

Farming Through the Change

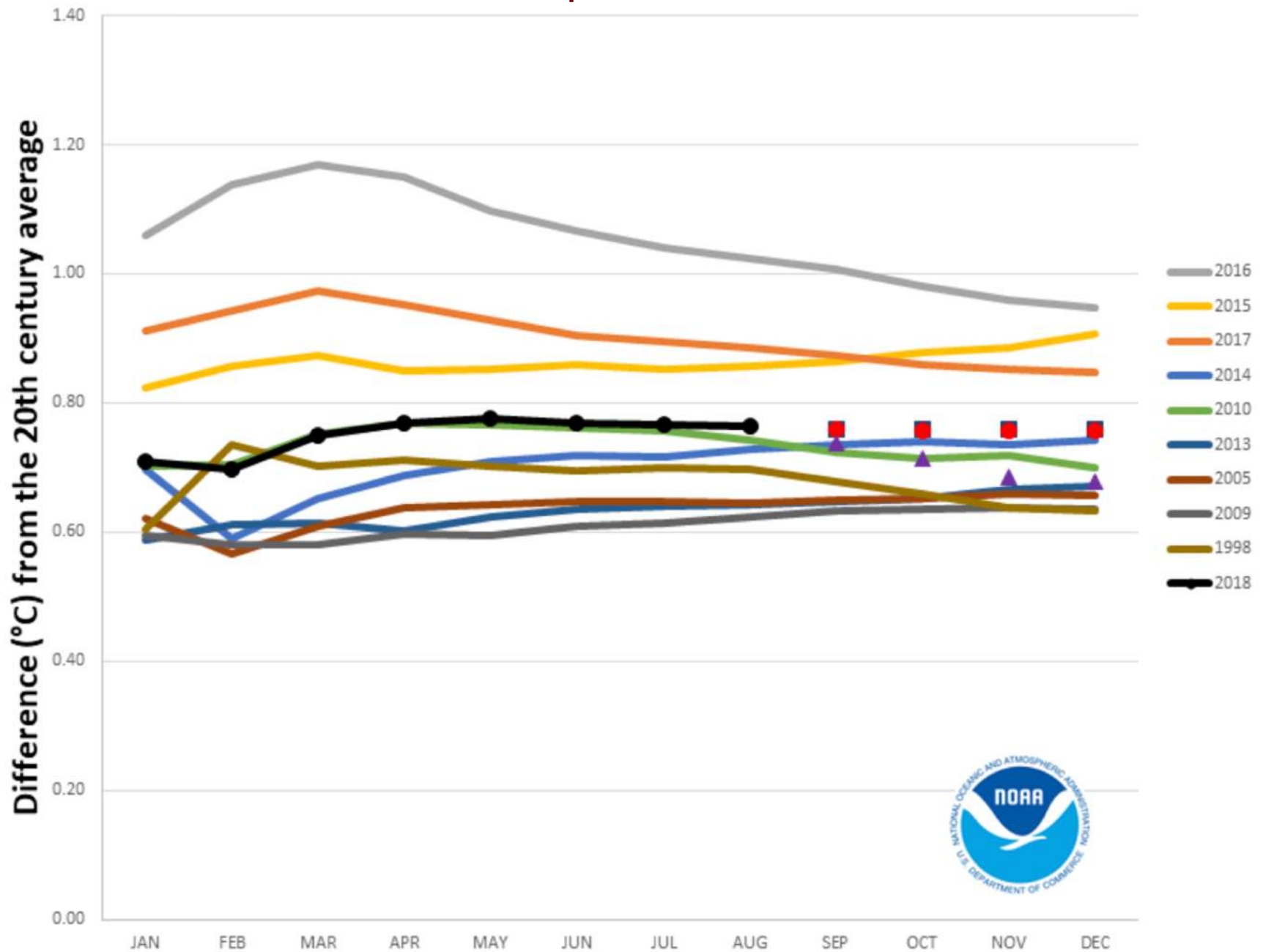
Dave Sauchyn, PhD, PGeo

Prairie Adaptation Research Collaborative (PARC), University of Regina

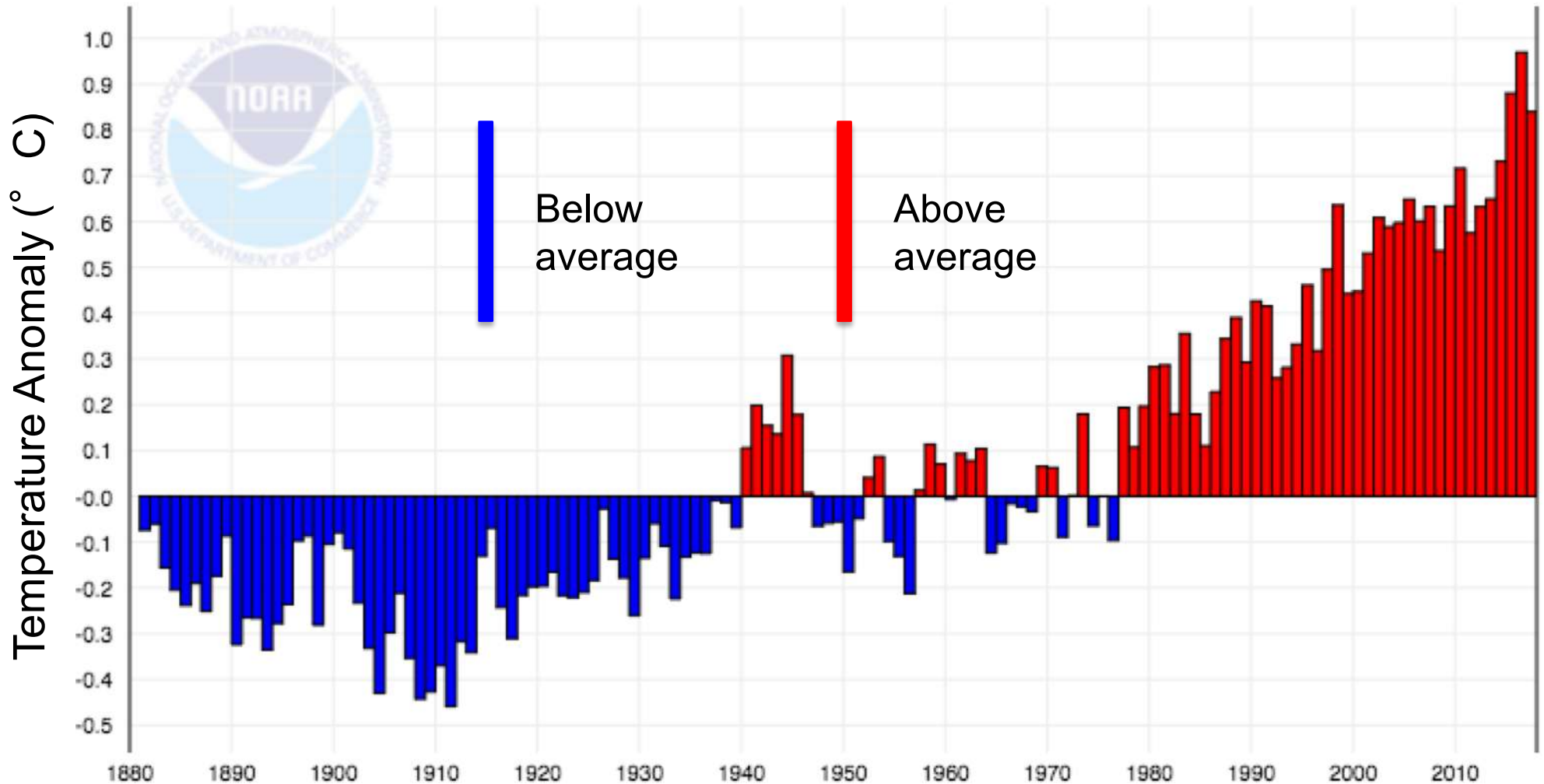


Water and Agriculture Conference, 22 November 2018, Crossfield, AB

The 10 warmest years since 1880: Global temperature anomalies

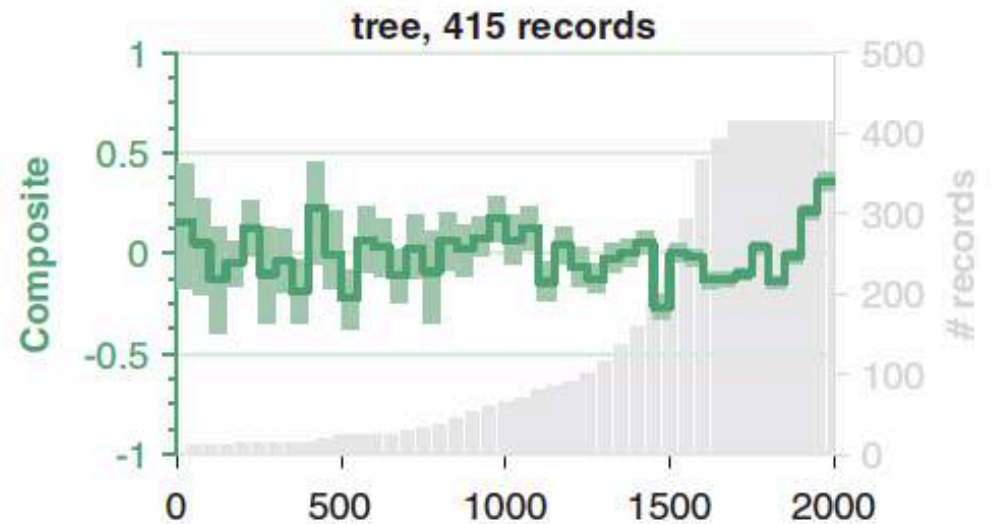
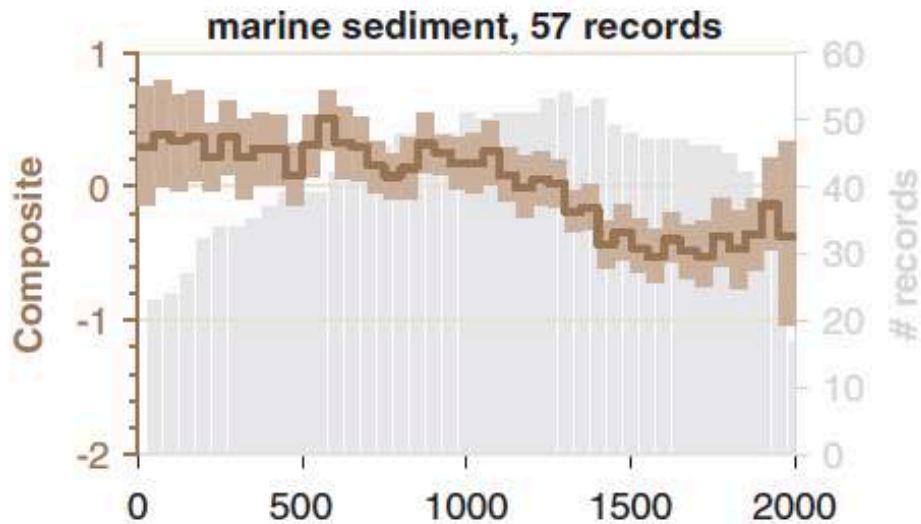
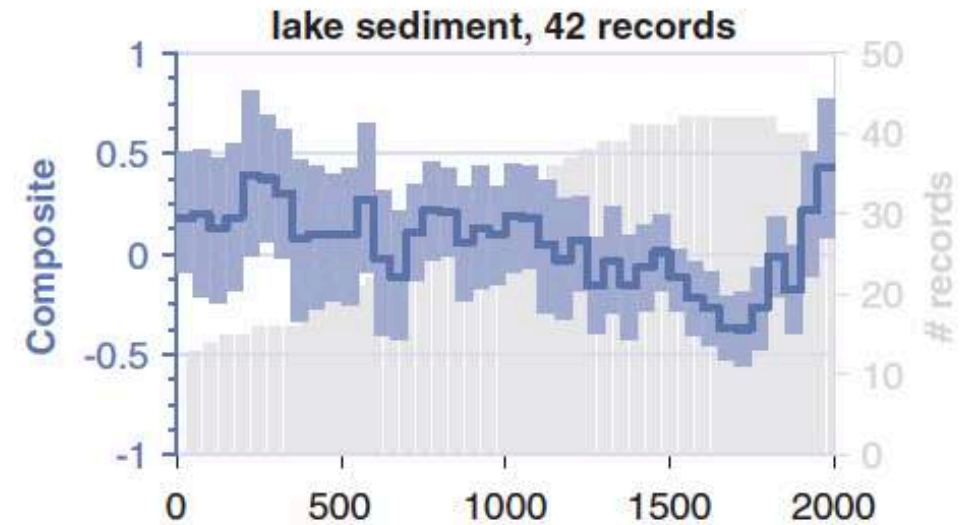
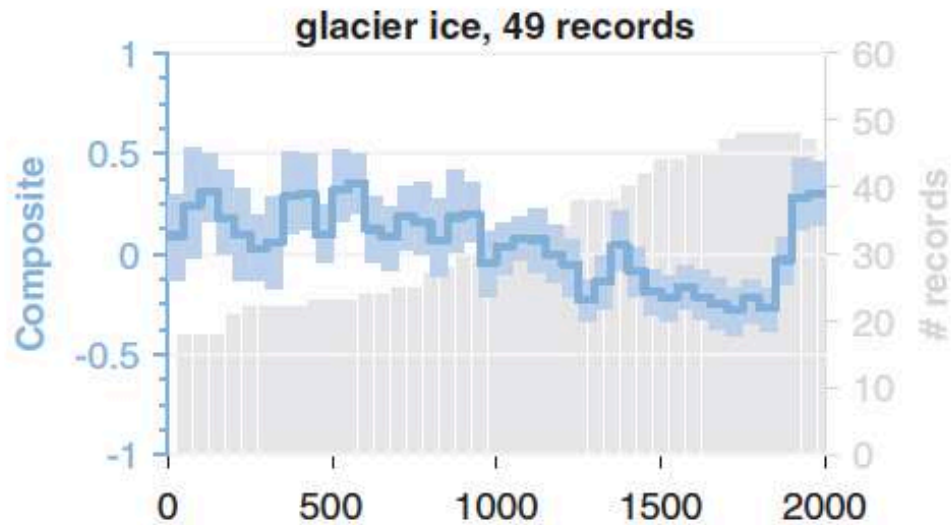


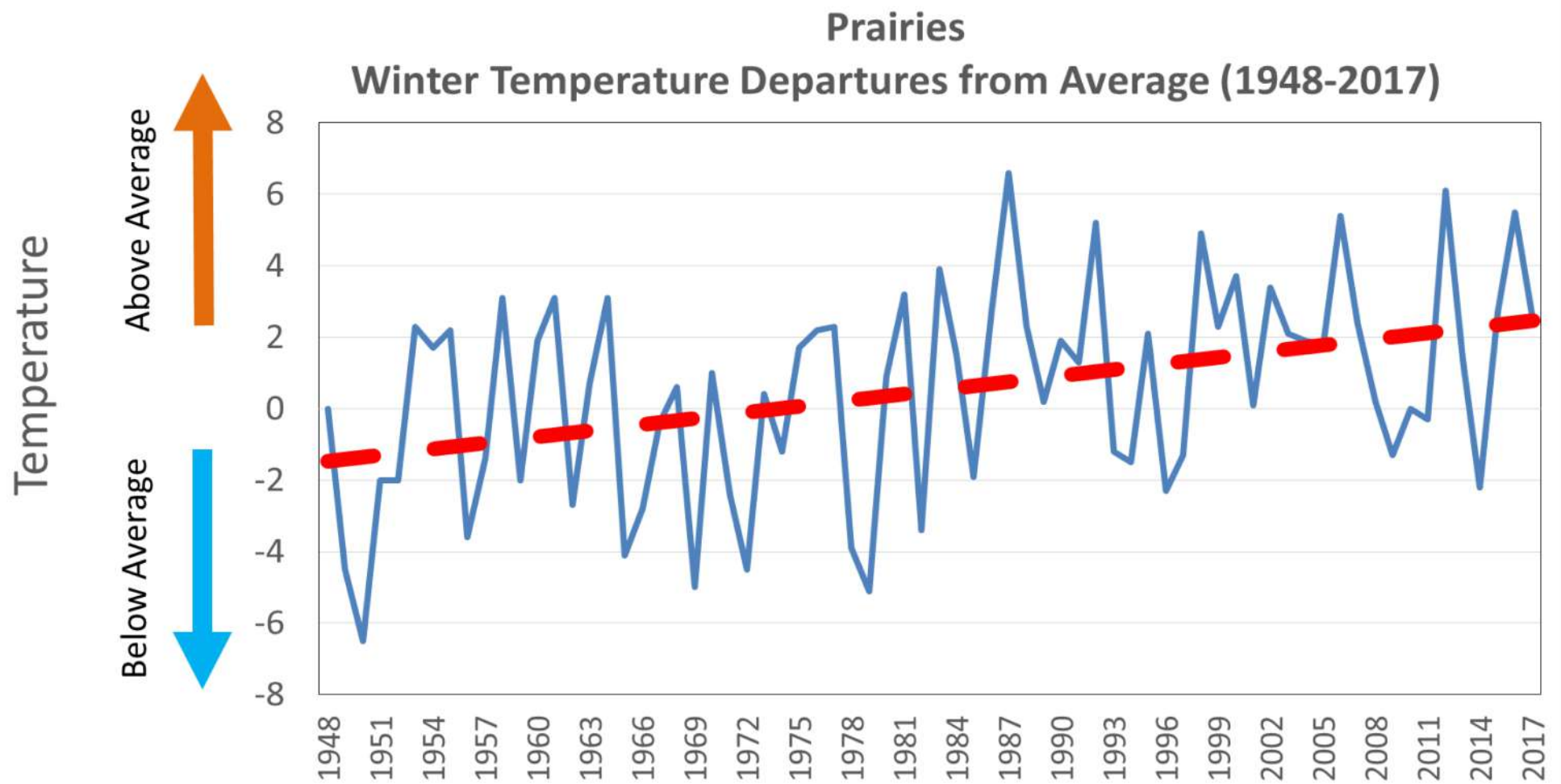
October 2018 marks was the **406th consecutive month** with temperatures above the 20th century average.





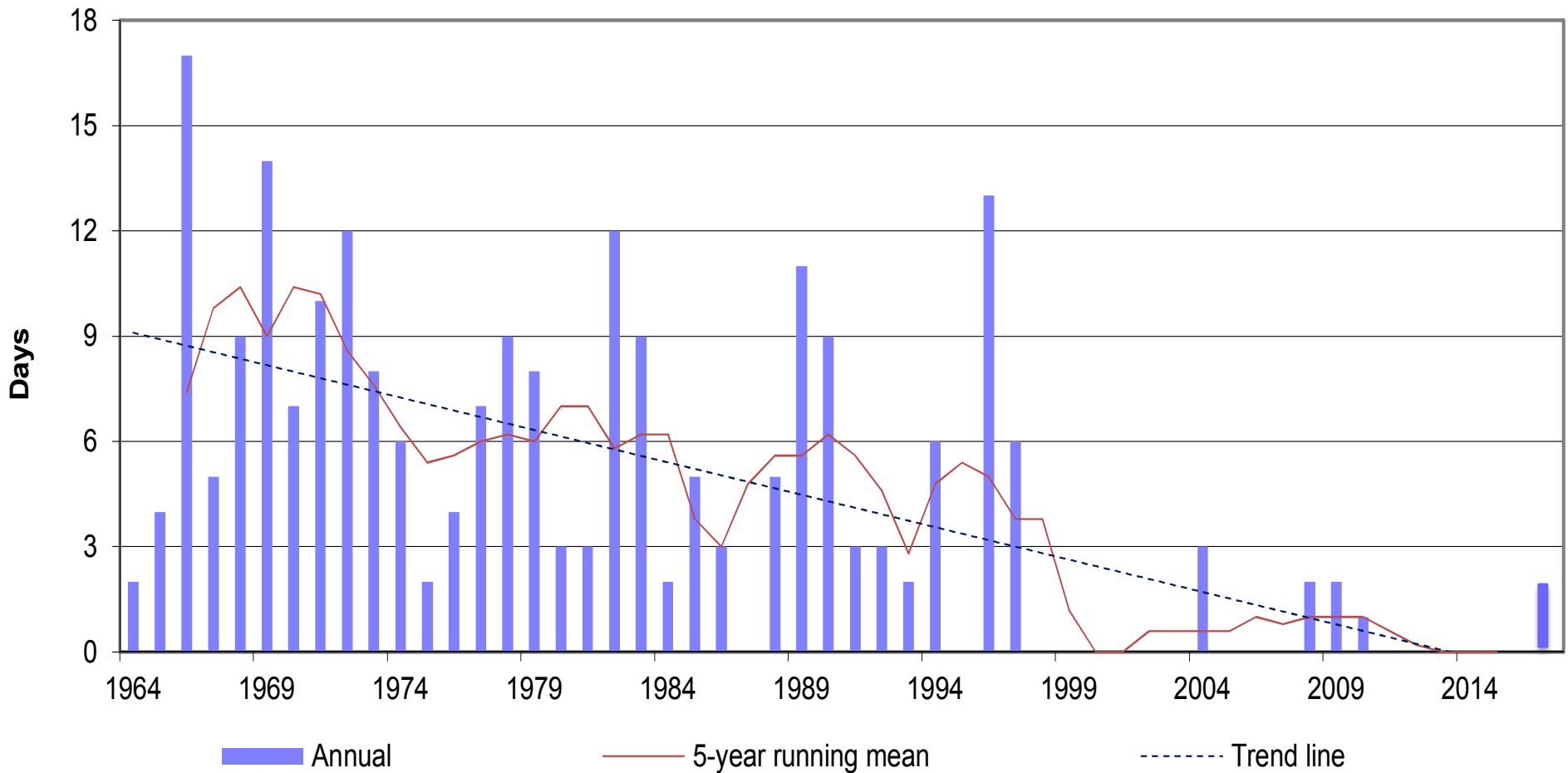
PAGES2k Consortium. 2017. A global multi-proxy database for temperature reconstructions of the Common Era, *Nature Scientific Data*





The Prairies are getting less cold

Extreme cold days (- 35 C and less) are vanishing 1964-2017, Saskatoon



Source: Wittrock 2018

We are losing the advantage of a cold winter



The view of Canada as a cold but warming country:

"**You're lucky** because you're a northern-latitude country, Mendelsohn says. "If you add it all up, **it's a good thing for Canada.**"

Robert Mendelsohn, Yale University

For countries like **Canada** and Russia, though, even more dramatic [than 2°] **warming wouldn't be a problem**

Benny Peiser, John Moores University (Liverpool)

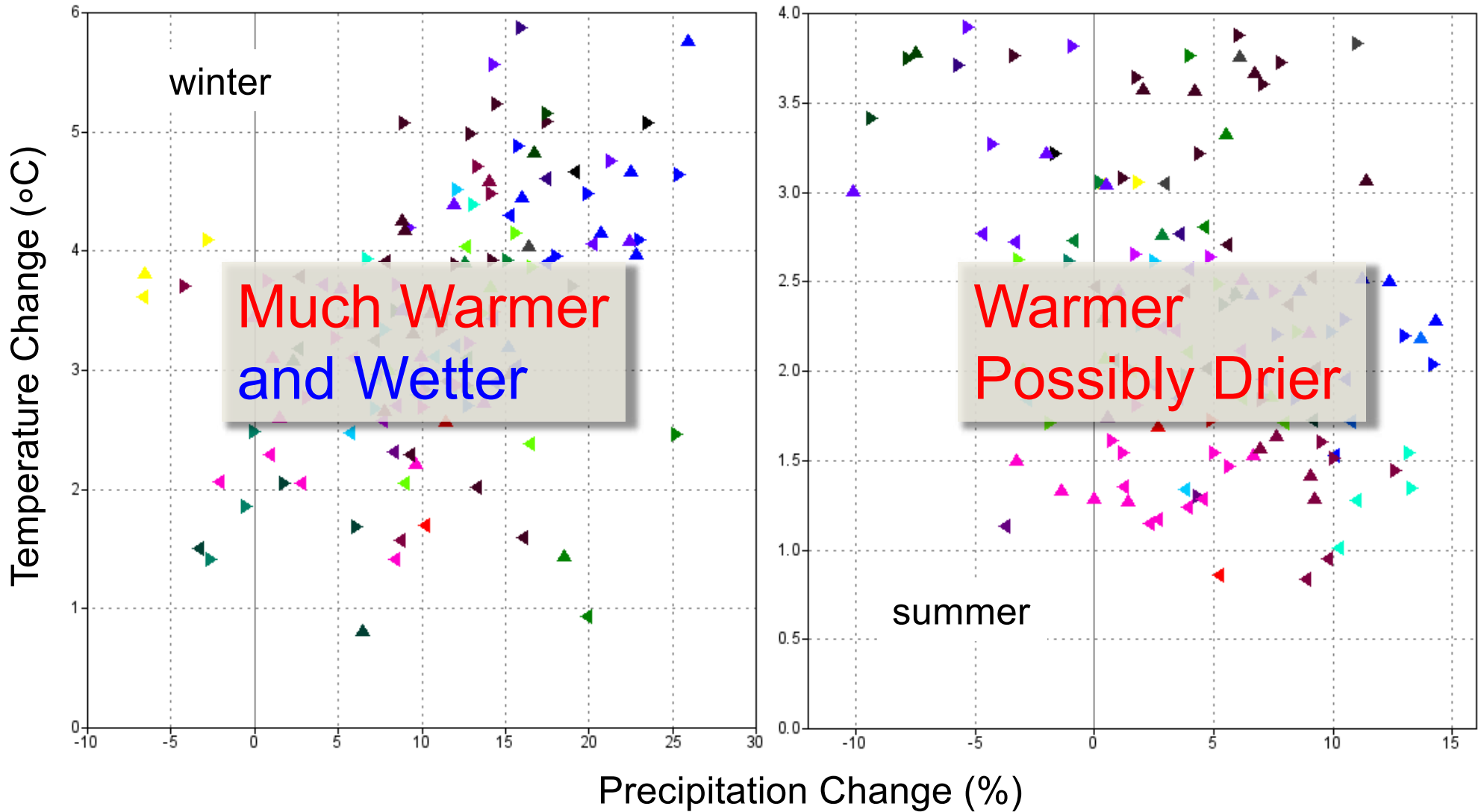
"We find a significant **increasing** trend in the **length of the growing season** and in the associated **available heat**. The **winter temperature is less damaging** and the frost-free periods are longer."

Qian et al. 2010

"in the case of **wheat, Canada** is projected by most models to replace the former Soviet Union [by 2050] to become **one of the top three exporters** in the world."

Food and Agriculture Organization (FAO)

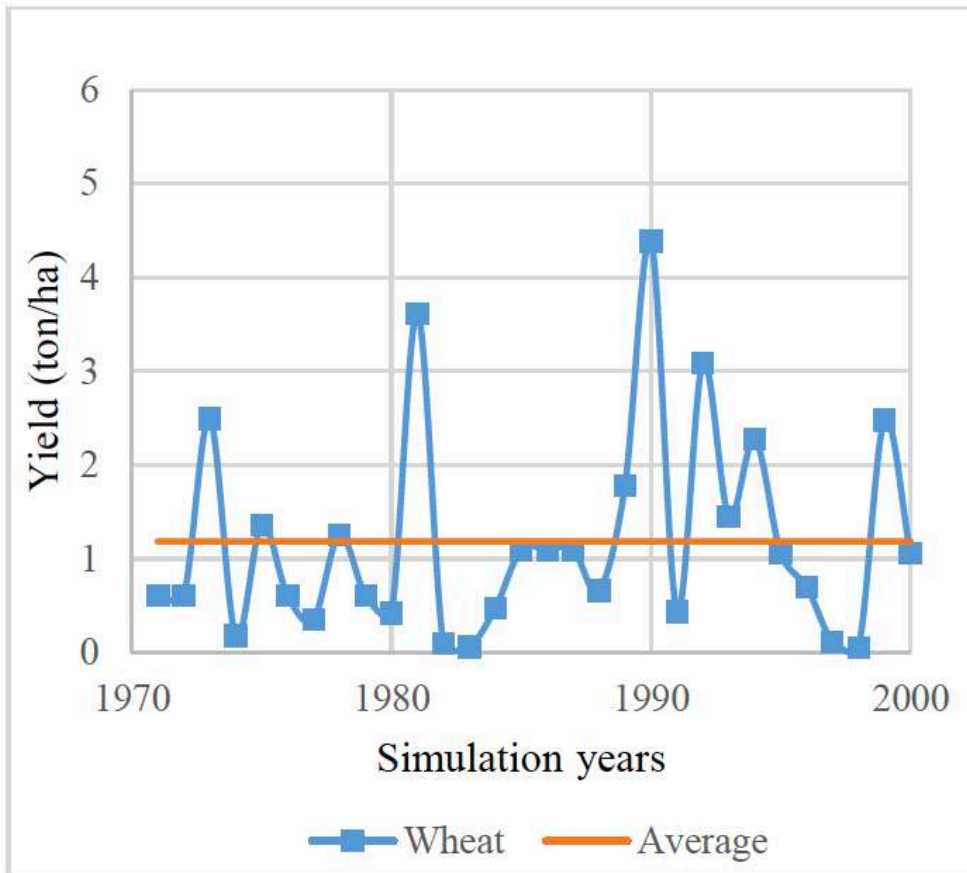
Projected Climate Changes, Western Canada 1971-2000 versus 2040-2069



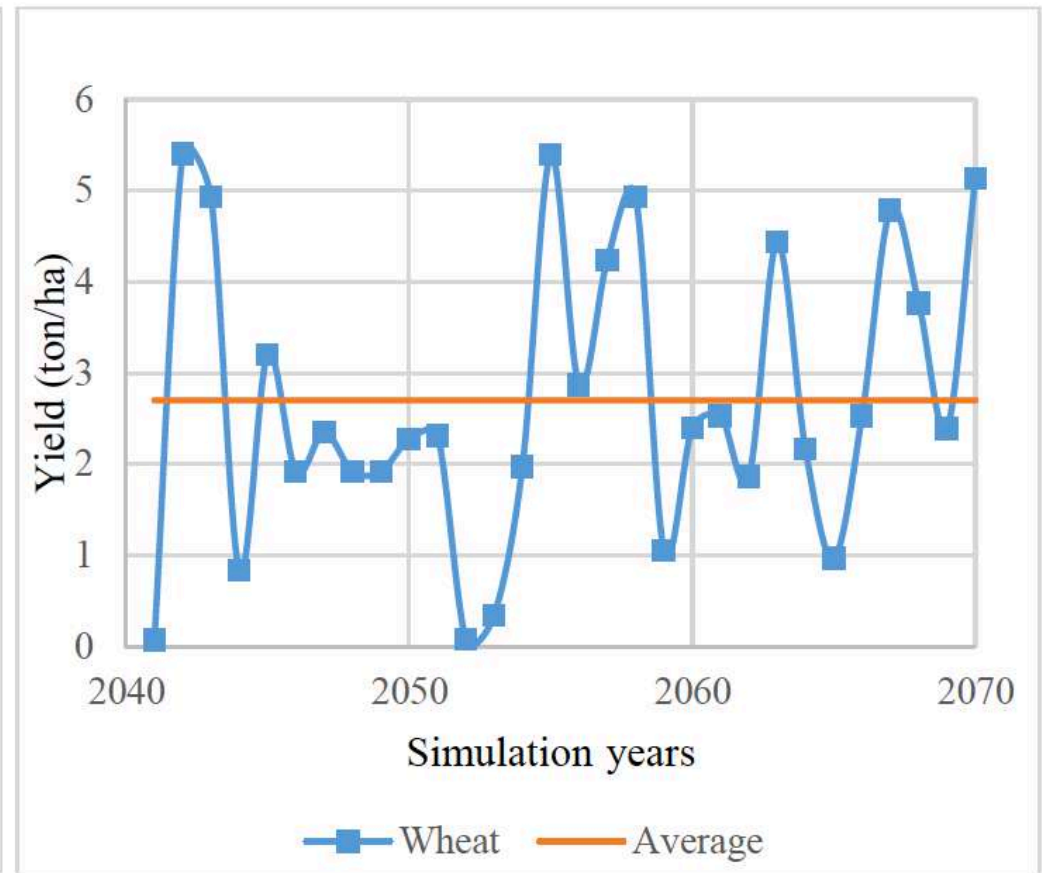
Source: PCIC

Crop Yield Simulations, Pincher Creek – Spring Wheat

1971-2000



2041-2070

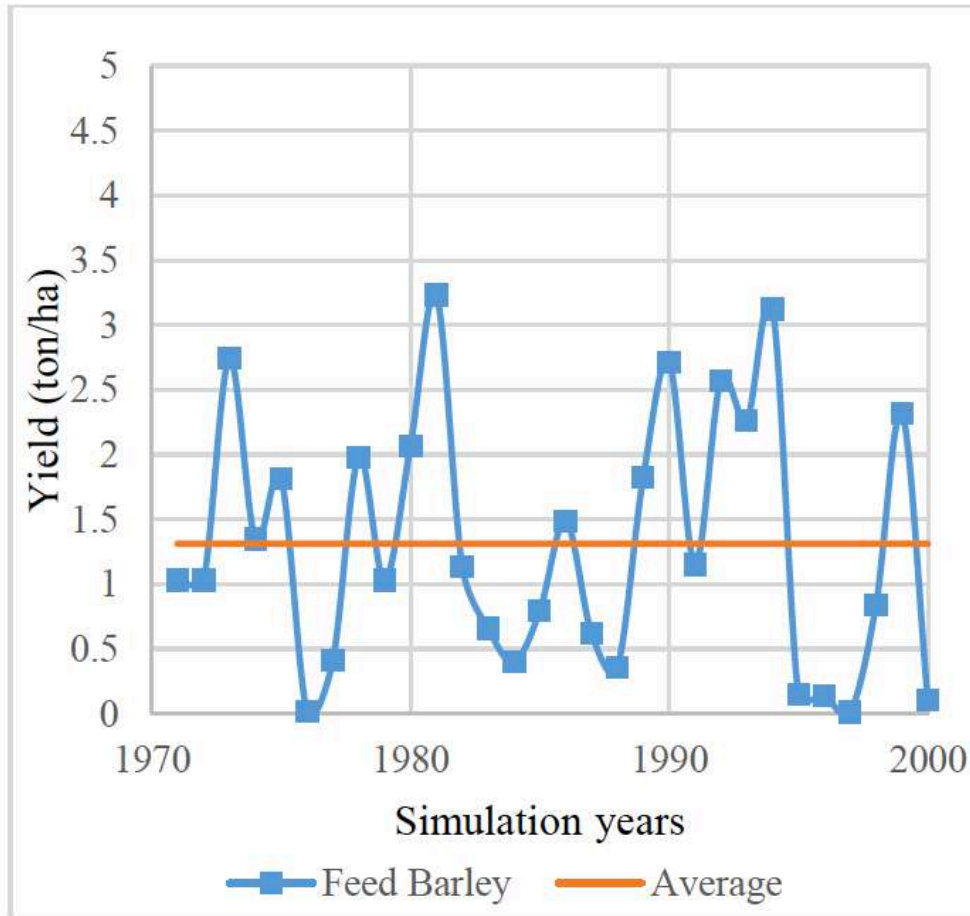


- AquaCrop model
- RCM3_CGCM3_A2 climate projection

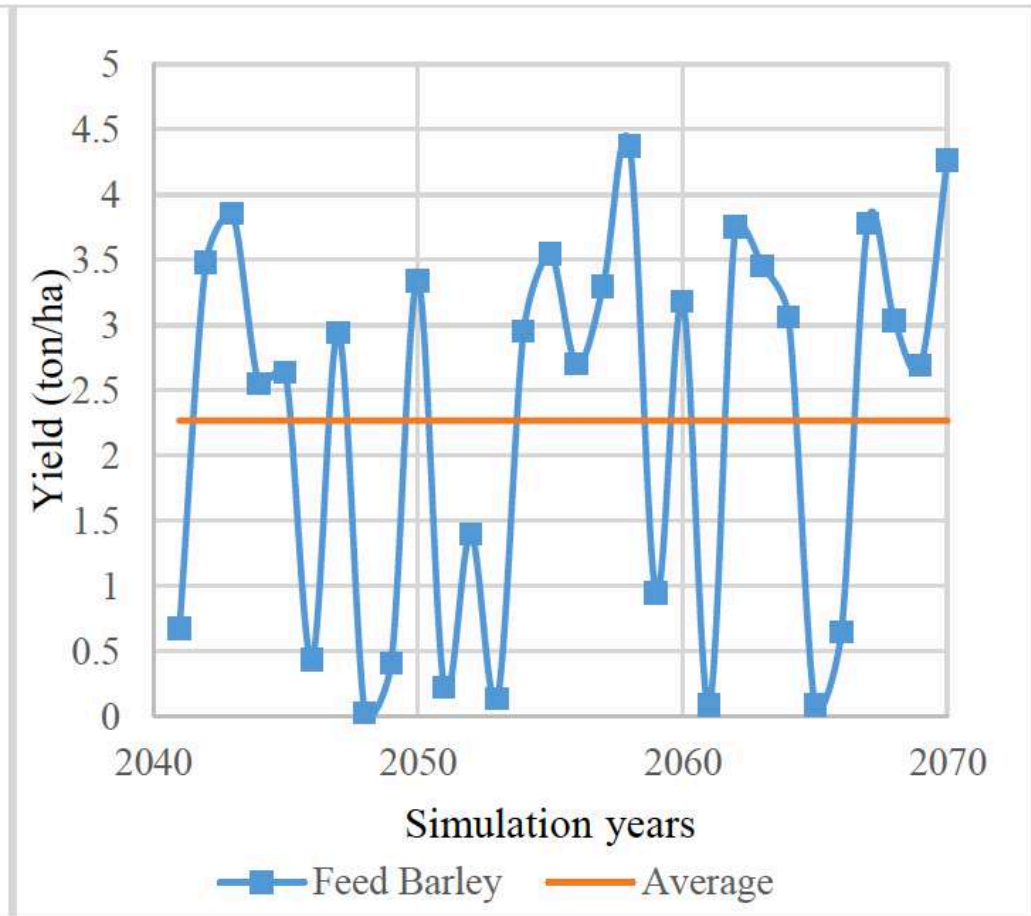
Poudel (2016)

Crop Yield Simulations, Pincher Creek – Feed Barley

1971-2000



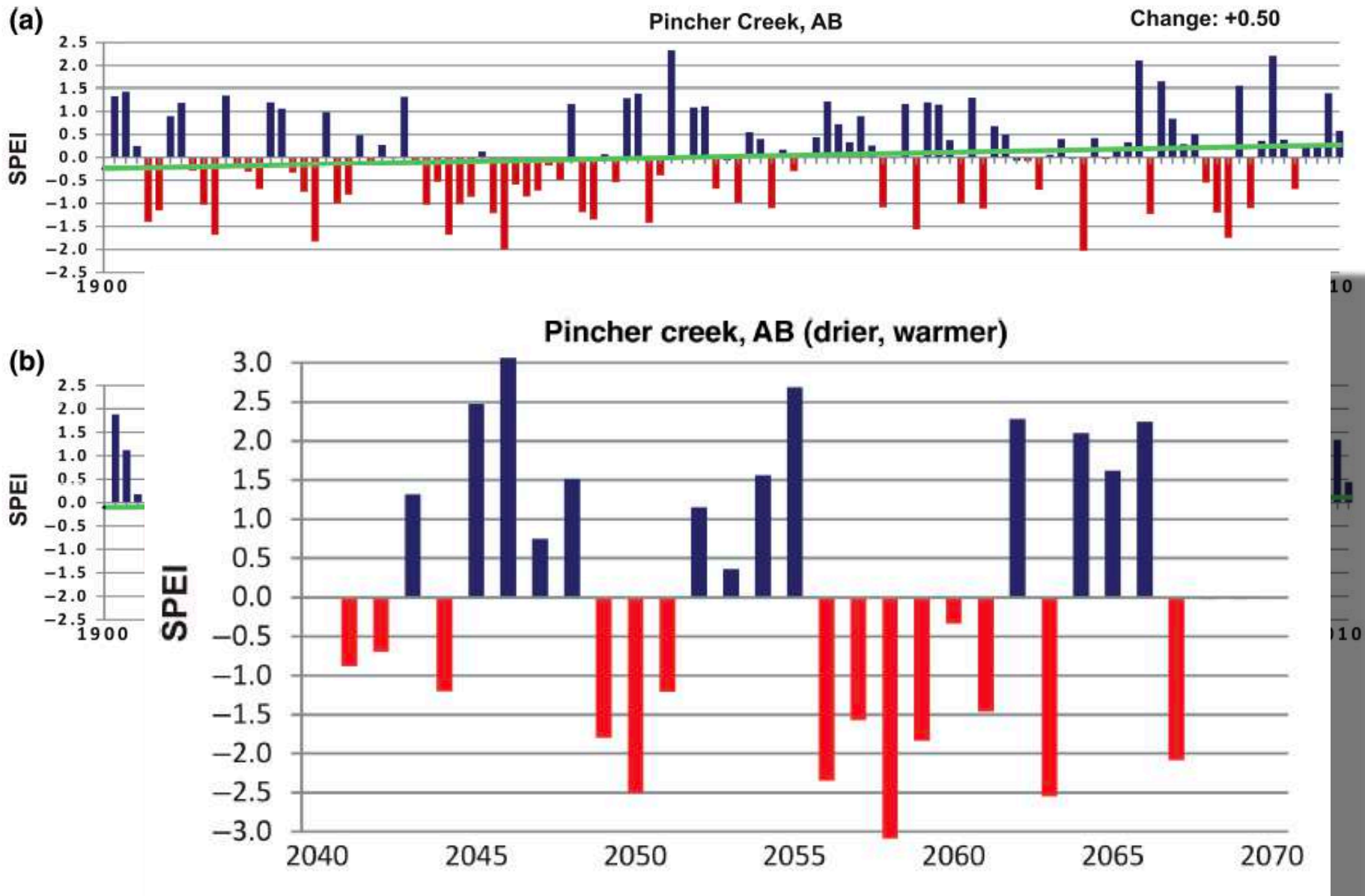
2041-2070



- AquaCrop model
- RCM3_CGCM3_A2 climate projection

Poudel (2016)

Standardized Precipitation Evapotranspiration Index (SPEI)



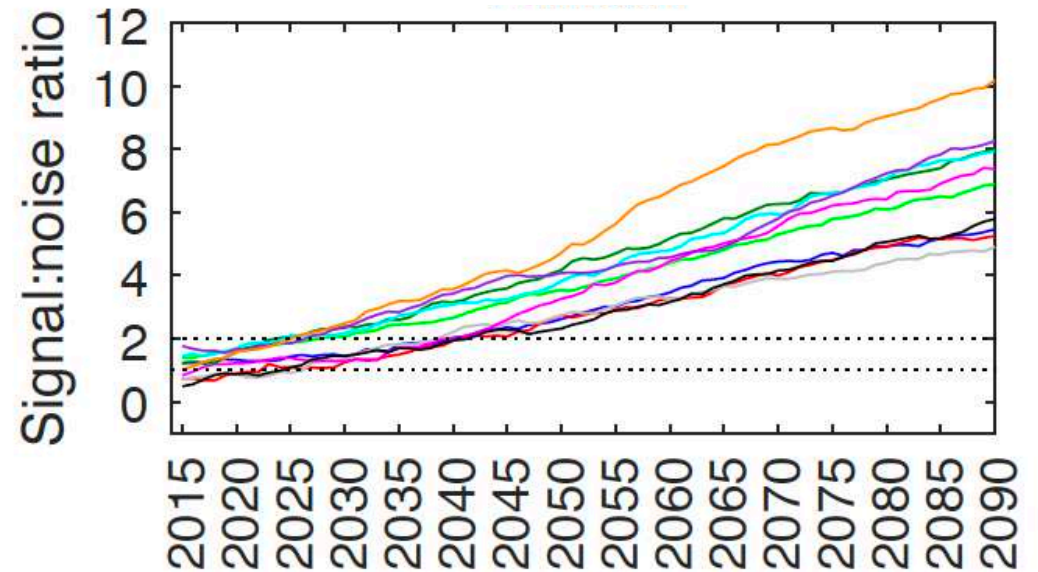
When will we notice climate change?

Signal: anthropogenic warming

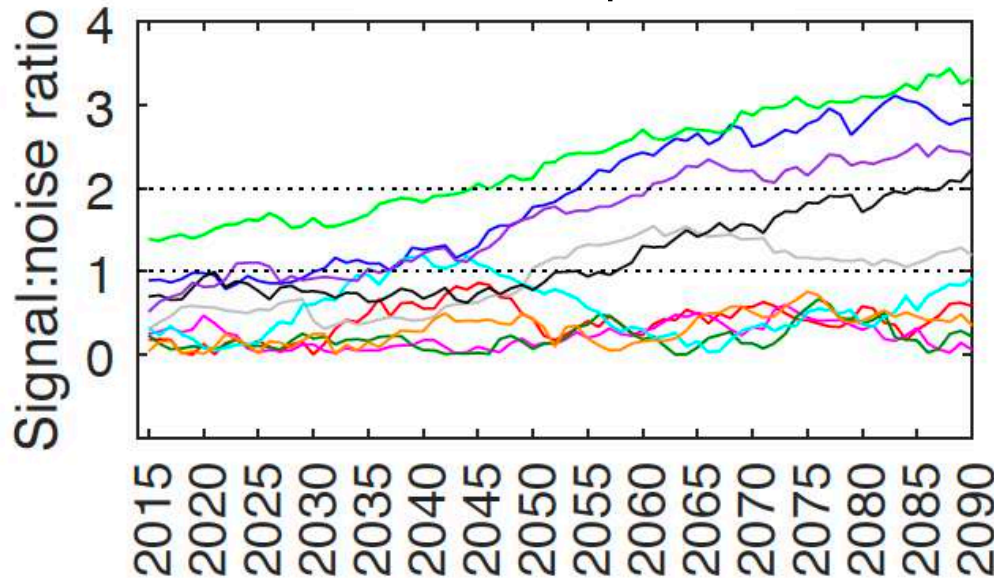
Noise: natural variability

Barrow and Sauchyn, 2018

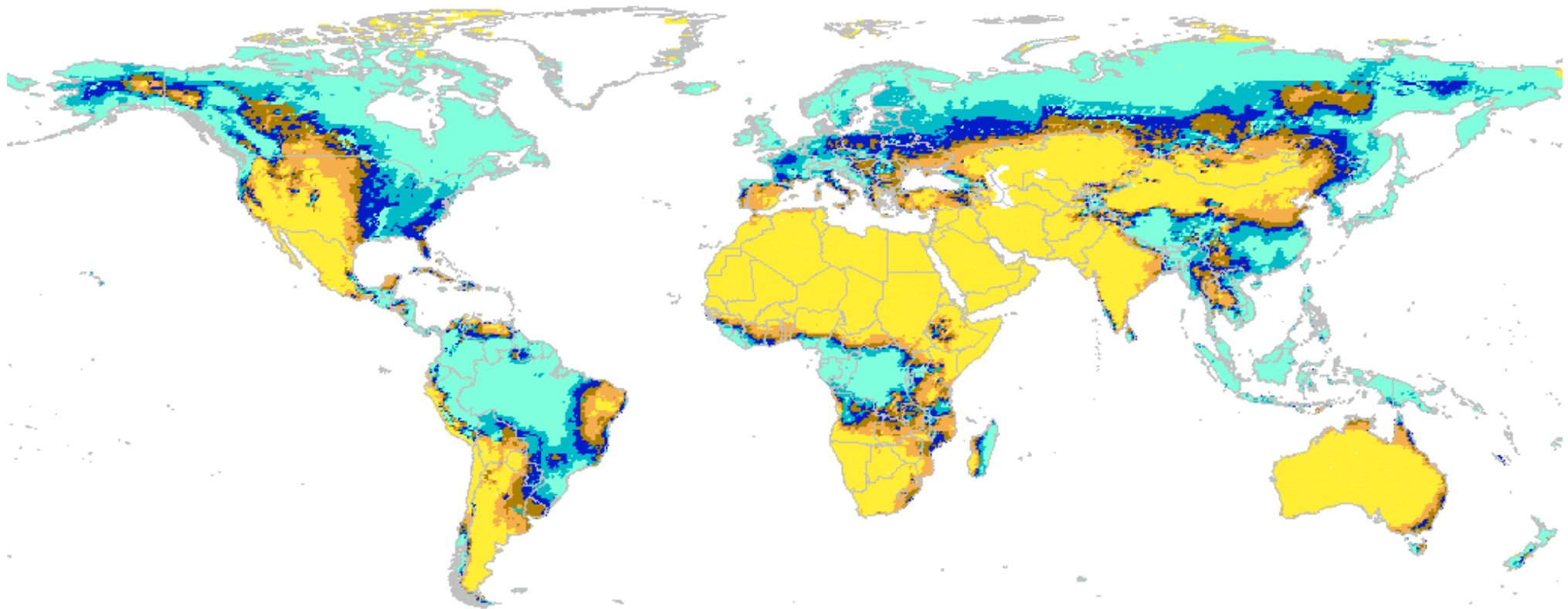
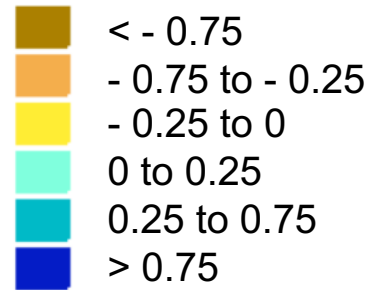
S/N: Temperature



S/N: Precipitation



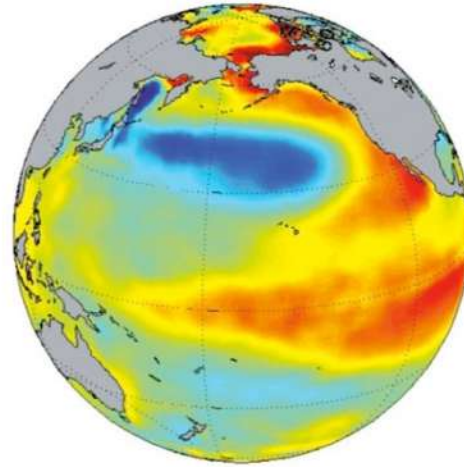
Inter-annual variation in the Climate Moisture Index (P-PET)



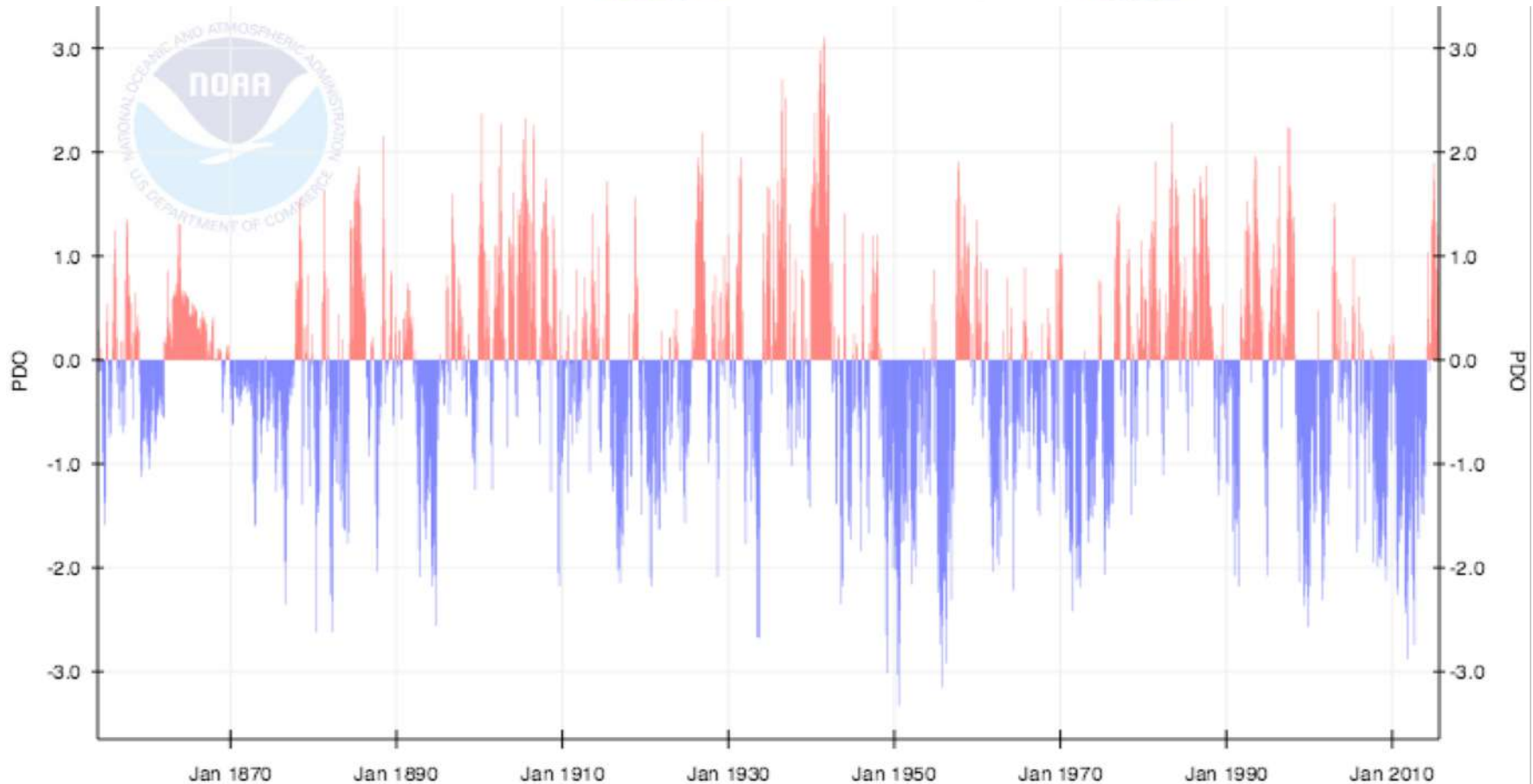
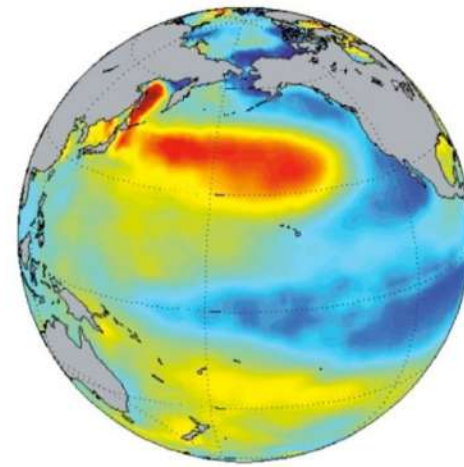


Pacific Decadal Oscillation

Warm Phase



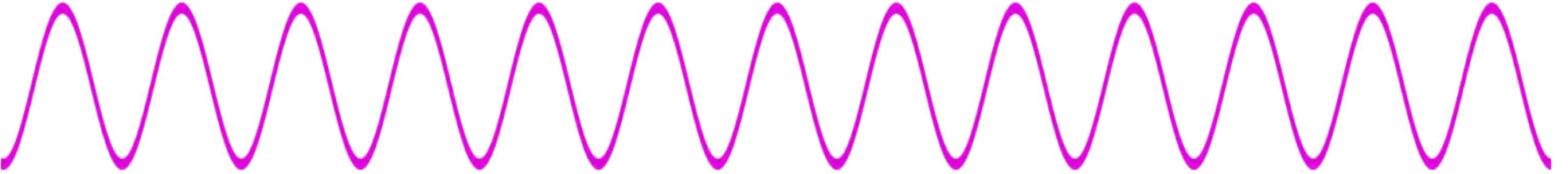
Cold Phase



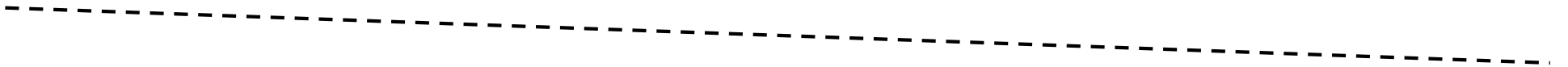
decadal cycle

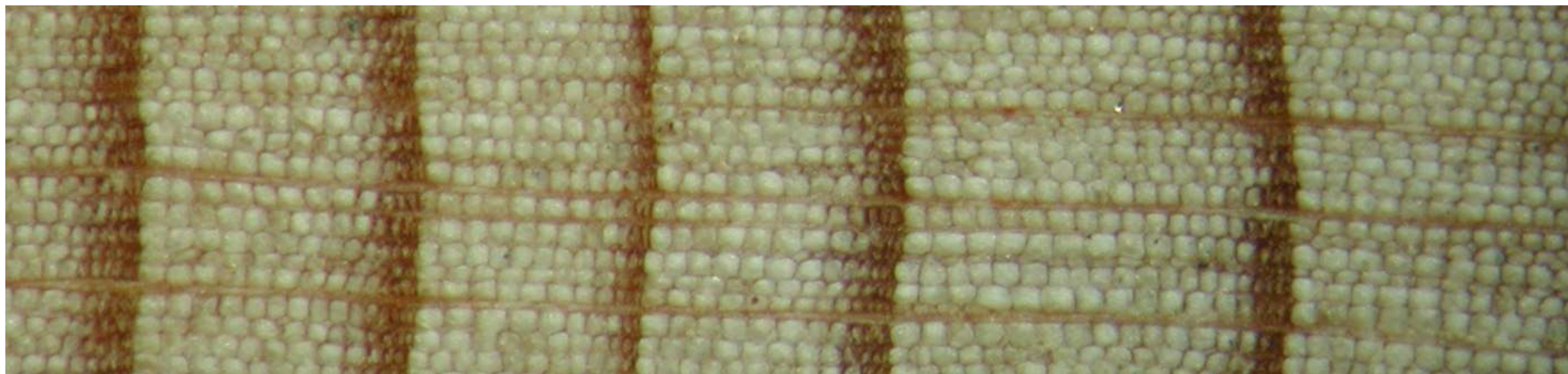


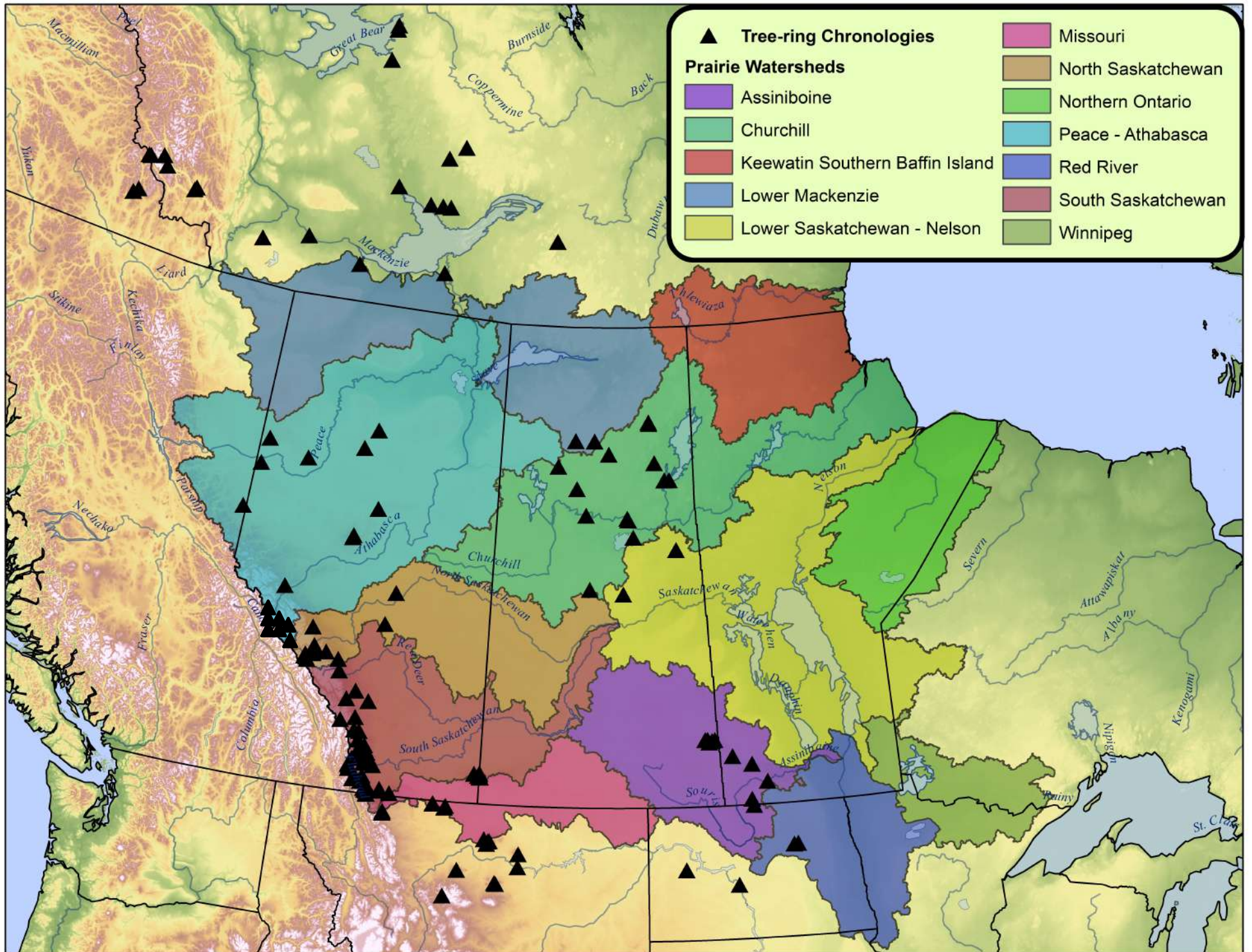
annual cycle



trend





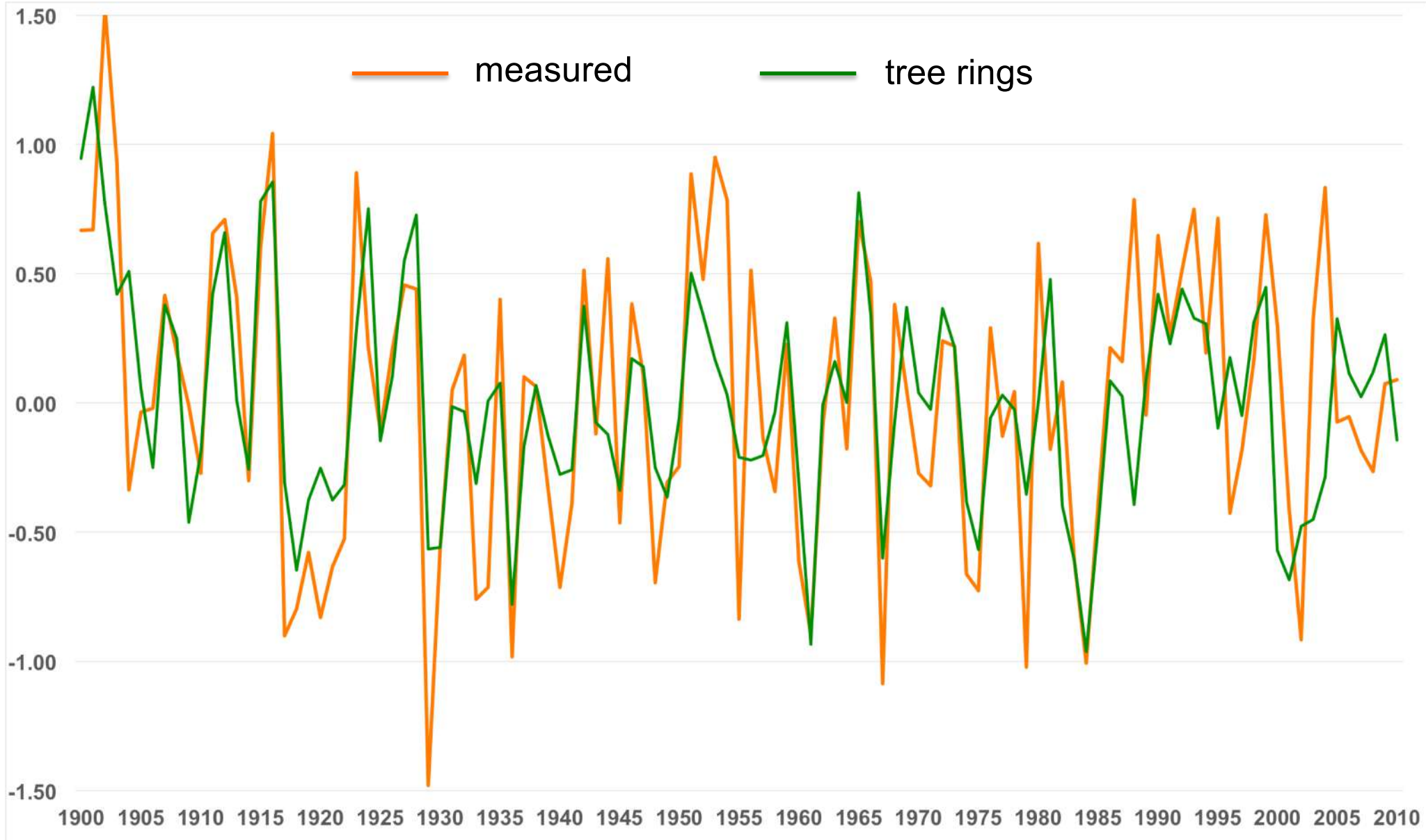


Bow River at Stoney Trail, Calgary





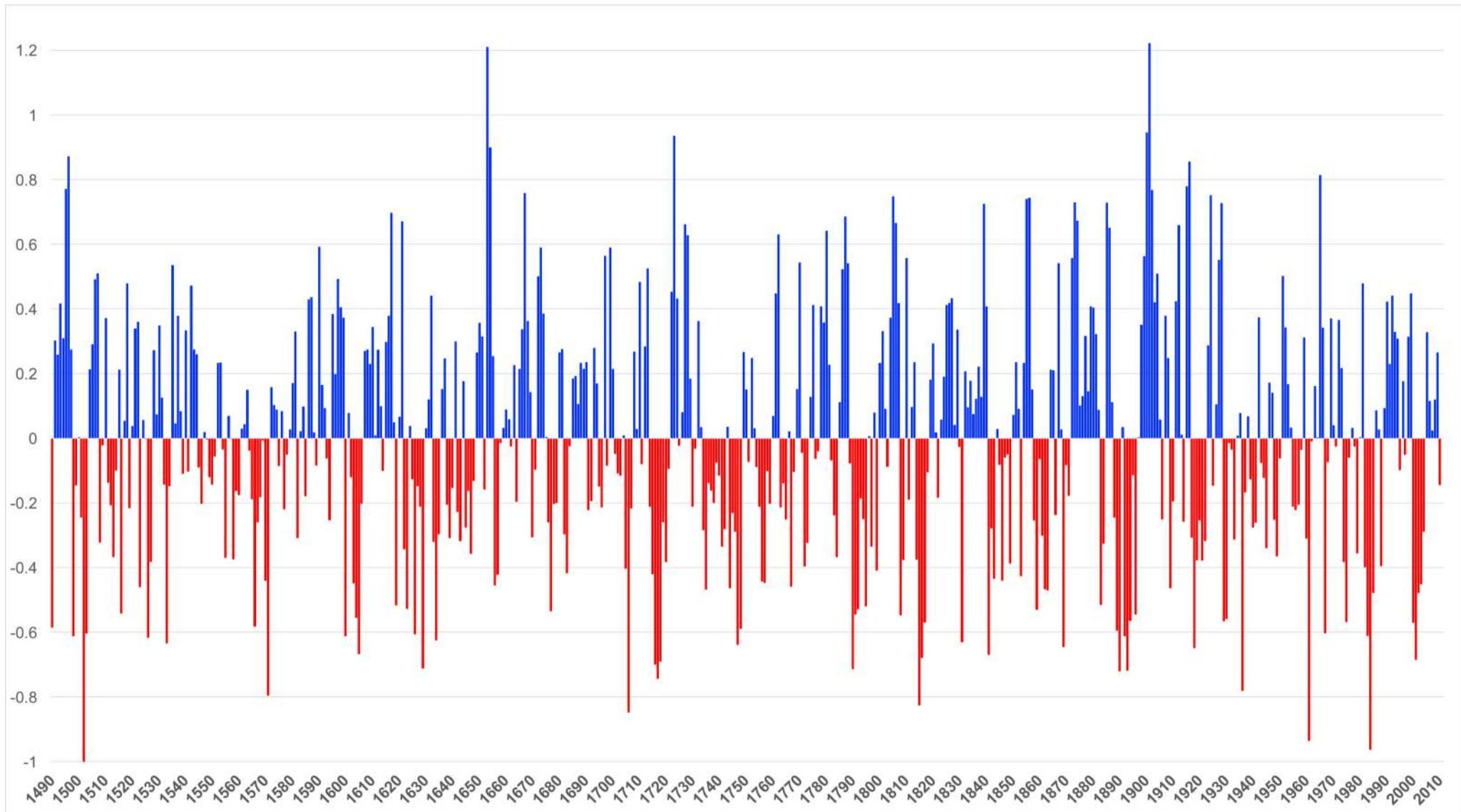
Growing Season SPEI* near Olds, AB, 1490-2010



* Standardized Precipitation Evapotranspiration Index

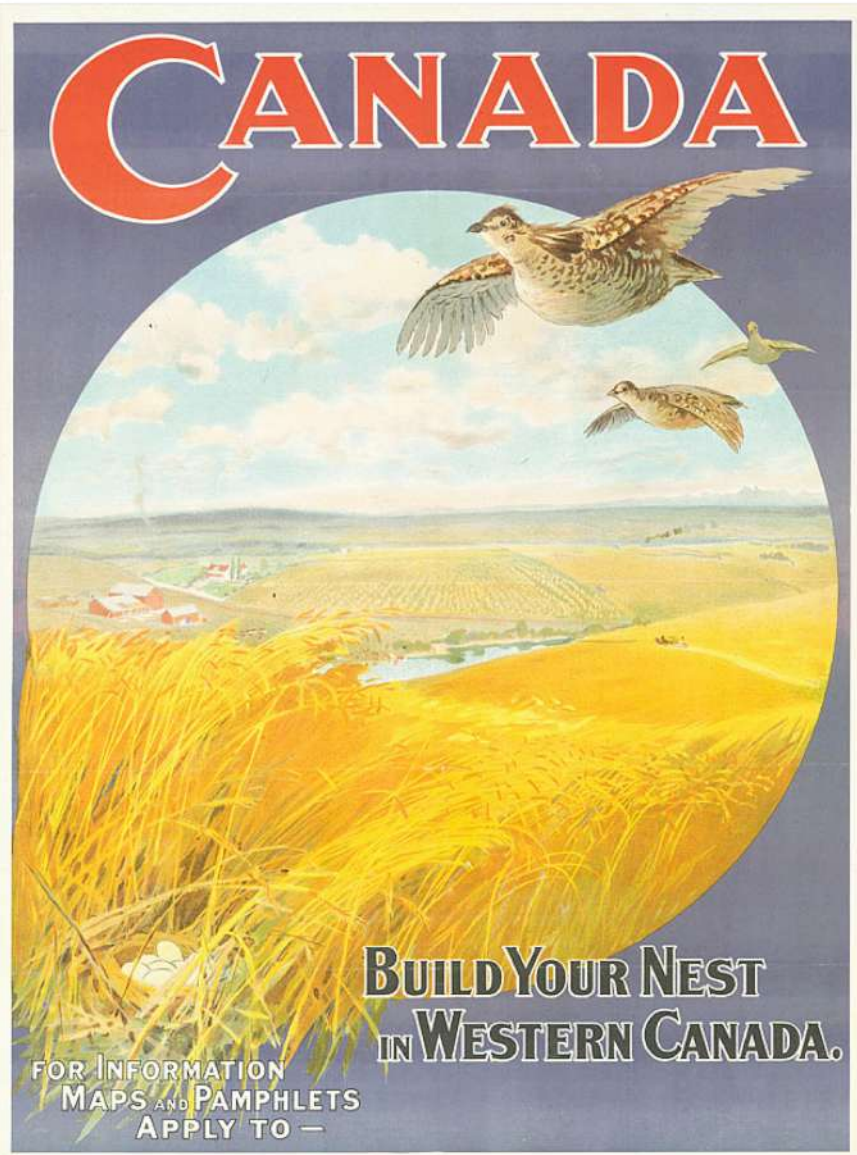
Growing Season SPEI near Olds, AB, 1490-2010

— wet year — dry year



It would be almost criminal to bring settlers here to try to make a living out of straight farming.

Our True Immigration Policy,
Medicine Hat Times, Feb 5, 1891



	1901	1911	1921	1931
SK	91,279	492,432	757,510	921,785
AB	73,022	374,295	588,454	731,605



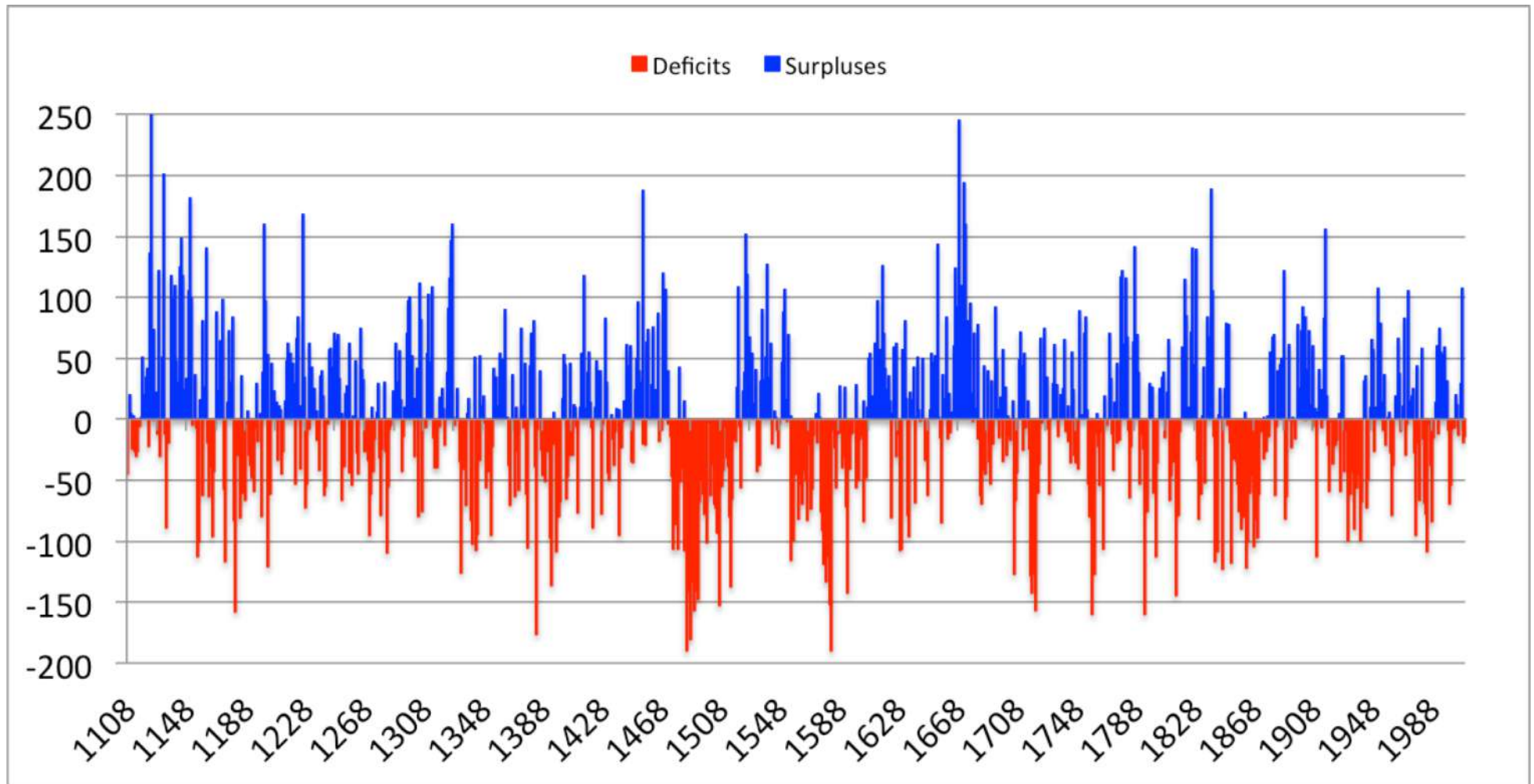
*why do keep
collecting more
wood, don't you
have enough?*

- Farmer X



Flagstaff County Agricultural Symposium
Sedgewick, Alberta, 28 July 2012

Mean Water Year Flow (m³/s) South Saskatchewan River at Medicine Hat, 1108-2010



Vulnerability and Adaptation to Climate Extremes in the Americas (VACEA)

Vulnerabilidad y Adaptación a los Extremos
Climáticos en las Américas



Principal Investigators:

Los investigadores principales

Dr. Dave Sauchyn, University of Regina, Canada
Dr. Fernando Santibañez, Universidad de Chile, Santiago



Social Sciences and Humanities
Research Council of Canada

www.parc.ca/vacea/

2042	0401	0.00	16.43	-0.36
2042	0402	0.05	14.54	-0.87
2042	0403	0.37	9.23	-0.45

2042	0501	0.25	15.22	3.80
2042	0502	0.00	16.74	4.96
2042	0503	0.15	18.53	8.86



Bev and Keith Everts

2042	0429	2.05	9.86	2.81
2042	0430	13.76	13.30	3.46

2042	0529	11.10	19.98	8.35
2042	0530	0.02	19.17	9.01
2042	0531	0.00	21.59	8.91

HOT TOPICS

SPECIAL FEATURES

PODCASTS

VIDEOS

ABOUT

IRPP

Climate change adaptation on the farm and ranch

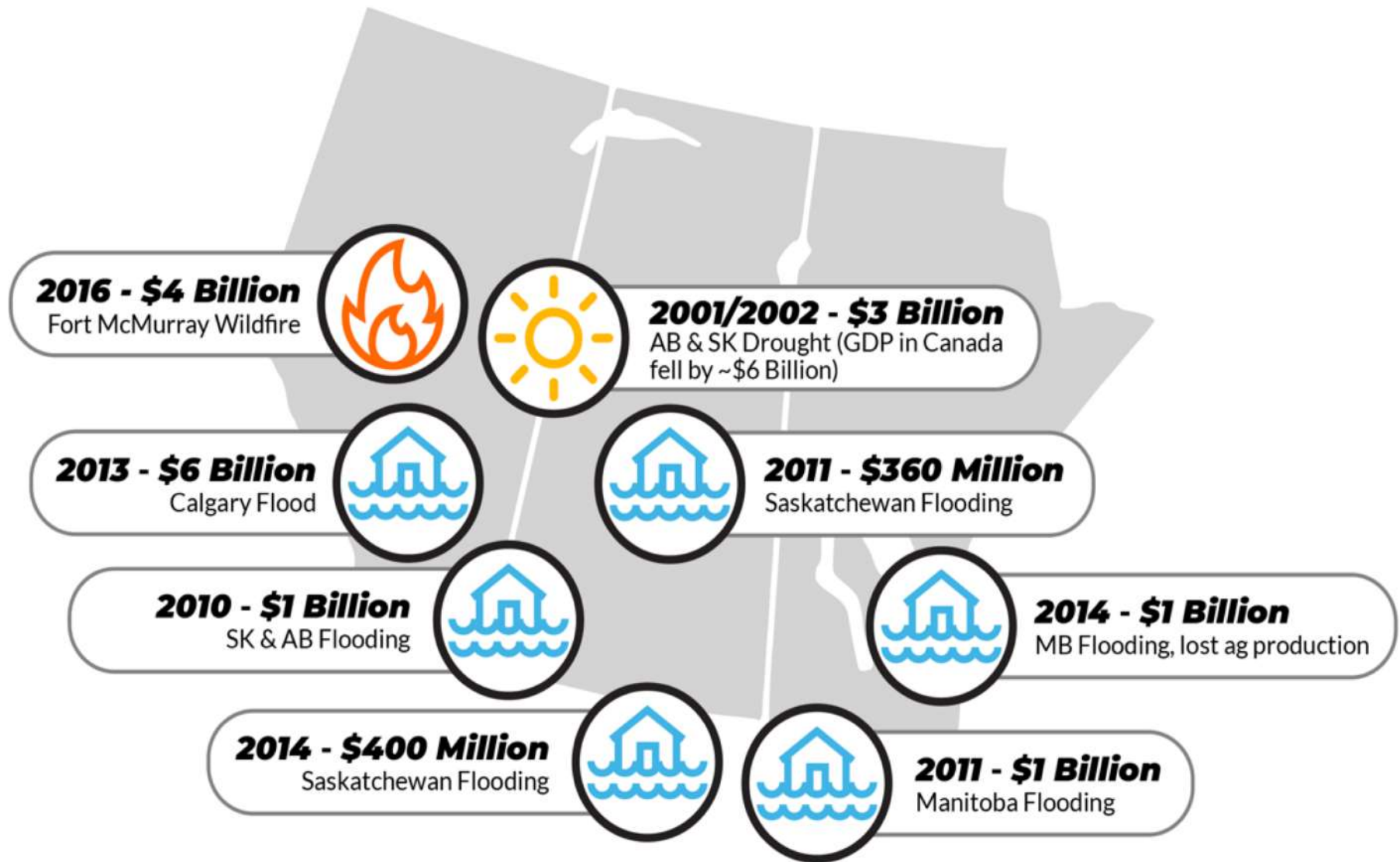
A meaningful climate change adaptation policy in the agri-food sector must include the families who are impacted by extreme and unexpected weather.

“I’ll believe in climate change when we get unexpected weather”
- *Irrigation District manager*

April 21, 2015



Recent Extreme Events in the Prairie Provinces

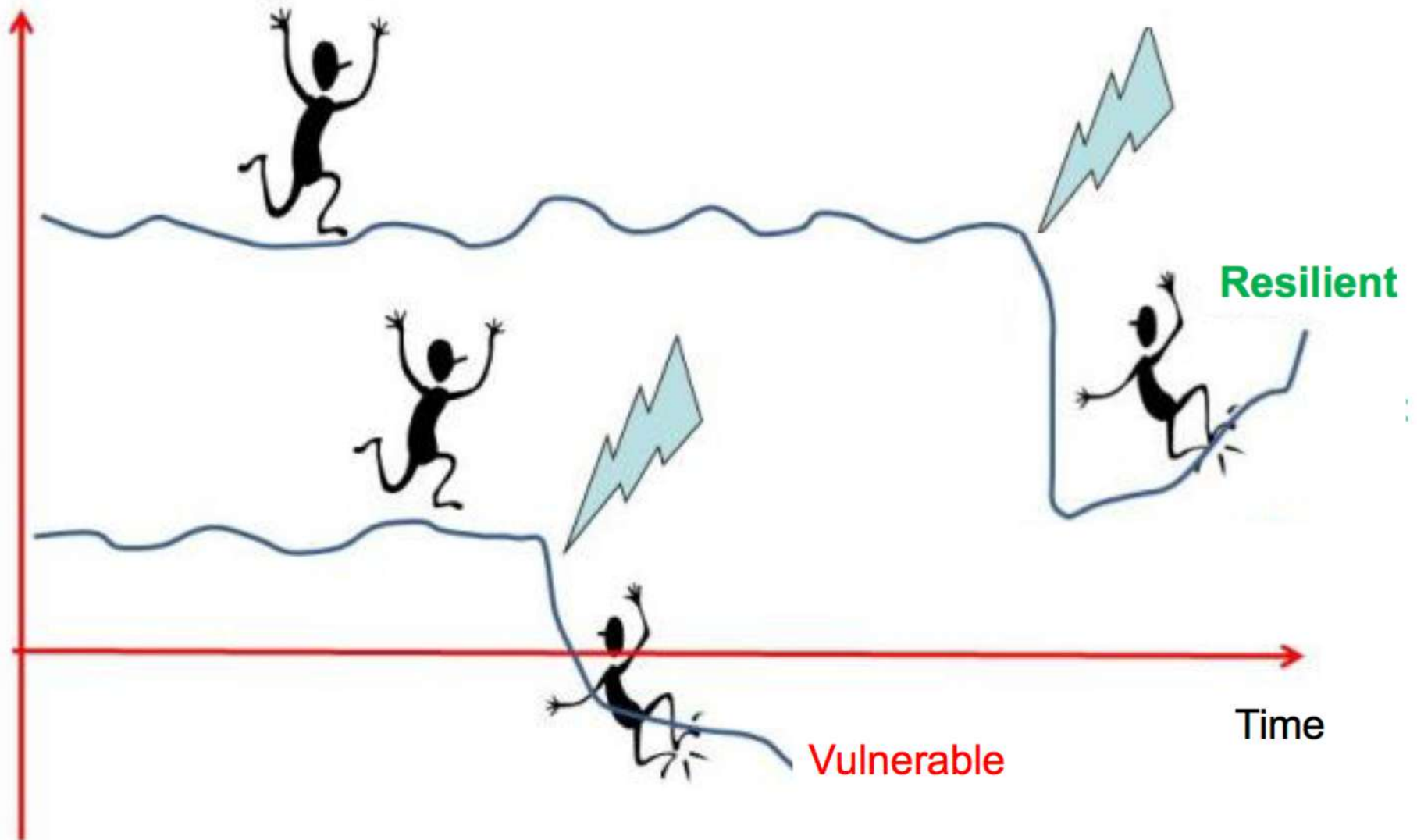


Source: PCC, U of W

“I don’t know how you plan for something that’s never happened” Regina Leader Post, 16 April 2015



Prepare for the Extremes



Key Principles of Sustainable Agriculture and Planned Adaptation to Climate Change

Planned Adaptation	Sustainable Agriculture
Sustainable	Sustainable
Engage the local community	Developed by local communities
Evidence-based	Science-based
A balanced / holistic approach	Integrated: complement existing programs and policies
Prioritized	Targeted
Flexible and adaptive	Flexible and adaptive
Transparent	Accountable

From: Sauchyn, D.J. **Sustainable Agriculture as Adaptation to Climate Change**, Farming for Tomorrow, Spring 2016

Opportunities

- Longer growing season
- More heat units
- Increased precipitation in winter
- Less cold, more favourable winter

Challenges

- Increased variability
- More favourable climate for pests and invasive species
- Less water stored as snow
- Reoccurrence of sustained drought but in a warmer climate

For more information:

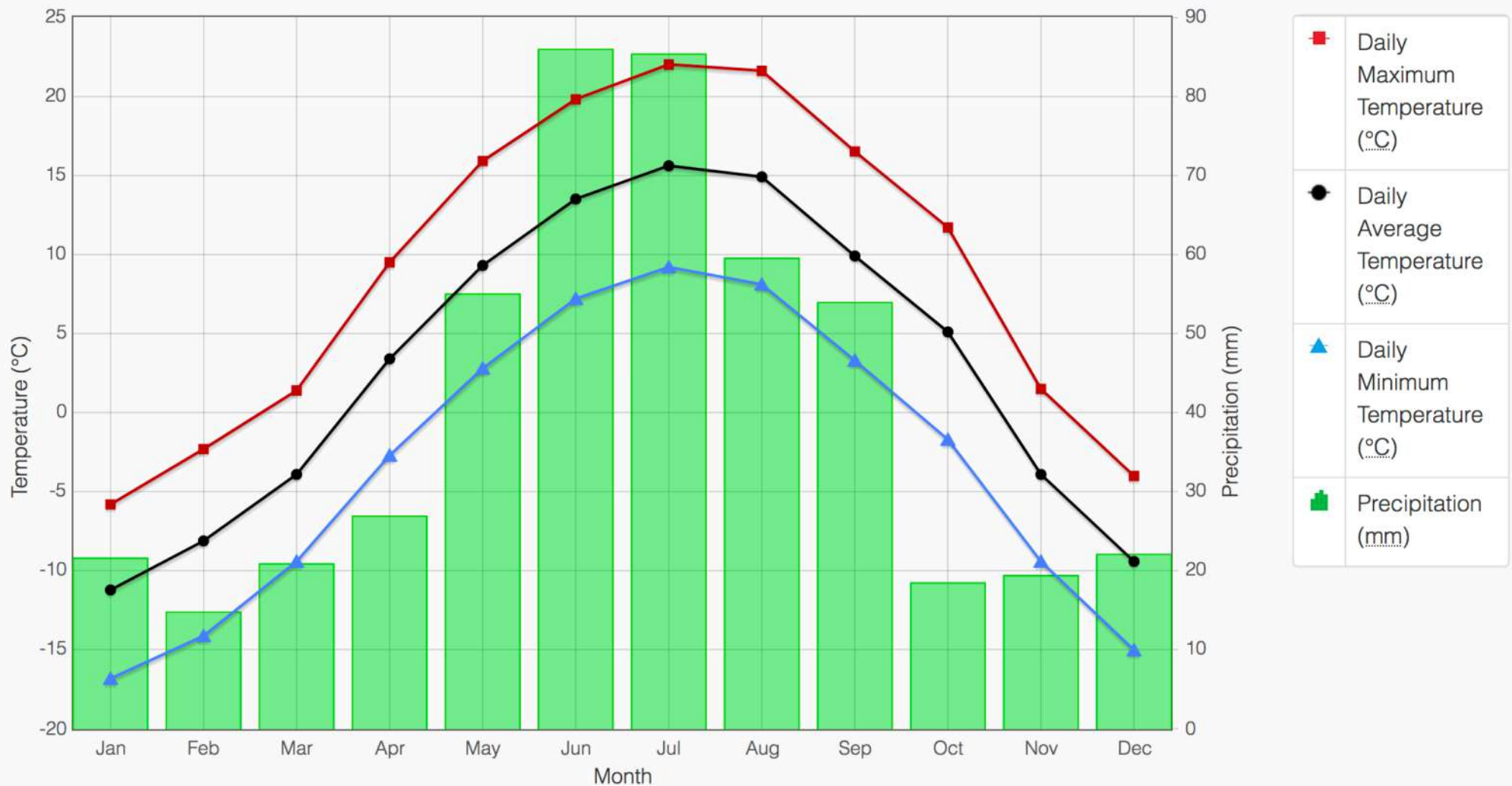
The **Prairie Adaptation Research Collaborative** was established in 2000, to provide scientific support for climate risk analysis and adaptation planning.

www.parc.ca

sauchyn@uregina.ca



'Normal' Climate for Olds: Average Monthly Precipitation and Temperature, 1961- 1990



Source: http://climate.weather.gc.ca/climate_normals/



Out Farm the Climate