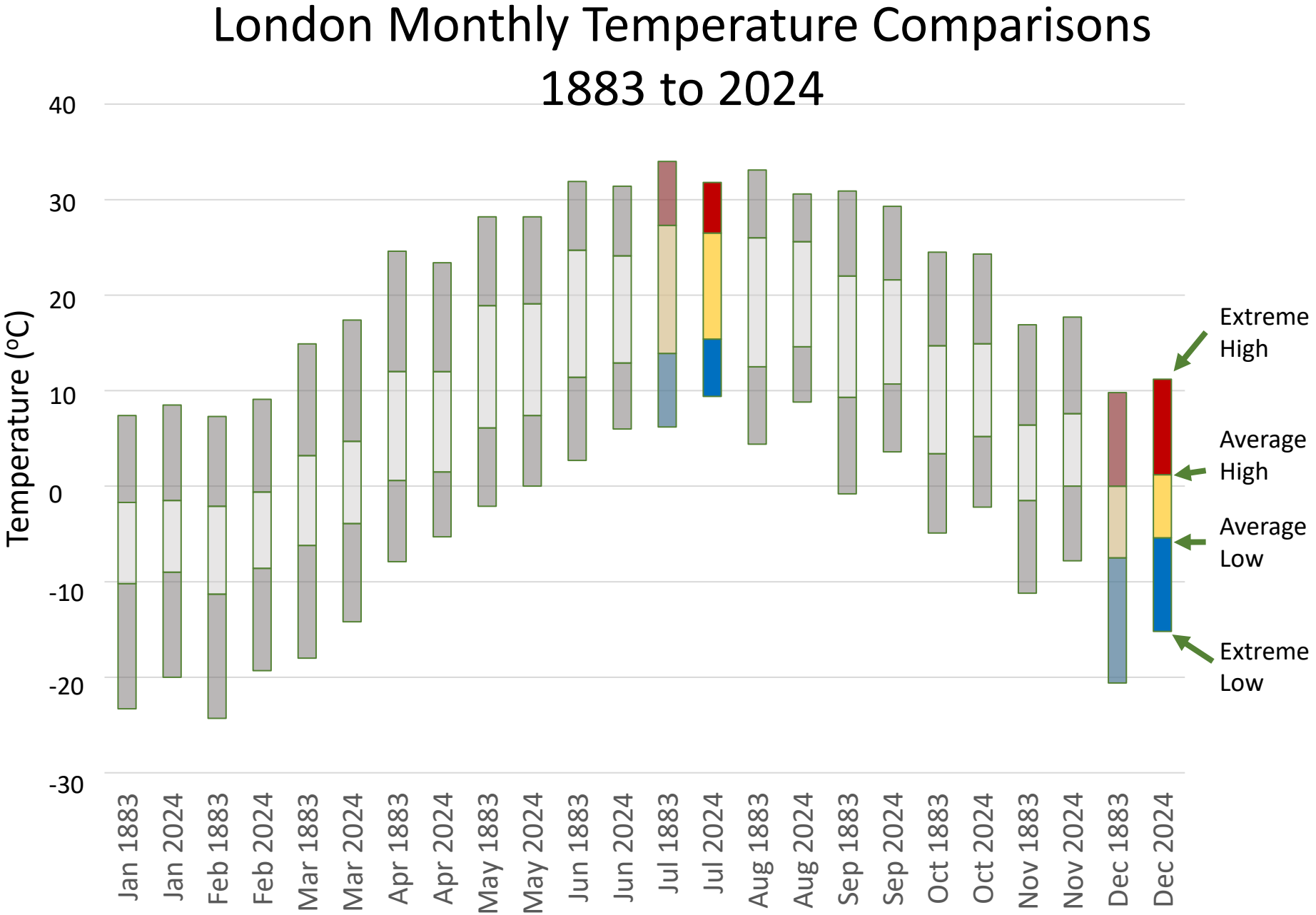


Windsor Monthly Temperature Comparisons 1940 to 2024

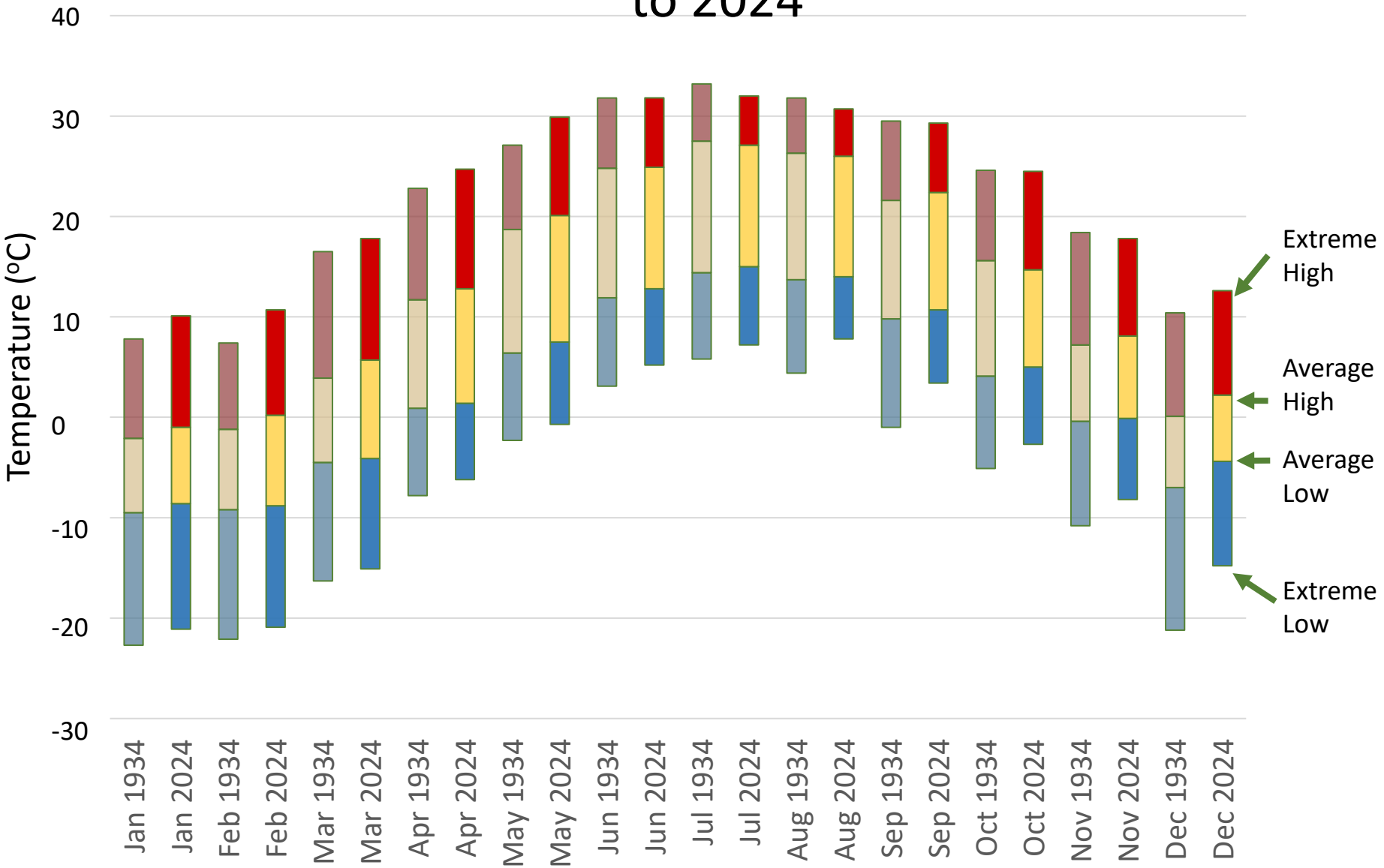


London Monthly Temperature Comparisons 1883 to 2024

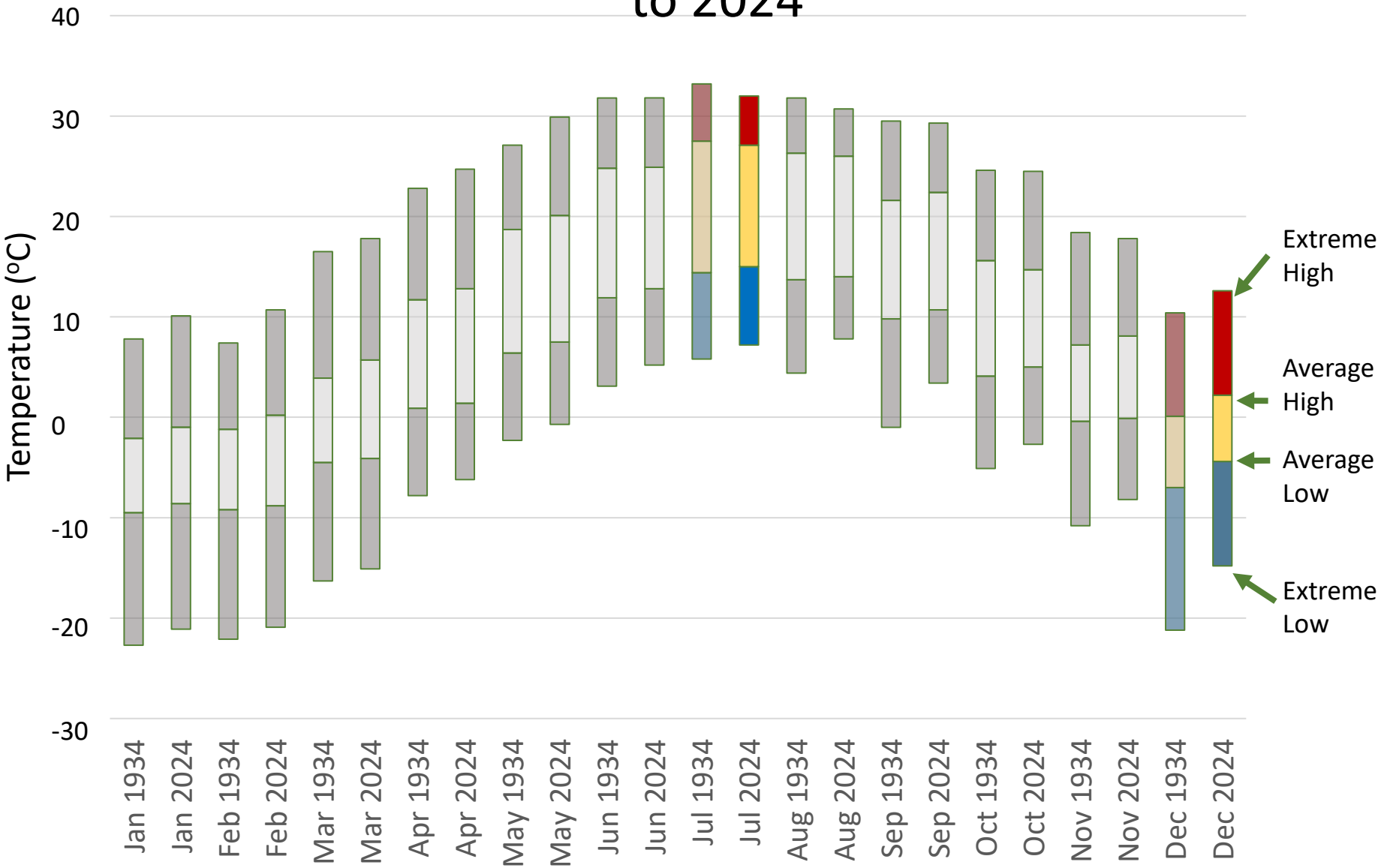



London Monthly Temperature Comparisons
1883 to 2024
Temperature (°C)
40
30
20
10
0
-10
-20
-30
Jan 1883
Jan 2024
Feb 1883
Feb 2024
Mar 1883
Mar 2024
Apr 1883
Apr 2024
May 1883
May 2024
Jun 1883
Jun 2024
Jul 1883
Jul 2024
Aug 1883
Aug 2024
Sep 1883
Sep 2024
Oct 1883
Oct 2024
Nov 1883
Nov 2024
Dec 1883
Dec 2024
Extreme High
Average High
Average Low
Extreme Low

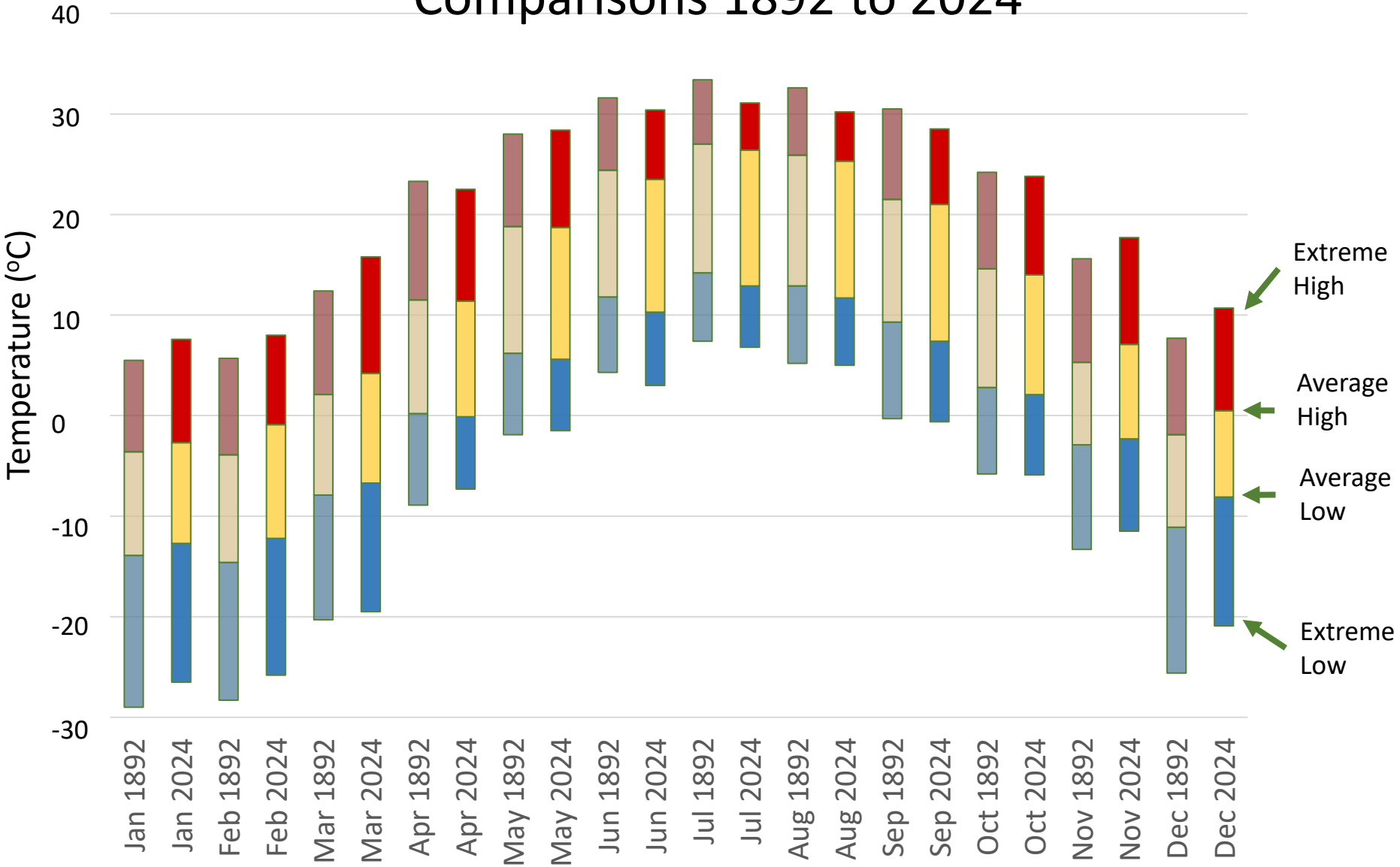
Delhi Monthly Temperature Comparisons 1934 to 2024

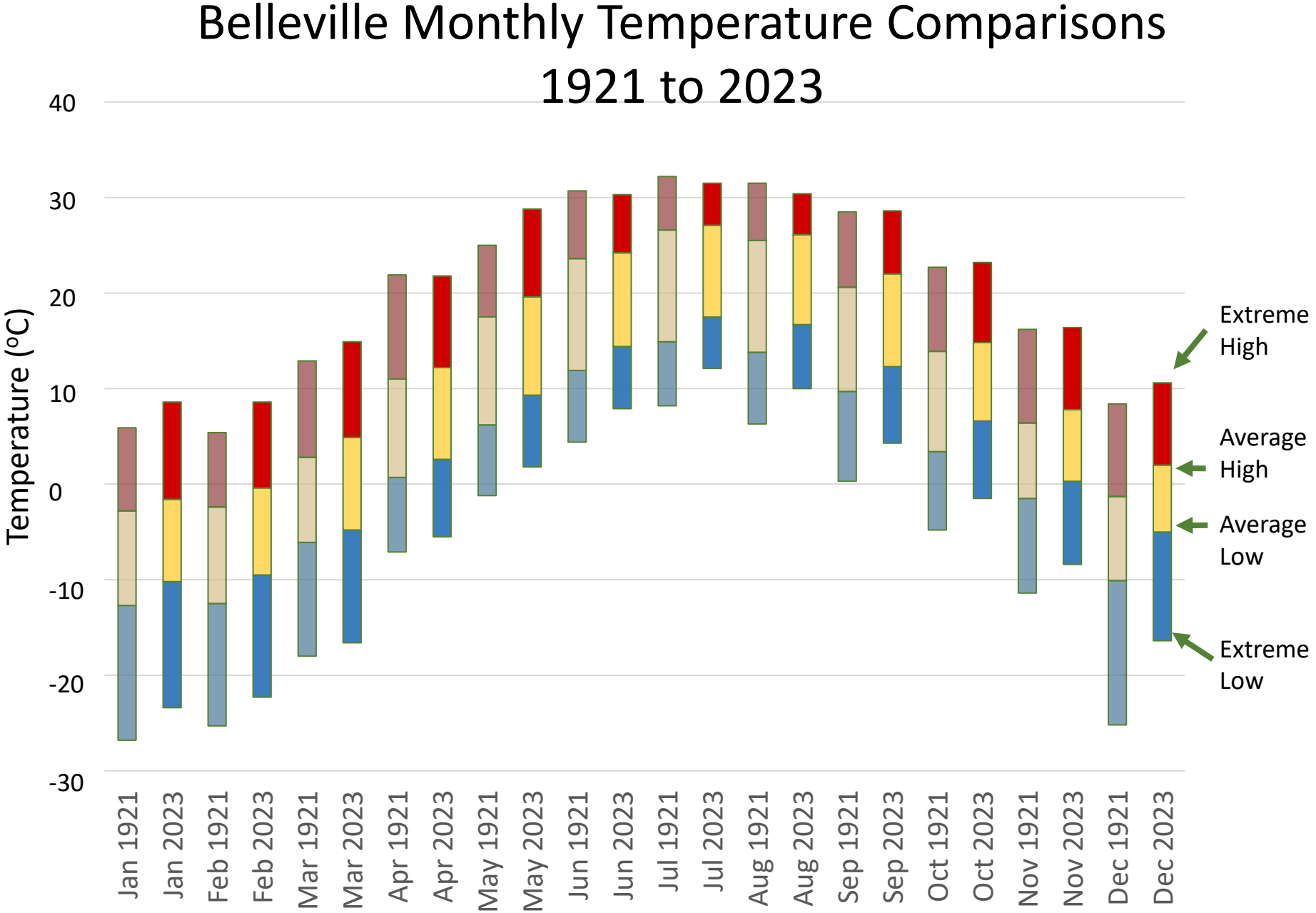


Delhi Monthly Temperature Comparisons 1934 to 2024

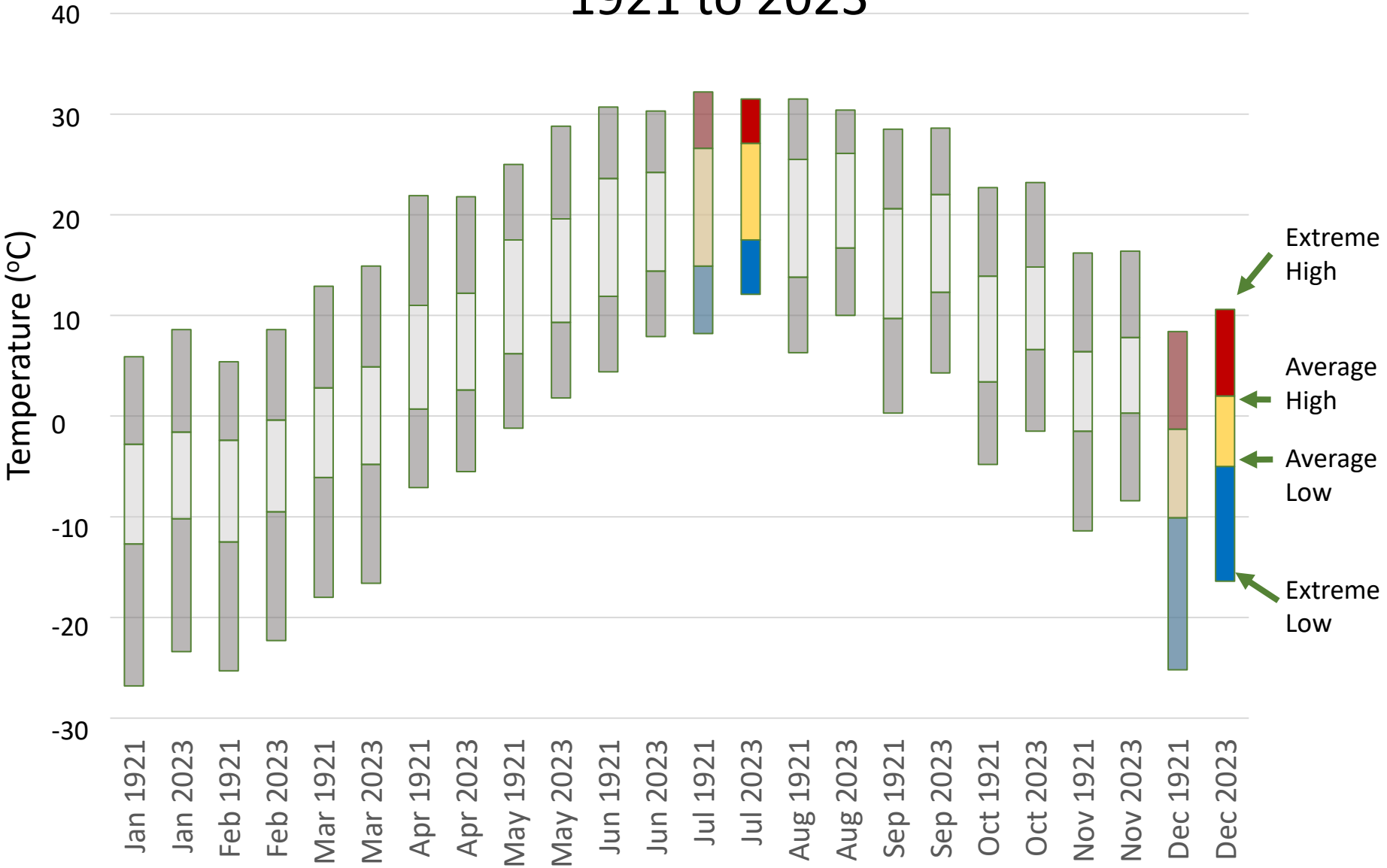


Peterborough Monthly Temperature Comparisons 1892 to 2024

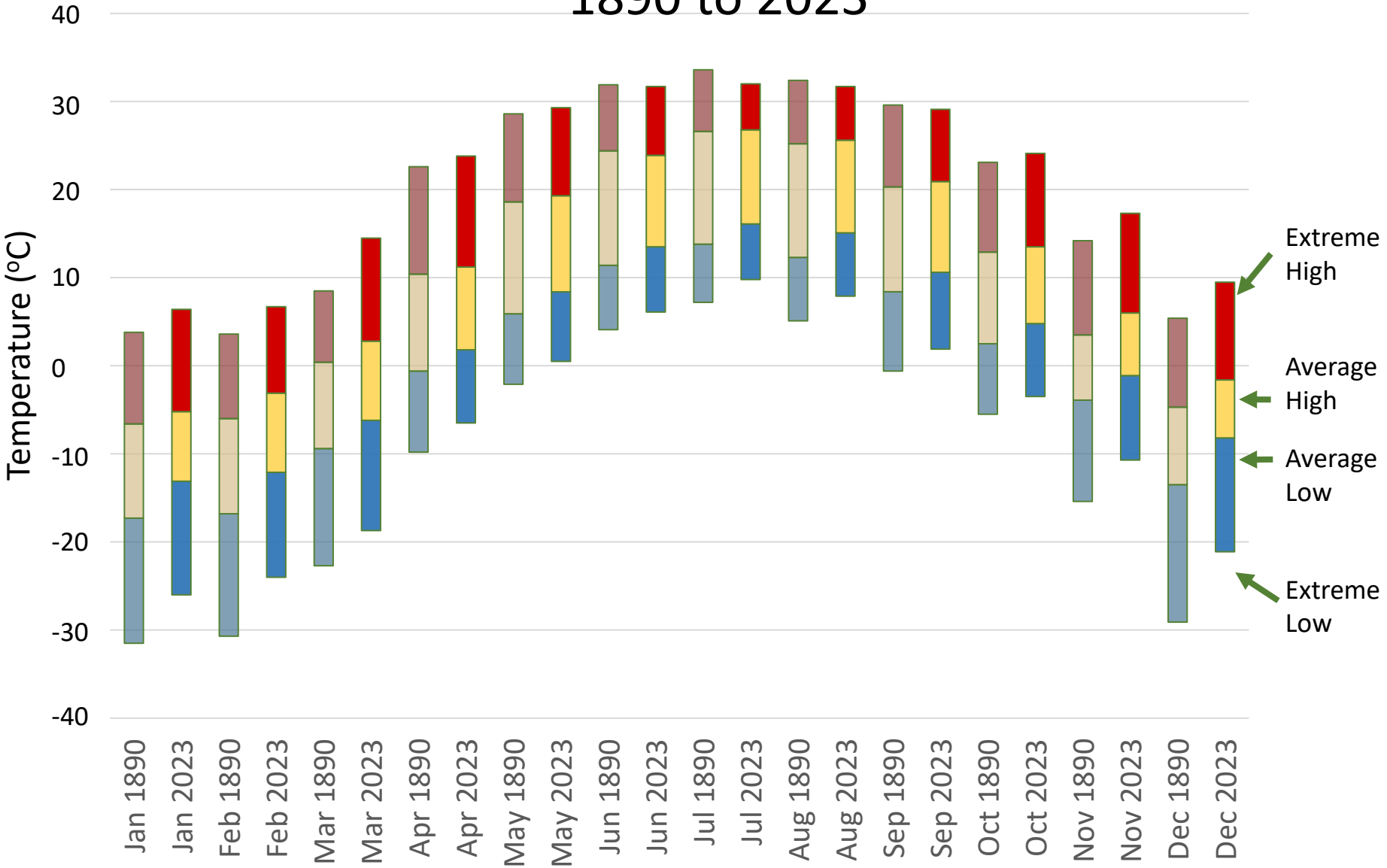



Belleville Monthly Temperature Comparisons
1921 to 2023
Temperature (°C)
40
30
20
10
0
-10
-20
-30
Jan 1921
Jan 2023
Feb 1921
Feb 2023
Mar 1921
Mar 2023
Apr 1921
Apr 2023
May 1921
May 2023
Jun 1921
Jun 2023
Jul 1921
Jul 2023
Aug 1921
Aug 2023
Sep 1921
Sep 2023
Oct 1921
Oct 2023
Nov 1921
Nov 2023
Dec 1921
Dec 2023
Extreme High
Average High
Average Low
Extreme Low

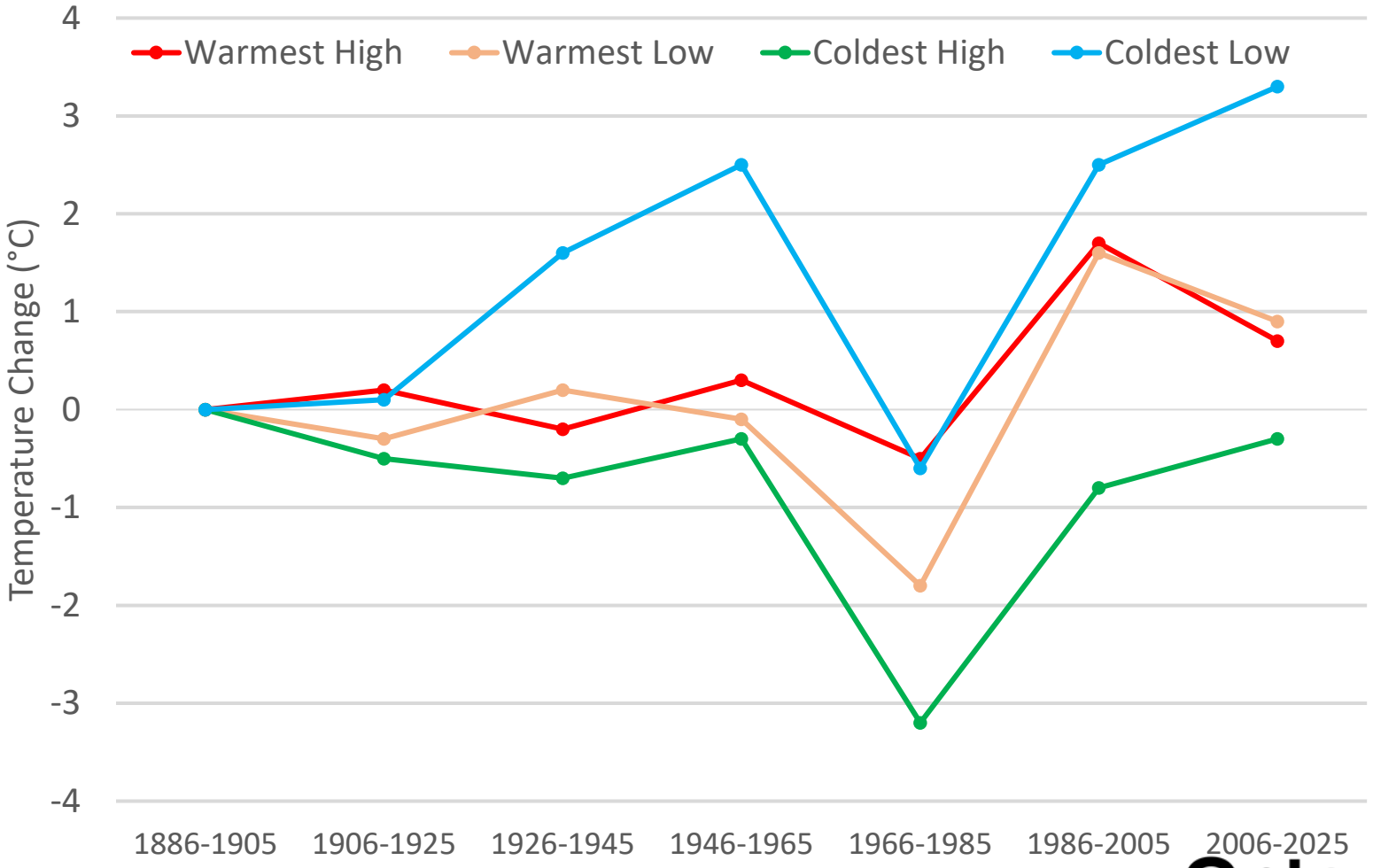
Belleville Monthly Temperature Comparisons 1921 to 2023



Ottawa Monthly Temperature Comparisons 1890 to 2023



Extreme Temperature Changes Over Time in January – London, ON



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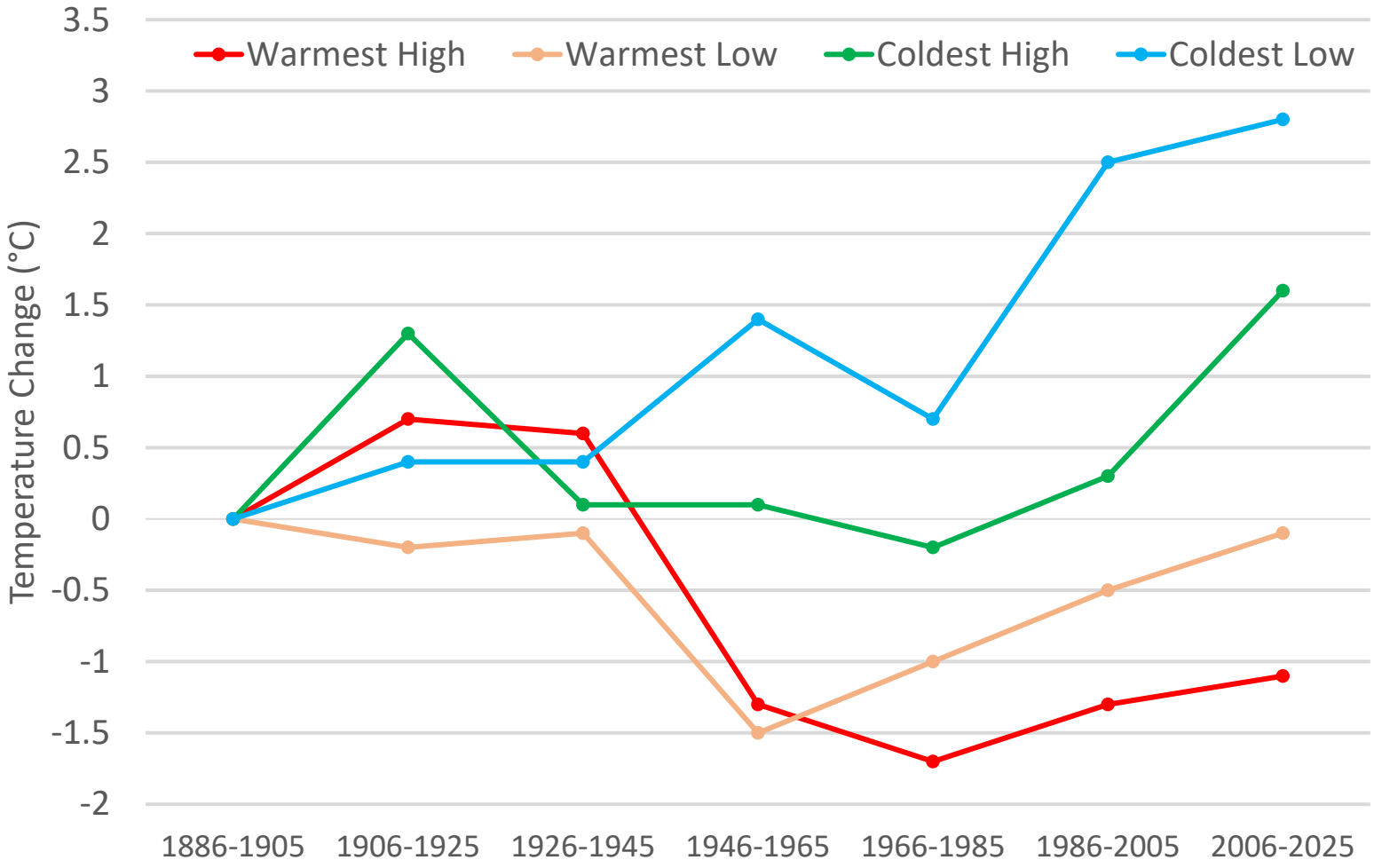
Extreme Temperature Changes Over Time in July – London, ON



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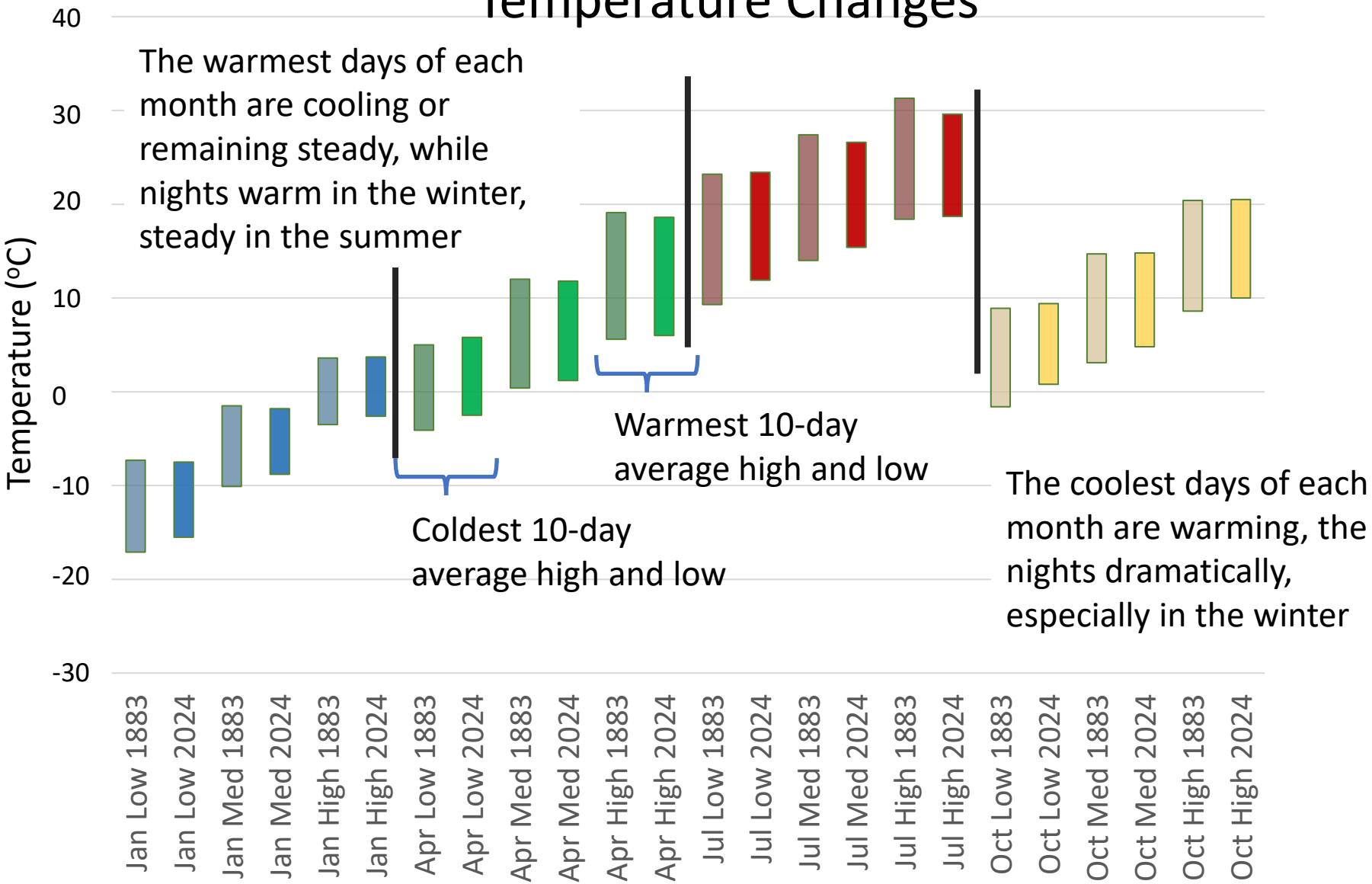
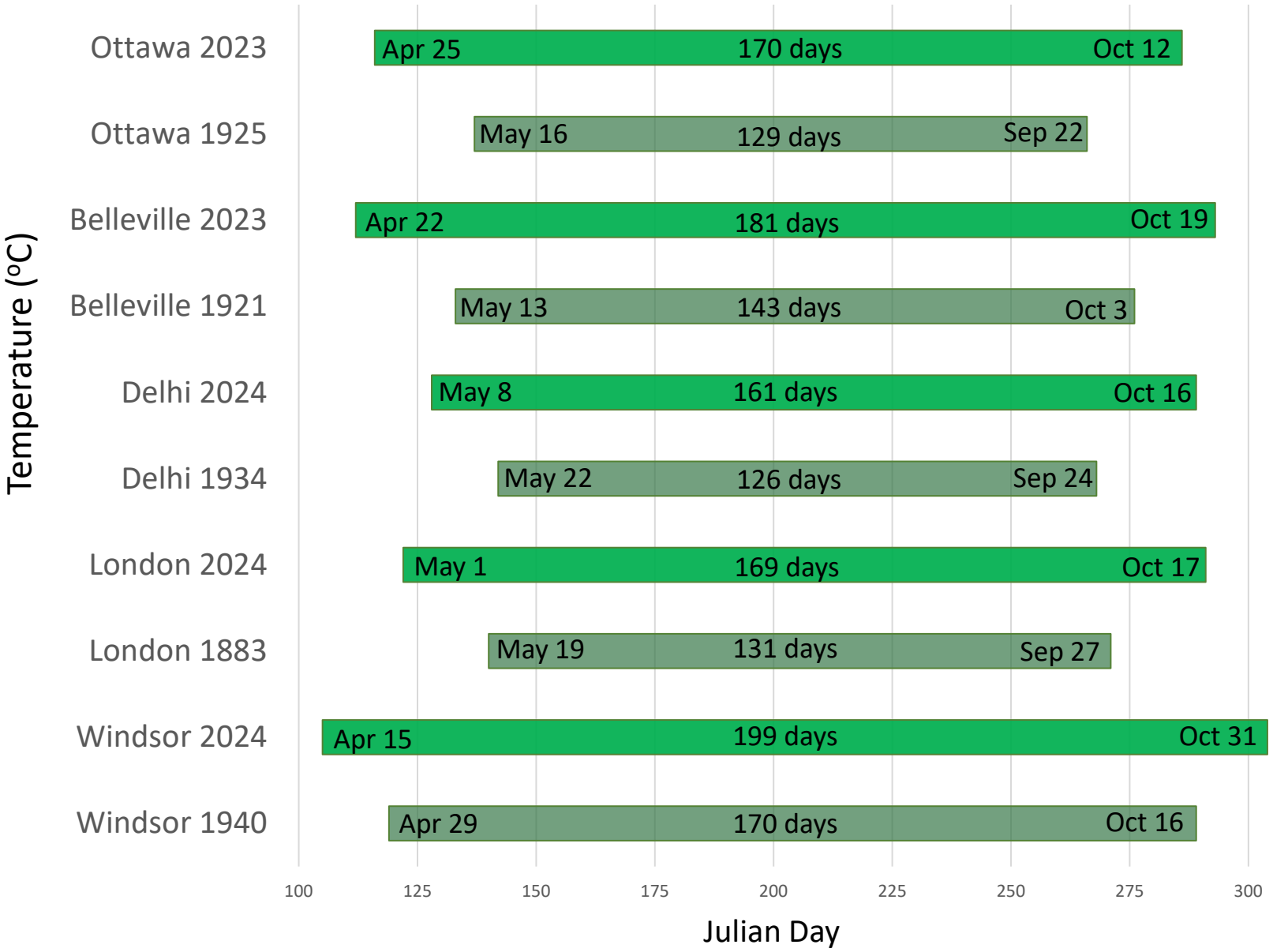
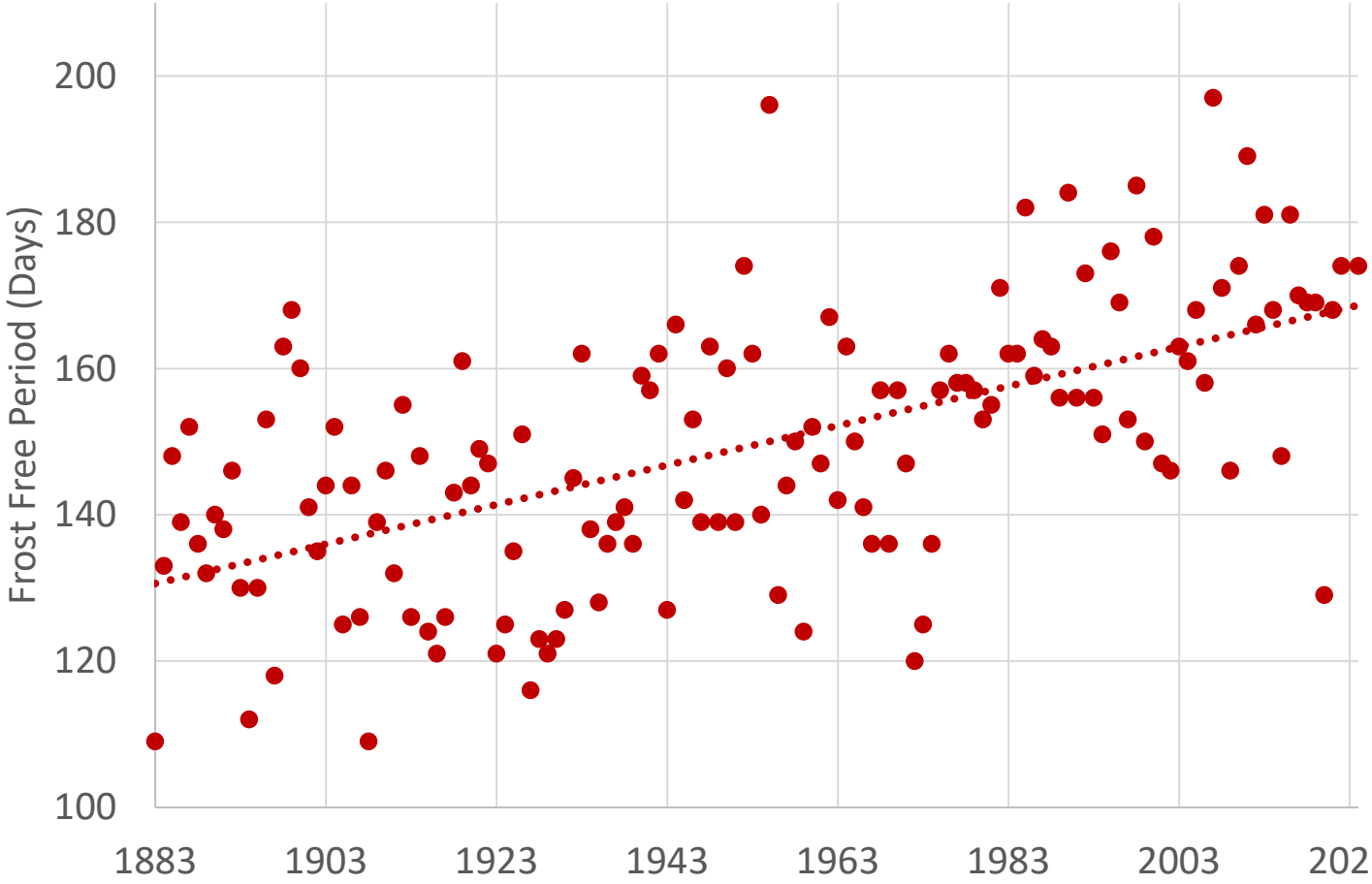
Breakdown of London 1883 to 2024 Temperature Changes



Frost Free Period (frost≤0.0°C)



Frost Free Period in Days - London



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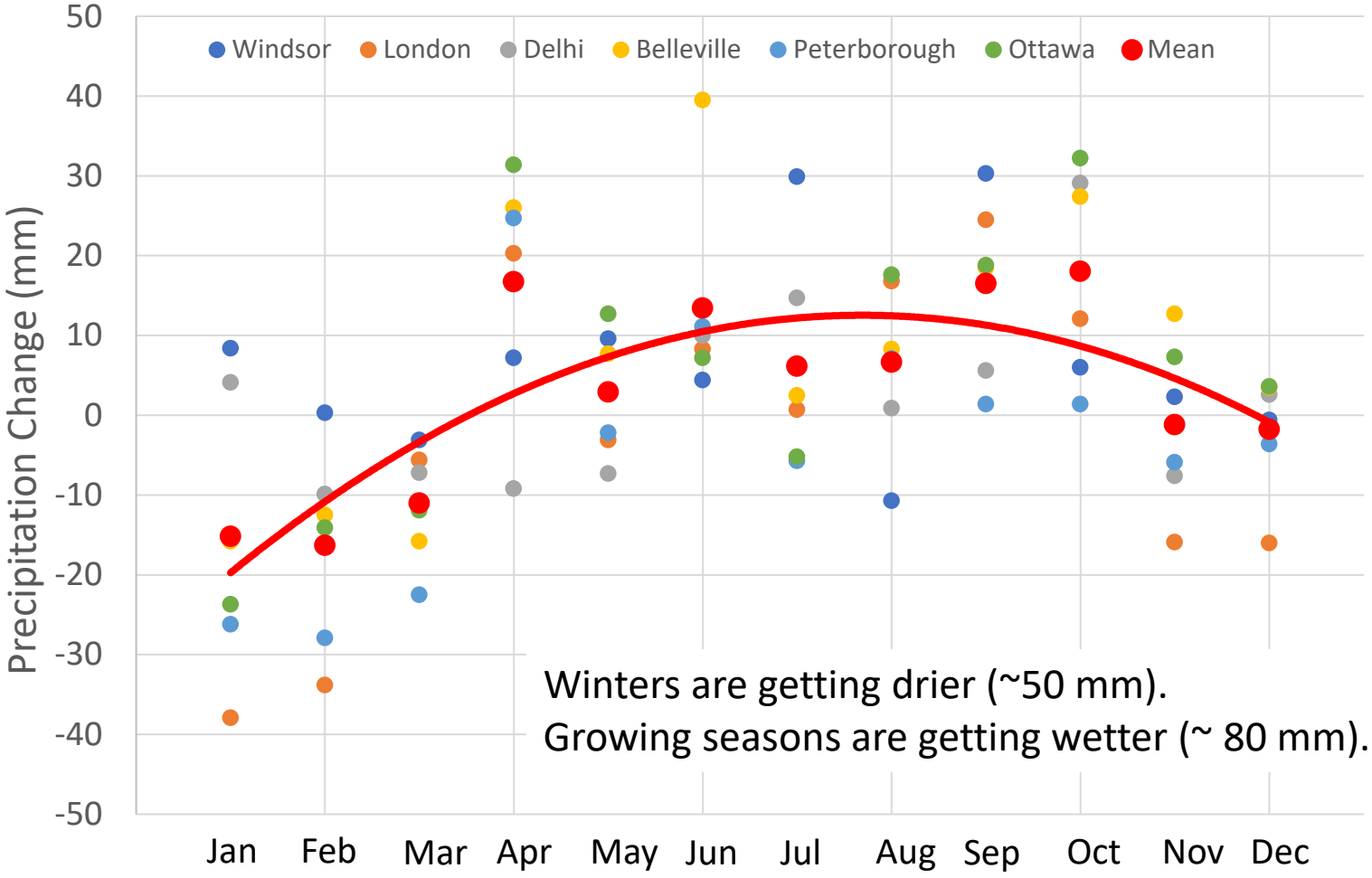
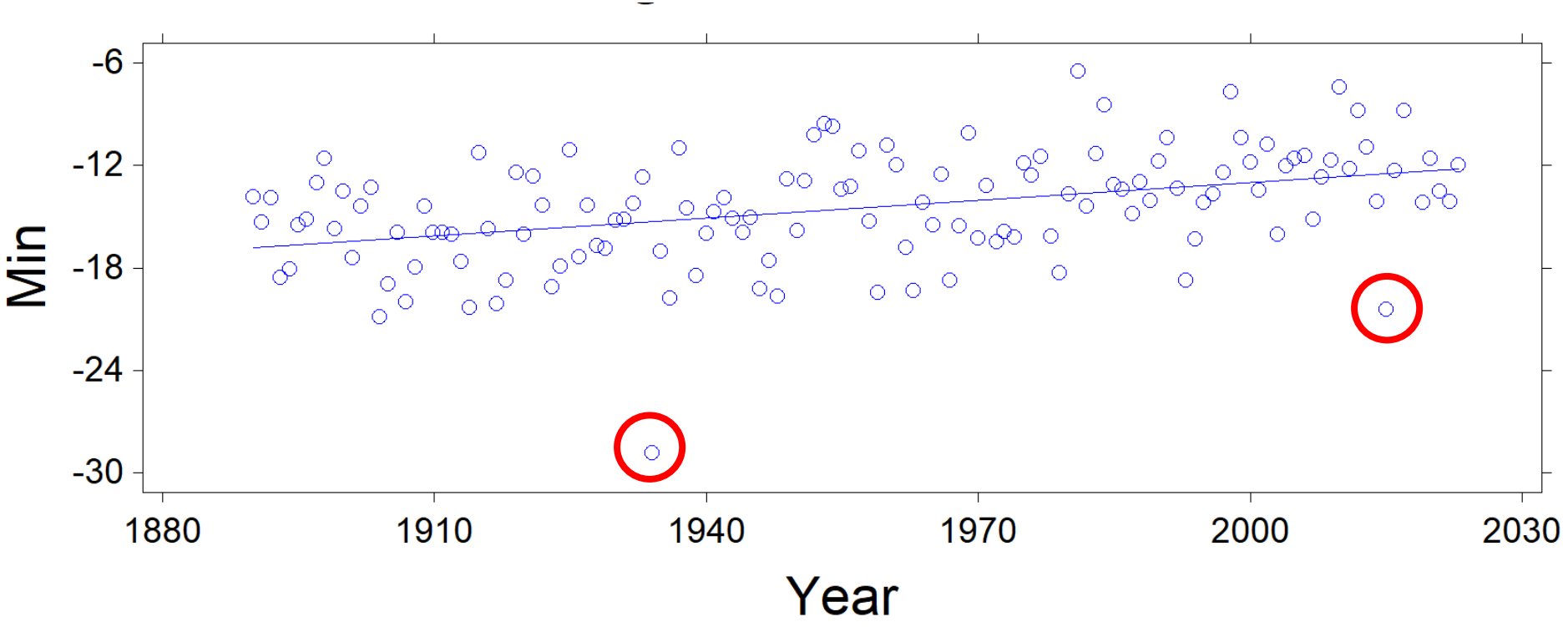
Total Precipitation Changes (relative to the past)



Ottawa February Average Low Temperature

Freak weather events will continue to occur, but the trends change the odds of getting these events.



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Quick Facts

- Delhi: 1934 to 2024 = 91 days over 35˚C
  - 3 straight days >40˚C in 1936
  - Last 30 years = 3 days (last one in 2012)
- # 30˚C days dropped from 23 days per year to 9 in London (1883 to 2024)
- Greatest monthly temperature change – December in Ottawa = +4.3˚C

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Overall Trends for Southern Ontario

- Winters are warming much more than summers
- Nights are warming more than days
- Hot days are cooling in the summer
  - More rainfall, humidity and clouds responsible?
- Warmer Arctic = less intense Arctic outbreaks?
- Areas near the Great Lakes may see more warming due to warmer water temperatures
- No obvious increase in variability

Implications for Lavender

- Less temperature extremes = better growth
- More rainfall = more summer flooding
- Warmer nights
  - Less risk of frost during the growing season
  - Less direct winter kill
- Winter warming and drying = less snow and ground frost
  - More rapid spring growth relative to air temperatures for perennial crops = higher frost risk
  - Perennials not staying dormant all winter = earlier spring development = higher frost risk
  - Similar windy/cold days in winter = higher winterkill

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Implications for Pests

- Warmer winters = higher insect survival
- Less temperature extremes = more optimal conditions for insects and diseases
- Wetter summers = higher disease pressures (e.g. Phytophthora)
- Longer growing season = more generations per year of many insects (e.g. garden fleahoppers)
- Warmer year-round = longer season of crop protection
  - Some disease controls may be needed year-round
- Warmer winters = survival of pests that previously died over winter

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Overall Impact on Lavender

Winter

- Less extreme cold
- More fluctuating from freezing to melting
- Less snow cover

Spring

- Variable depending on snow cover
- Increased frost risk

Summer

- Less extreme heat
- Warmer overall
- More rainfall

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Overall Impact on Lavender

Winter

- Less extreme cold
- More fluctuating from freezing to melting
- Less snow cover

Site Selection and Drainage

Row Covers

Spring

- Variable depending on snow cover
- Increased frost risk

Cultivar Choice and Row Covers

Summer

- Less extreme heat
- Warmer overall
- More rainfall

Site Selection and Drainage

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Cold Protection with Row Covers

- Cultivars
  - All of them!
  - Lavandins must be covered
- Types
  - Floating row covers (e.g., Agryl P-40) – 1-2°C protection
    - Can cover multiple rows at once = less labour
    - Shorter lifespan
  - Winter blankets (e.g., Hibertex Pro) >2°C protection
    - One row at a time
- Timing
  - Install as late as possible before semi-permanent snow (mid-Nov. to early-Dec.)
  - Remove anytime after early March when the forecast is free of extreme cold, especially if sunny

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Lavender Row Cover Trials

- On-farm and UofG replicated trials
- Treatments:
  - Thick and thin white row covers
  - Straw mulch
  - Uncovered
- Cultivars: Hidcote, Twickel, Grosso and Provence
- Covered in 2013/2014 and 2014/2015
- Winter kill rating 0 (dead) to 10 (healthy)

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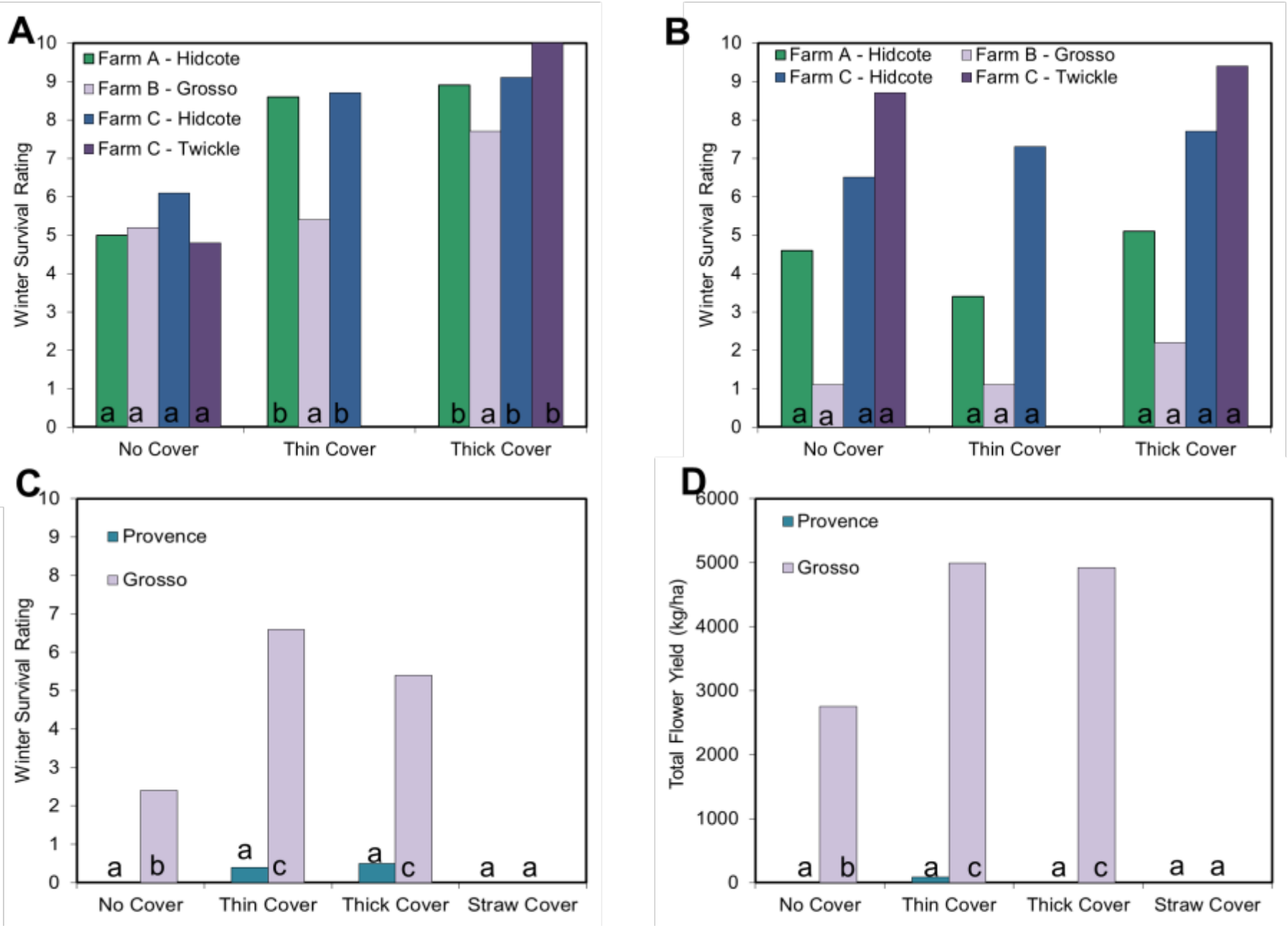

Row cover trial results on-farm in 2013 (A) and 2014 (B) and on-station (C,D)

Fig. 4. Comparison of ‘Grosso’ lavender in May 2014 in Simcoe after row covers were removed: Left – thick row cover, Middle – thin row cover, Right – no cover.

Spring Frost Protection

- Options: fans ($$), continuous irrigation (disease risk), row covers
- Keep row covers handy after removal
- Consider reapplying when:
  - Frost or extreme cold is forecast
    - Green plants – estimated tolerance -3 - -4°C
    - Buds showing – estimated tolerance -1 - -2°C
- Much fewer weights/staples required
  - Still high labour requirement

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Improving Drainage

Soleno.com

- The single most important consideration
- Best site characteristics:
  - Sandy soil (through the whole profile)
  - Slope
- Site improvements
  - Tile drainage
    - May not help in mid-winter when ground is frozen
  - Broad raised beds
  - Removal of surface water through trenches/Hickenbottom drains
- Not helpful:
  - additions of sand or gravel to the soil

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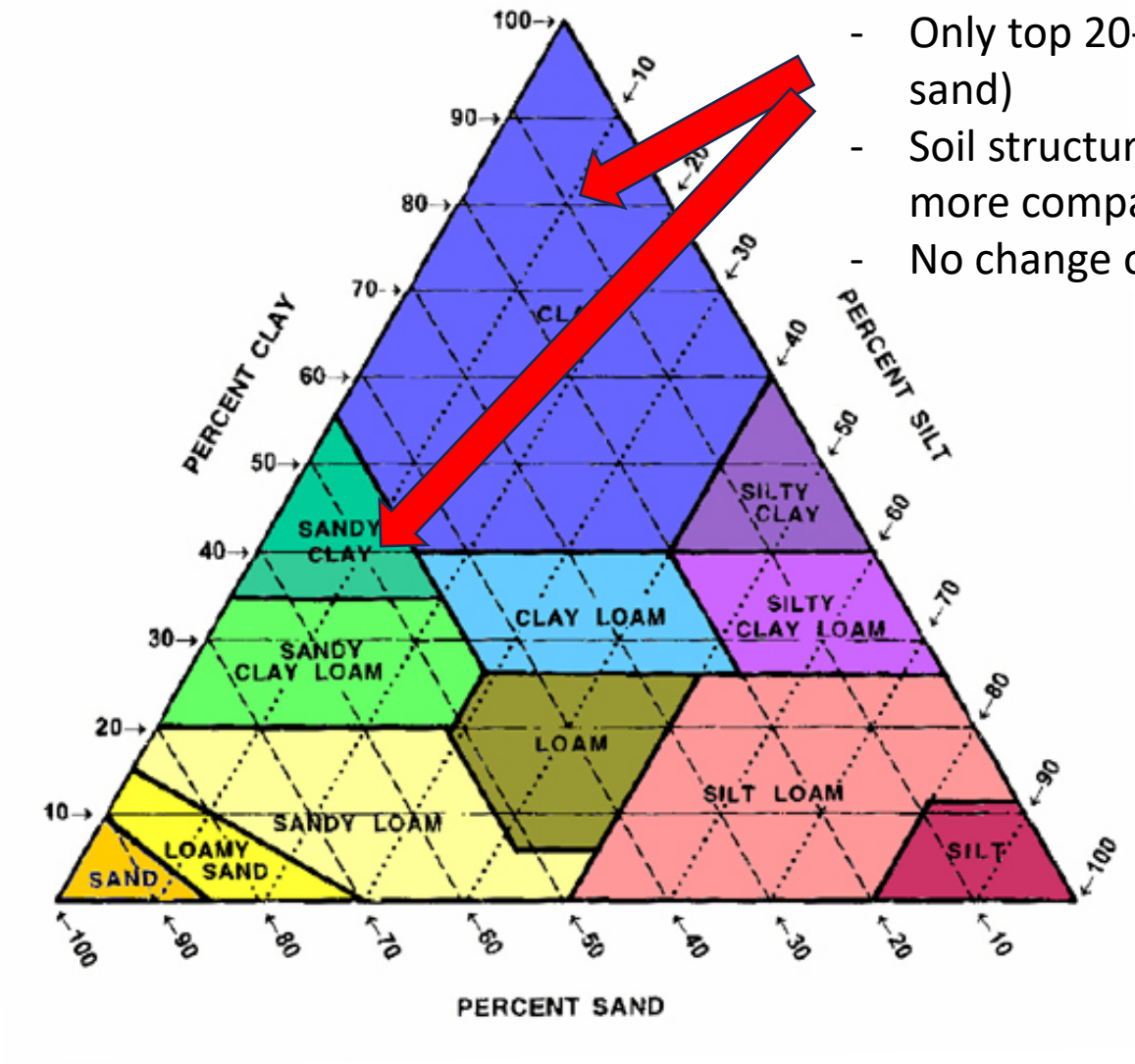
Soil Texture



It would take 40 extended dump trucks of sand to change an acre of heavy clay to sandy clay:

- Only top 20-25 cm (15 cm of sand)
- Soil structure destroyed = more compaction
- No change or worse drainage

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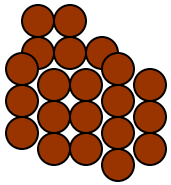
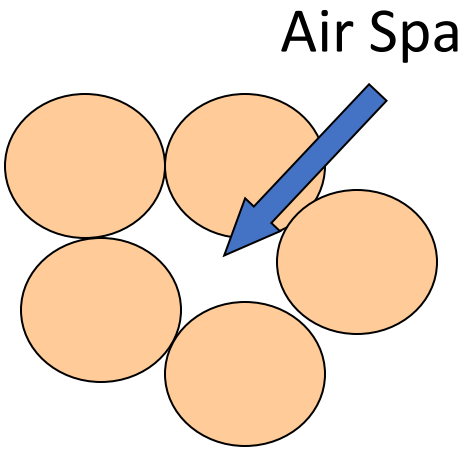
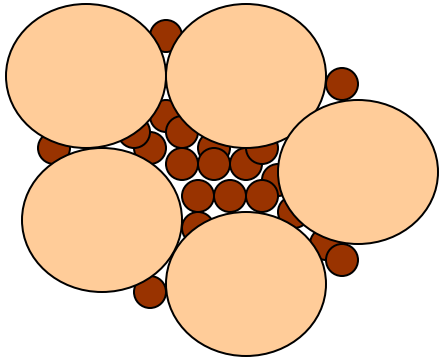
Adding Sand to a Clay Soil



Clay Soil



Sandy Soil



Sandy Clay

1 part fine clay + 2 parts sand + 3 parts gravel + water = concrete

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Soil Structure

- Soil texture does not tell the whole story!
- Clay loams can behave like sandy loams with good structure
  - Avoid compaction
  - Improve organic matter content
  - Cover crops to break soil clods
  - Avoid tillage when the soil is wet
- Lavender is more prone to rot in poorly aerated soils

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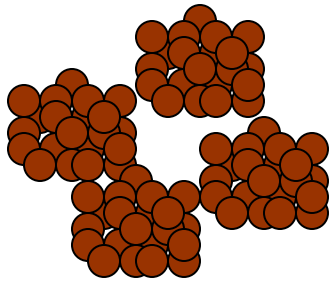
Improving Soil Structure



Organic matter
acts as a glue

Clay Soil with
Good Structure

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Conclusions

- The climate of southern Ontario has been changing
  - Temperatures are getting less cold
  - Extreme heat is declining
  - Summers are getting wetter
- It is dangerous to extrapolate to the future
  - Weather patterns could shift causing very different weather
- Lavender growers should prepare for changing patterns
  - Higher pest pressures
  - Need for improved drainage
  - Increased winter and spring protection

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Questions?
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519-420-7440