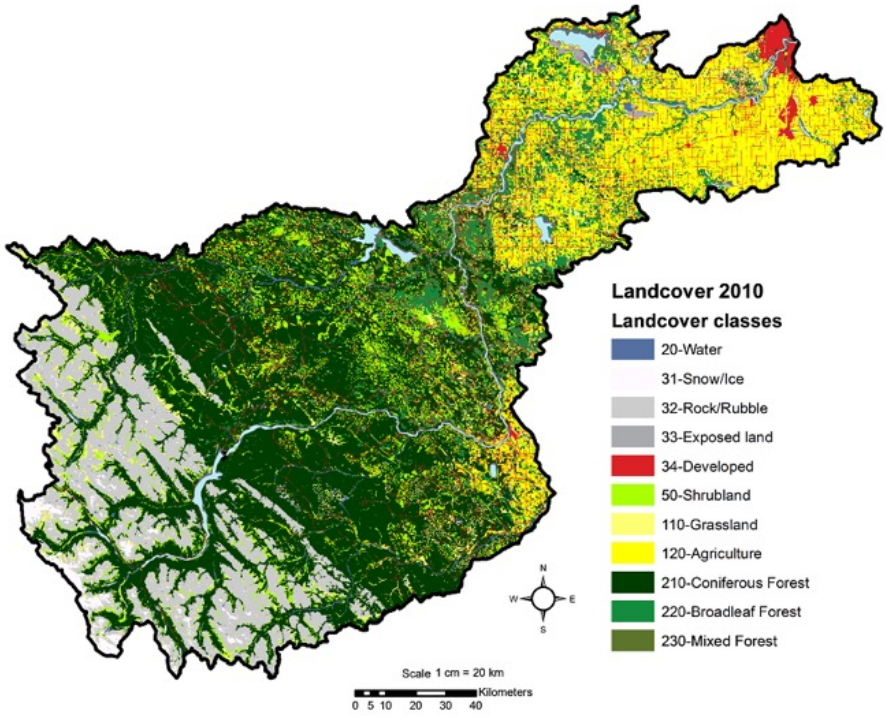
EPCOR's Source Water Protection Plan: Vision

EPCOR is committed to ensuring clean and abundant water supplies for Edmonton's water treatment plants through application of a source water protection program



PROVIDING MORE EPCOR

Source Water Risks

Source	Land-Uses / Potential Contaminant Source/Activity	Inherent Risk	Residual Risk
POINT	Small urban waste water discharges	H	L
	Pipeline break	M-H	M-L
NON-POINT	Livestock waste excretion	H	L
	Livestock physical alteration of watershed	M-H	L
	Agricultural cropping activities	M-H	L
	Agricultural land cover and use	M-H	L
	Wildlife activity in watershed.	M-H	L
	Rural septic fields	M-H	L
	Small urban stormwater runoff	M-H	L
	Forest harvesting activities	M-H	L
	Pine beetle infestation	M-H	L
	Forest fires	M-H	M-L
	Waste disposal sites	M-L	L
	Alteration in climate (natural and anthropogenic)	M-H	M-L
	City of Edmonton stormwater runoff	H	L
	Contamination of pet fecal matter in urban areas	M-H	L
	Proximity to transportation corridor	M-H	L
	Chemical spill on a bridge	M-H	M-L
	Recreational activities	M-L	L
	Ground water contamination from airport	M-L	L
	Gravel extraction activities	M-L	L
	Coal surface mining	L	L
	Disposal of animal remains within watershed	M-L	L
	Dam operation and management	M-L	L
	Contamination of shallow aquifers	M-H	M-L
	Industrial land spillage	M-H	M-L
OTHER	Intentional contamination at critical source intakes	M-H	M-L
	Insufficient raw water quantity	M-L	L
	Catastrophic failure of dams	M-H	L
	Contamination of raw water due to intentional dumping or release of chemicals from industries	M-H	M-L
	Construction activities on the River – Walterdale Bridge	M-H	M-L
	Lack of integration among watershed and other land and water planning initiatives	M-H	L

Key Source Water Risks:

- Climate Change
- Wildfires
- Spills

- Engaged PARC: Dave Sauchyn in early 2010s to evaluate water availability

Climate Change Predictions for the NSR

Variable	Projection
Annual temperature	Increase by 1.3 to 4.5 °C by 2050
Annual precipitation	Increase 4.3 to 12.5 % by 2050
Timing of precipitation	Increase in winter and spring, decreases in summer and fall
Storm events	Increase of frequency intensity of short duration storms
Snow pack in headwaters	Increase of precipitation as rain, earlier spring melt, decreases of water storage in snow pack
Soil moisture	Increase in winter and spring, decreases in summer and fall
Landscape changes	Increase of forest fires, decrease of forested areas, increase of grasslands, agricultural changes, decreased wetlands

Sources: Vance et al. (1995), Barrow and Yu (2005), Golder (2008), Kienzle et al. (2012), Weaver (2017), Schneider (2013)

Variability and Change in the Hydroclimate of the NSRB

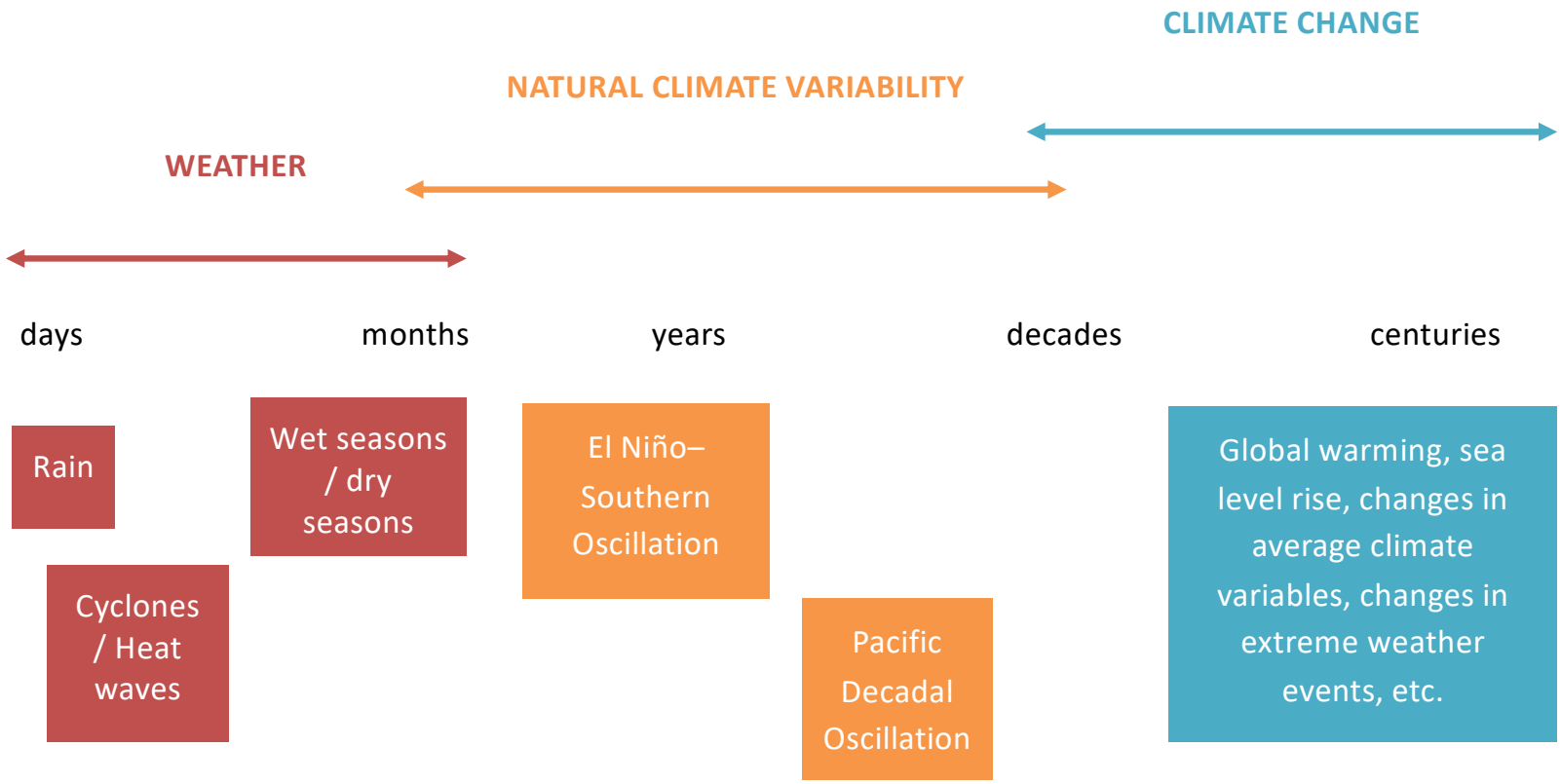
Dave Sauchyn, PhD, PGeo
Director, Prairie Adaptation Research Collaborative (U of R)

NSWA Watershed Wednesdays Speaker Series, 02 Feb 2022

Researchers:

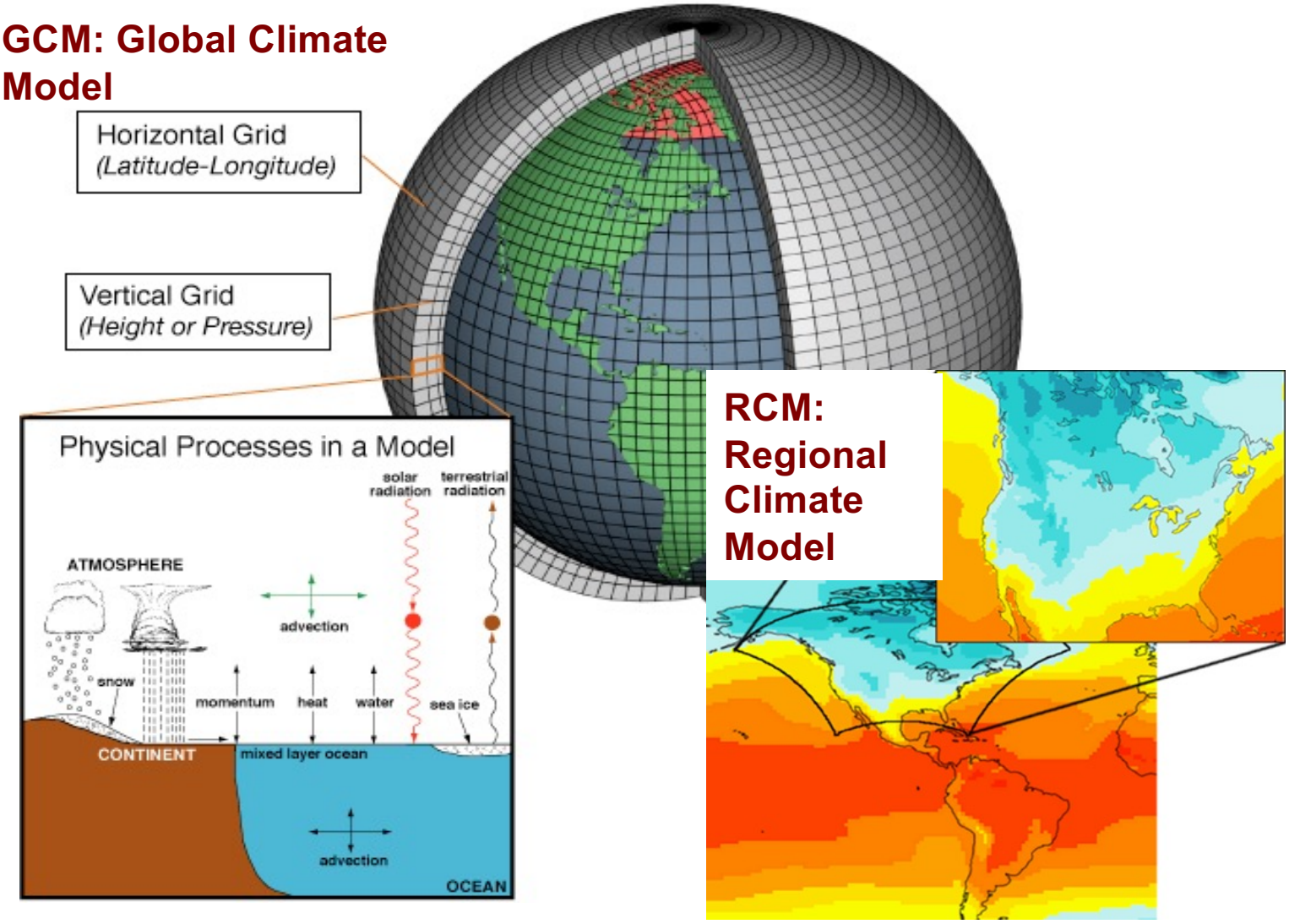
- Muhammad Rehan Anis
- Yuliya Andreichuk
- Soumik Basu
- Samantha Kerr
- Sheena Stewart

Weather, natural variability and climate change

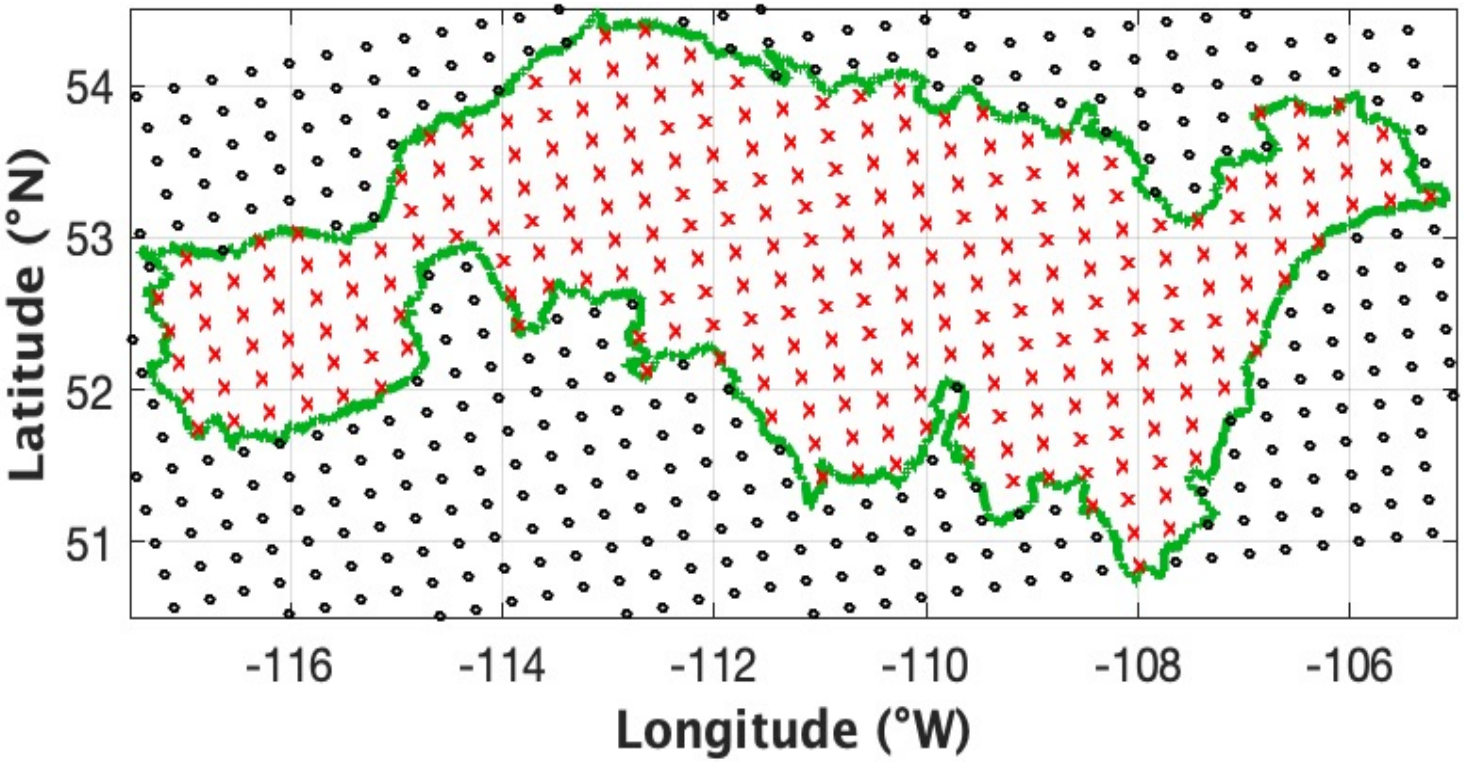


Source: Modified from Ouranos and Pacific Climate Futures

GCM: Global Climate Model

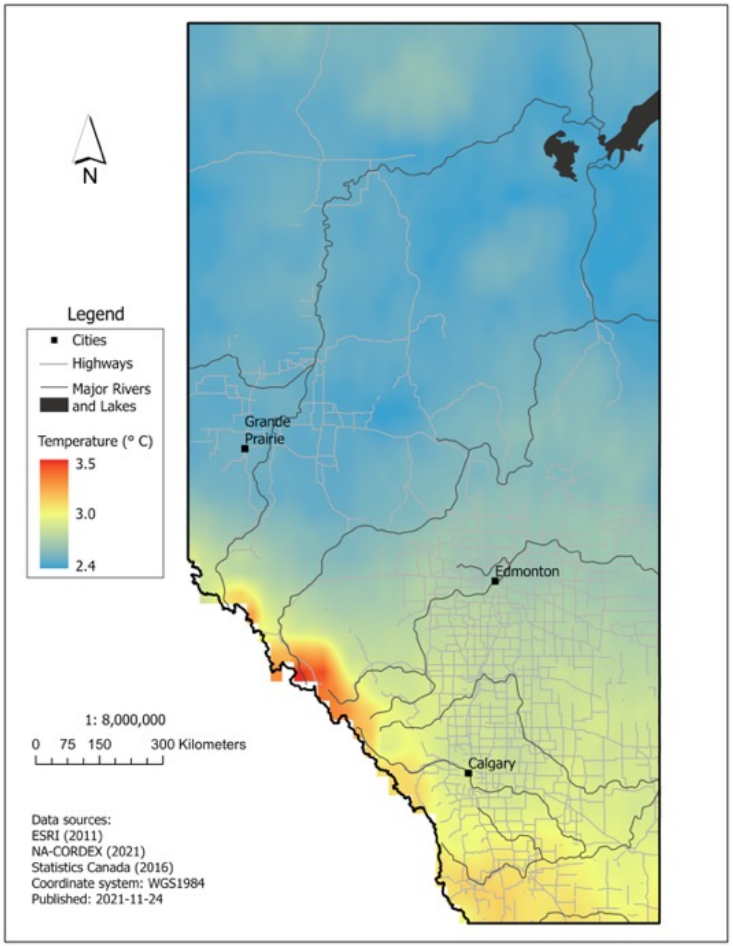


25 km CRCM5 grid and the NSRB

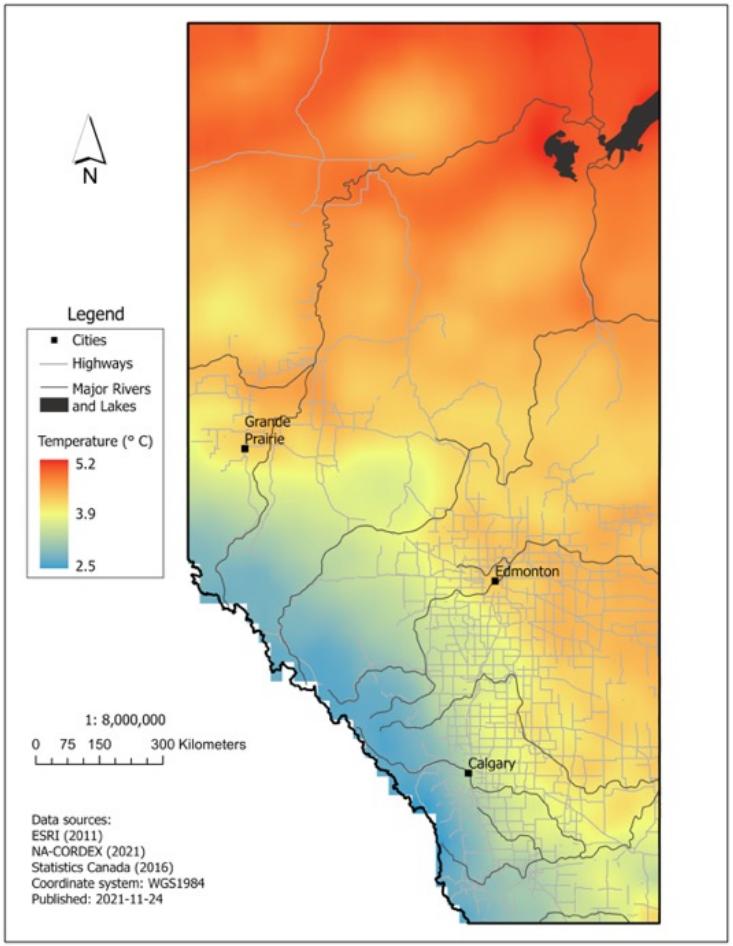


Multi-Model Temperature Changes, 2 ℃ Scenario

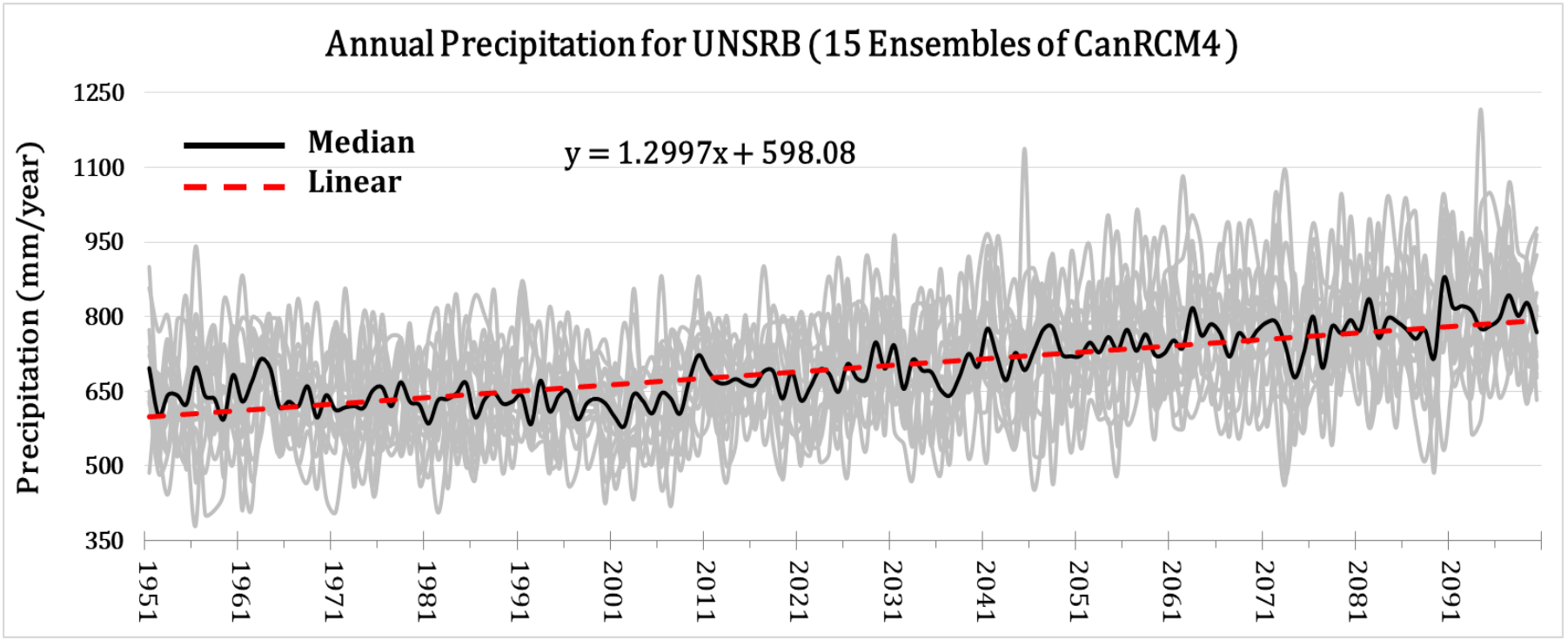
Summer Maximum



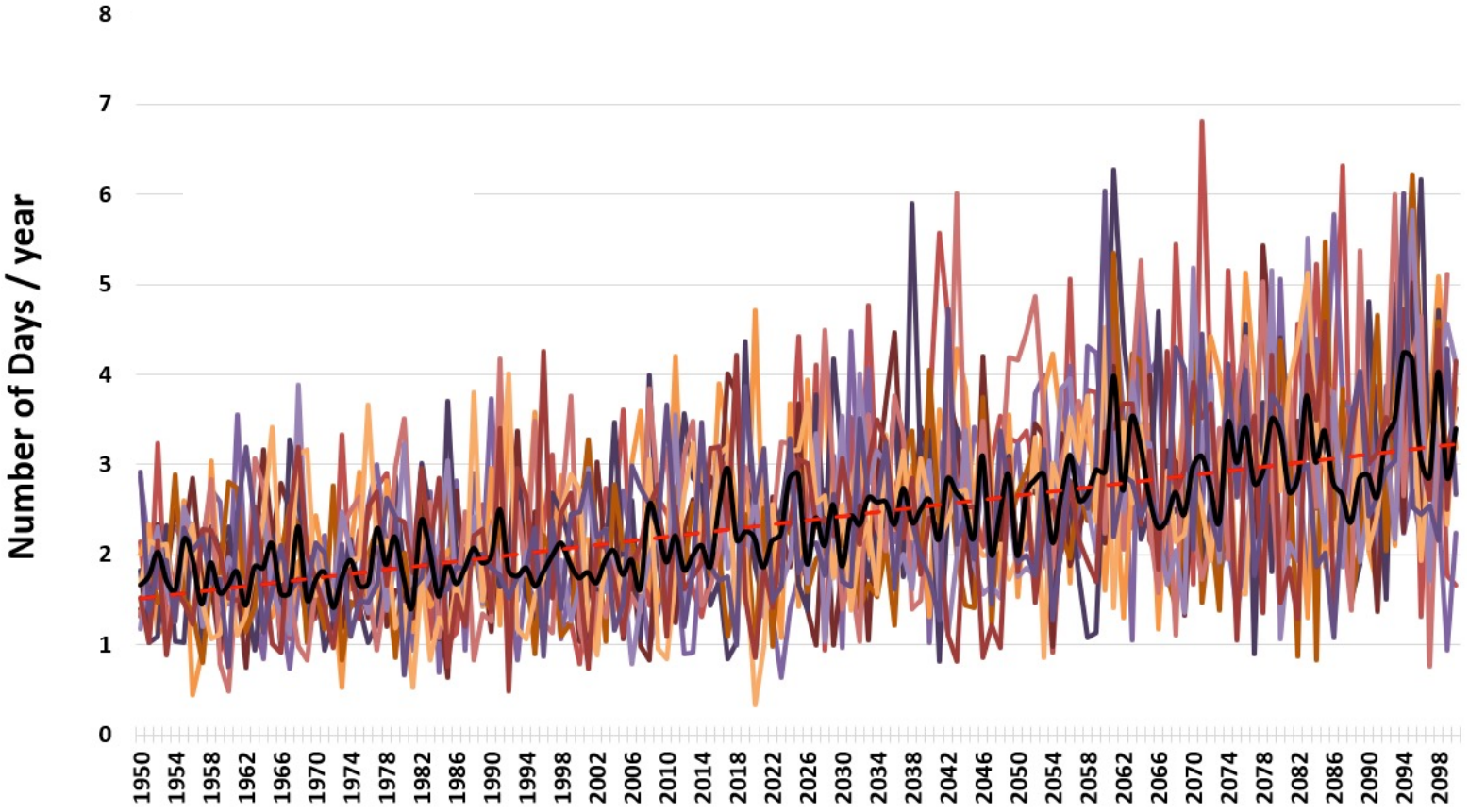
Winter Minimum



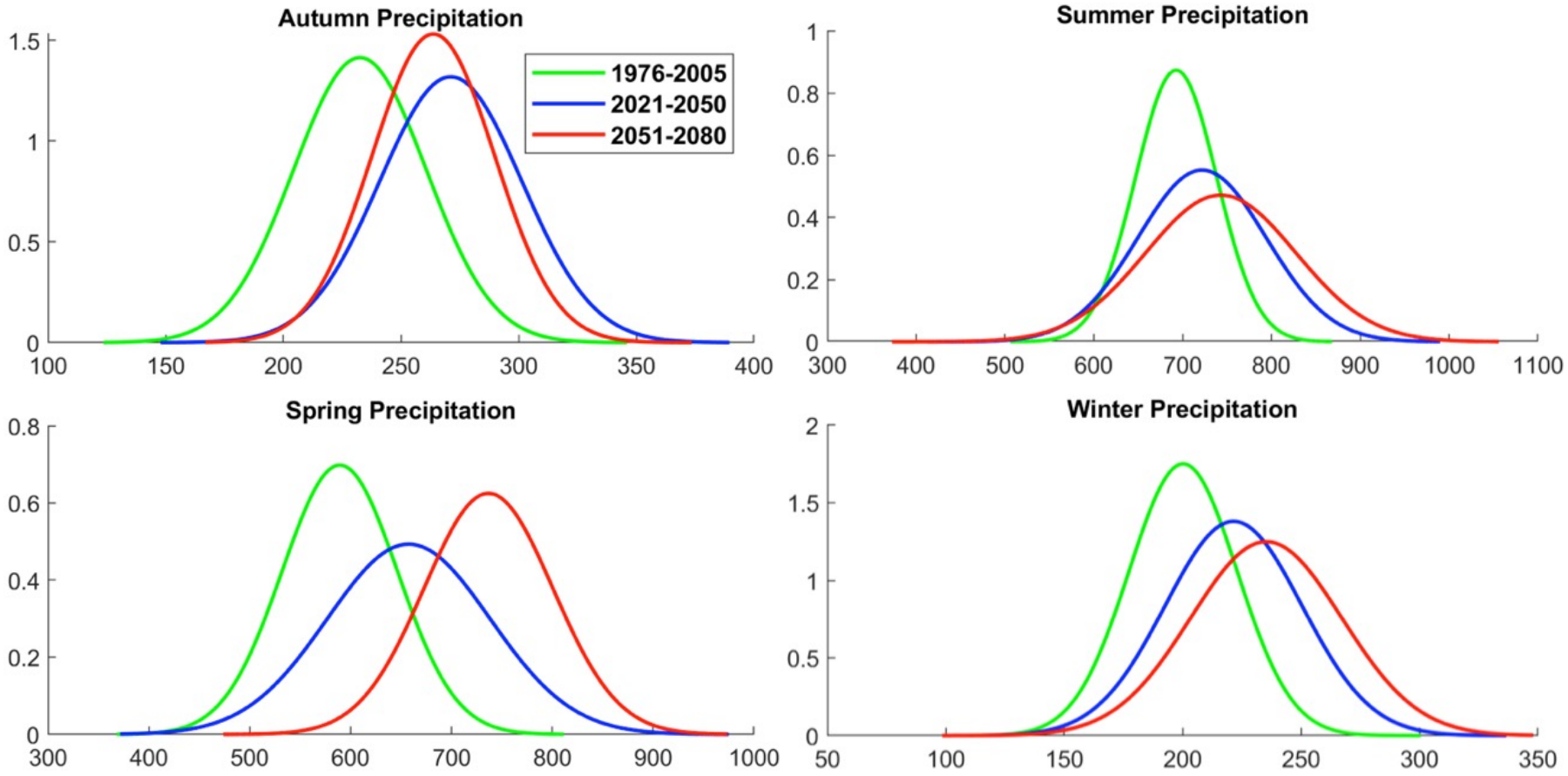
Total annual precipitation from 1951 to 2100 from the 15-member CanRCM4 ensemble (RCP 8.5 scenario)



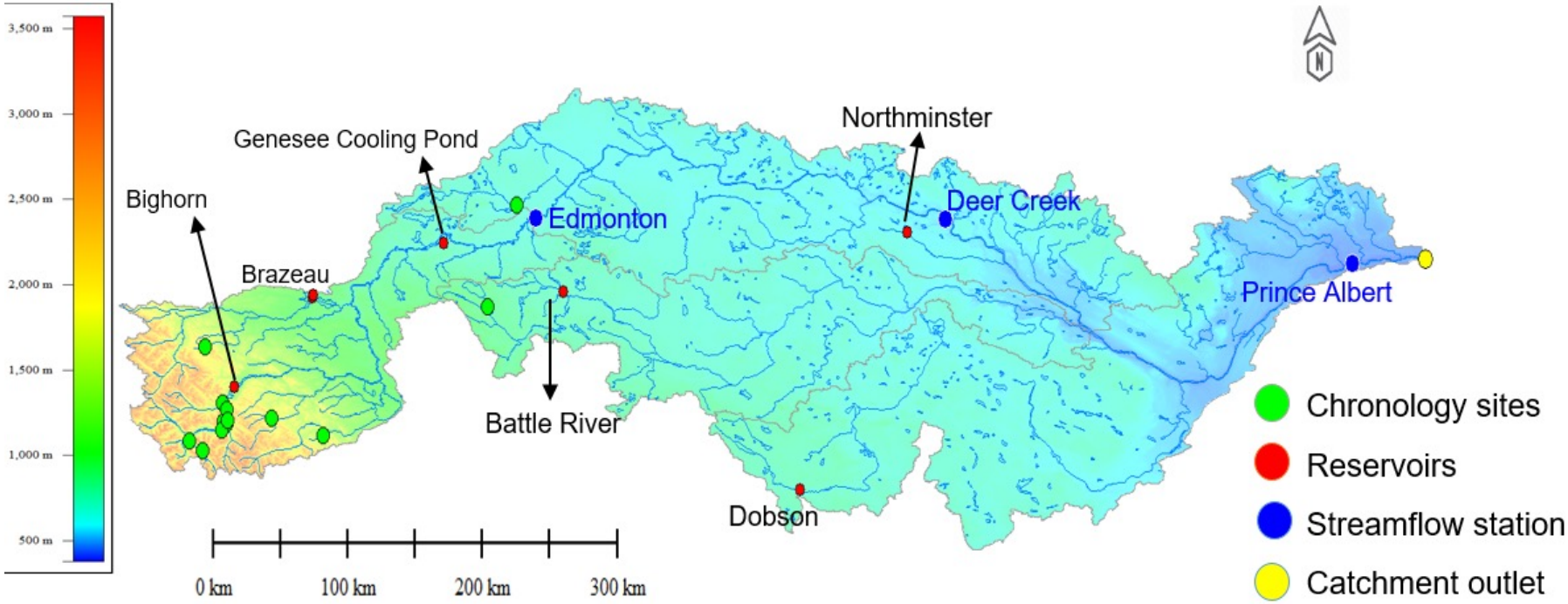
Frequency of heavy precipitation (> 20 mm), NSRB



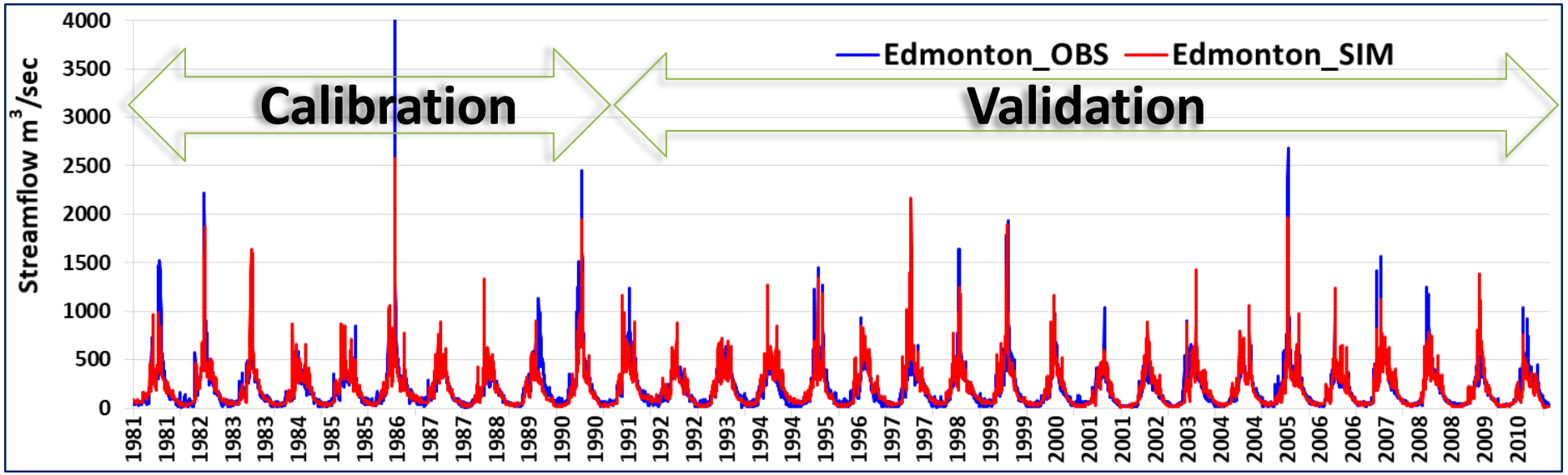
Precipitation Probability Density Functions, NSRB



North Saskatchewan River Basin (NSRB)

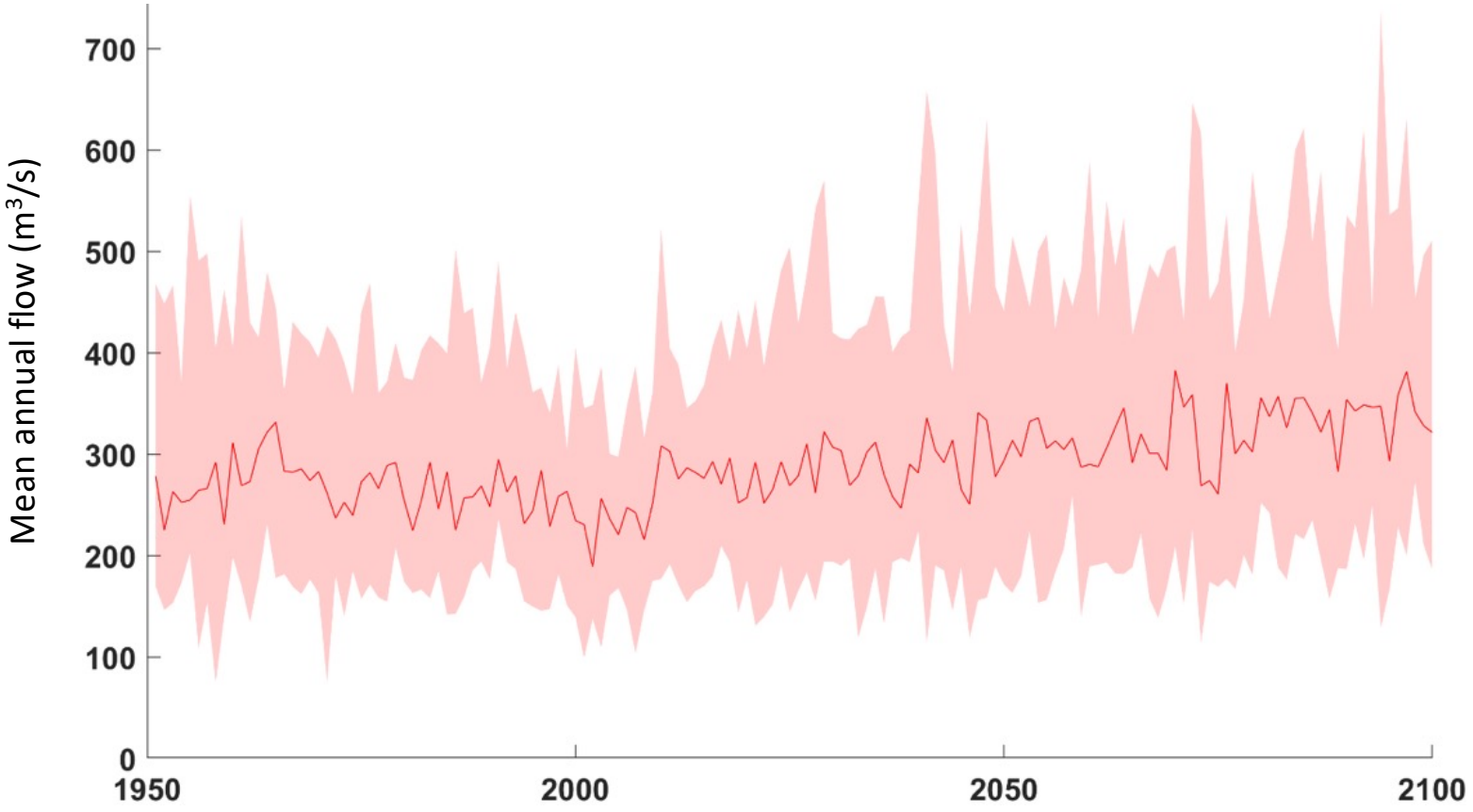


MESH Model – Calibration and Validation

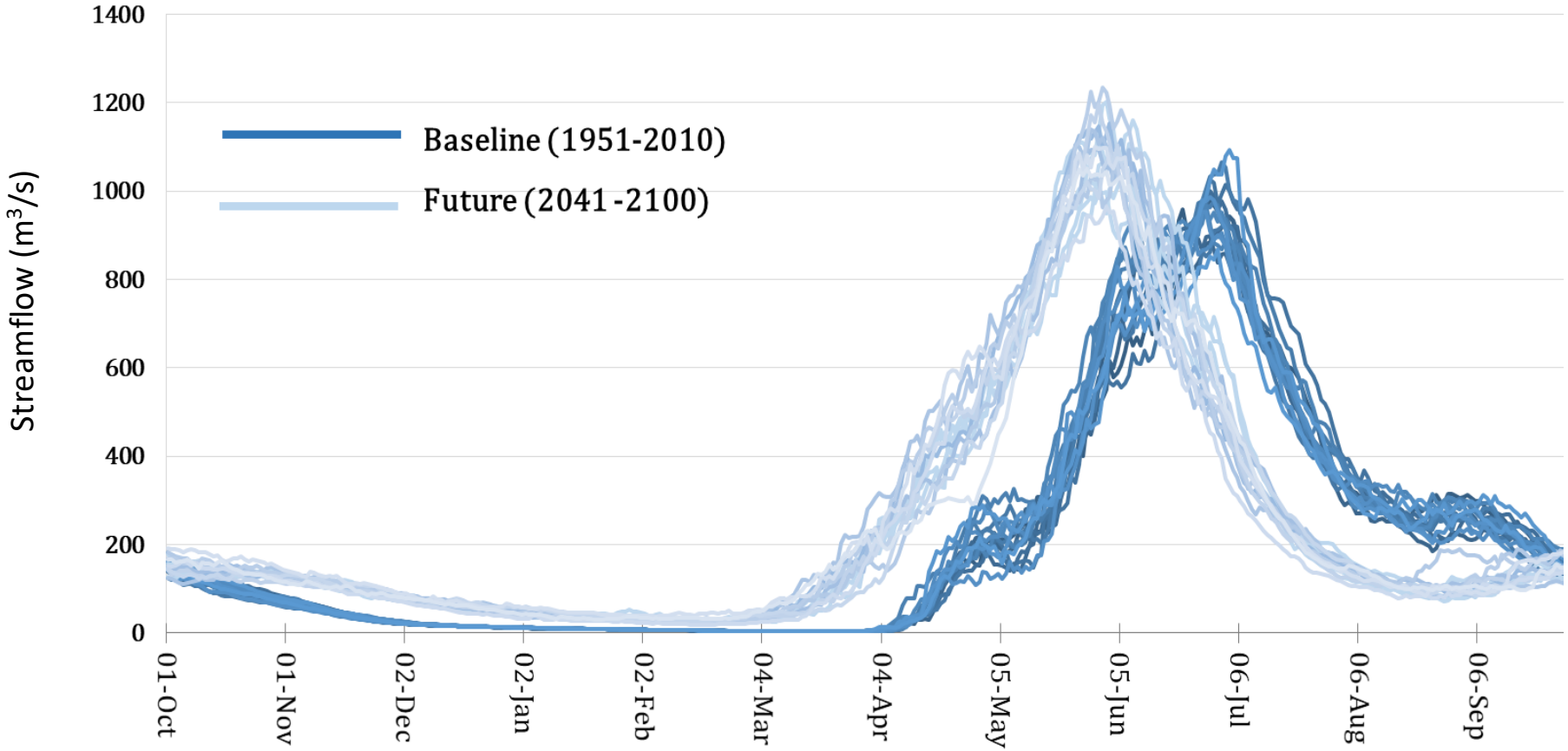


WFDEI-GEM-CaPA (1979 - 2016) Historical	Calibration (1981-1990)		Validation (1991-2010)	
	NSE	% Bias	NSE	% Bias
Edmonton (05DF001)	0.76	4.04	0.72	5.11

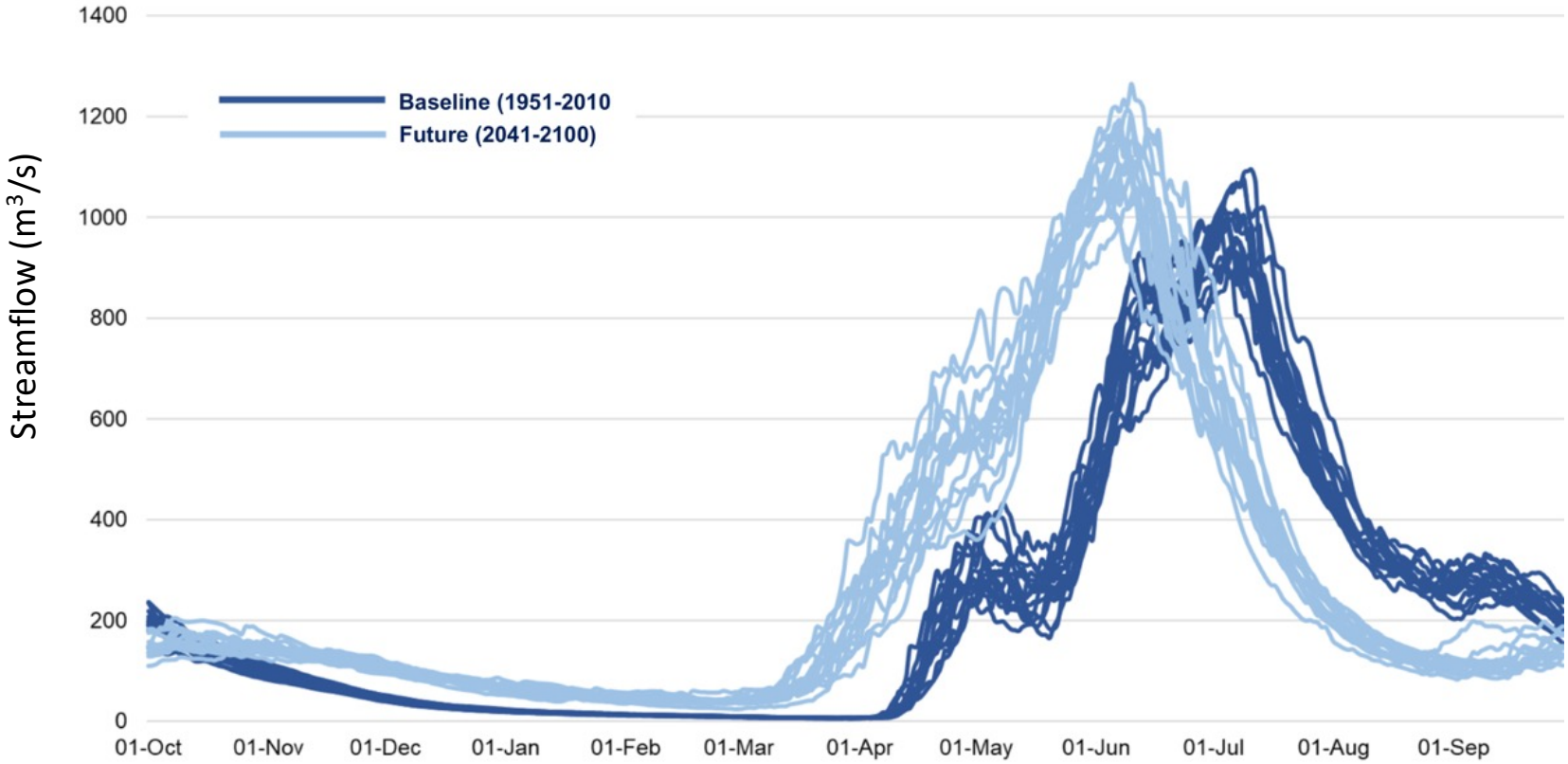
Mean Annual Flow (m^3/s), North Saskatchewan River near AB-SK Border 1951-2100, 15-Member Ensemble



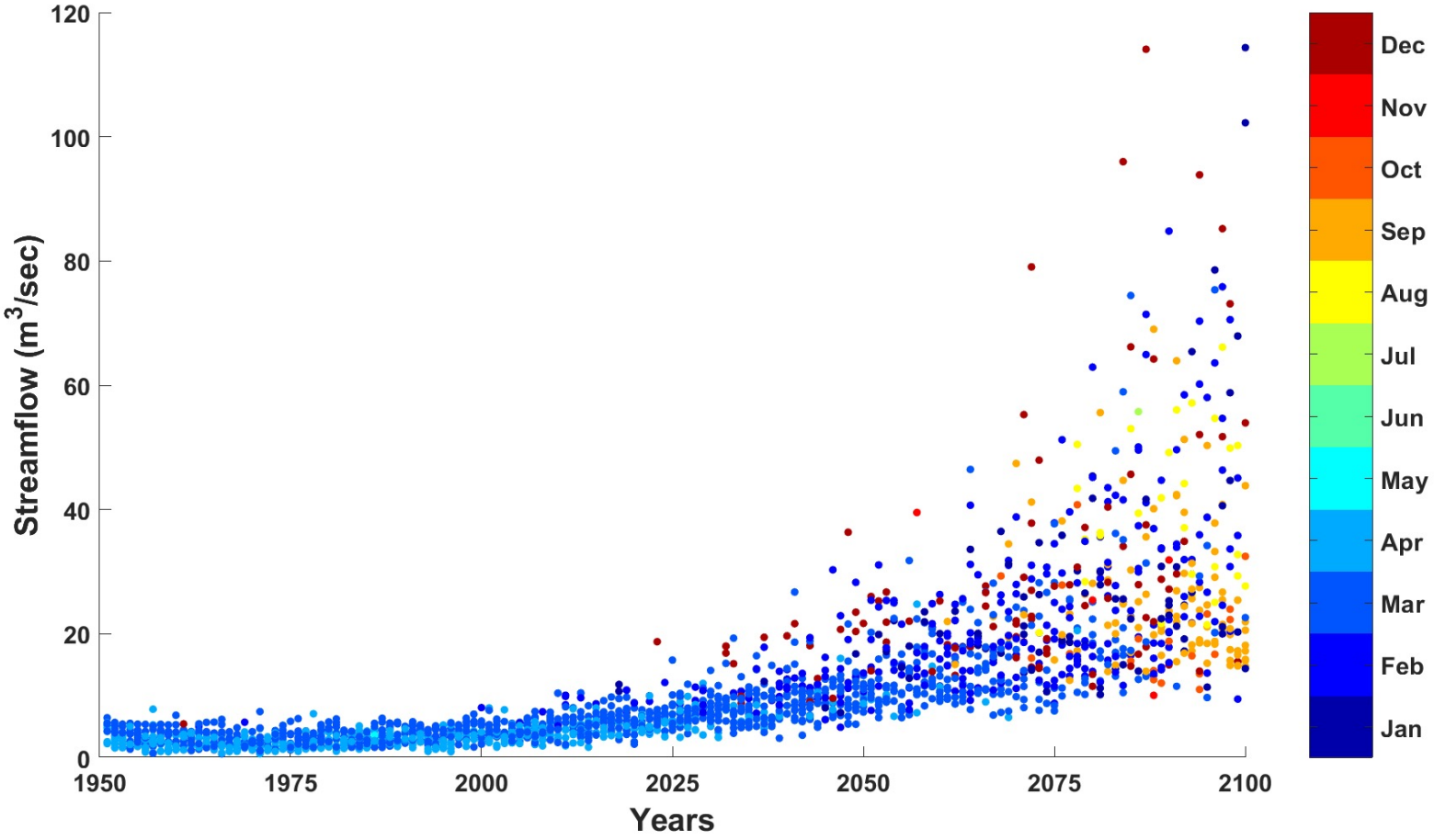
Historical baseline (1951 - 2010) and future (2041-2100) water-year hydrographs of the NSR at Edmonton



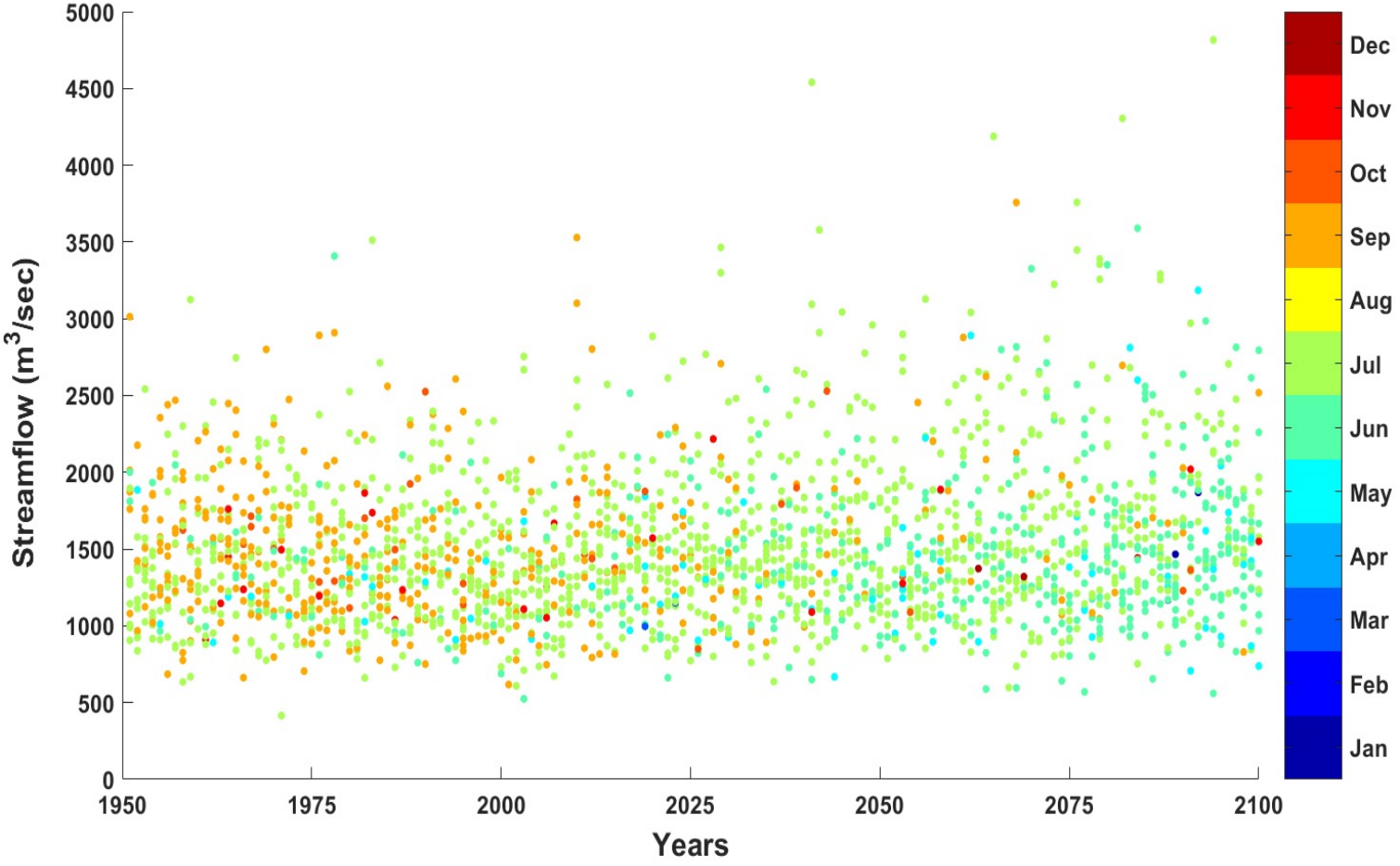
Historical baseline (1951 - 2010) and future (2041-2100) water-year hydrographs of the NSR near AB-SK Border



Daily low flows of the NSR at Edmonton, 1951-2100



Daily high flows of the NSR at Edmonton, 1951-2100

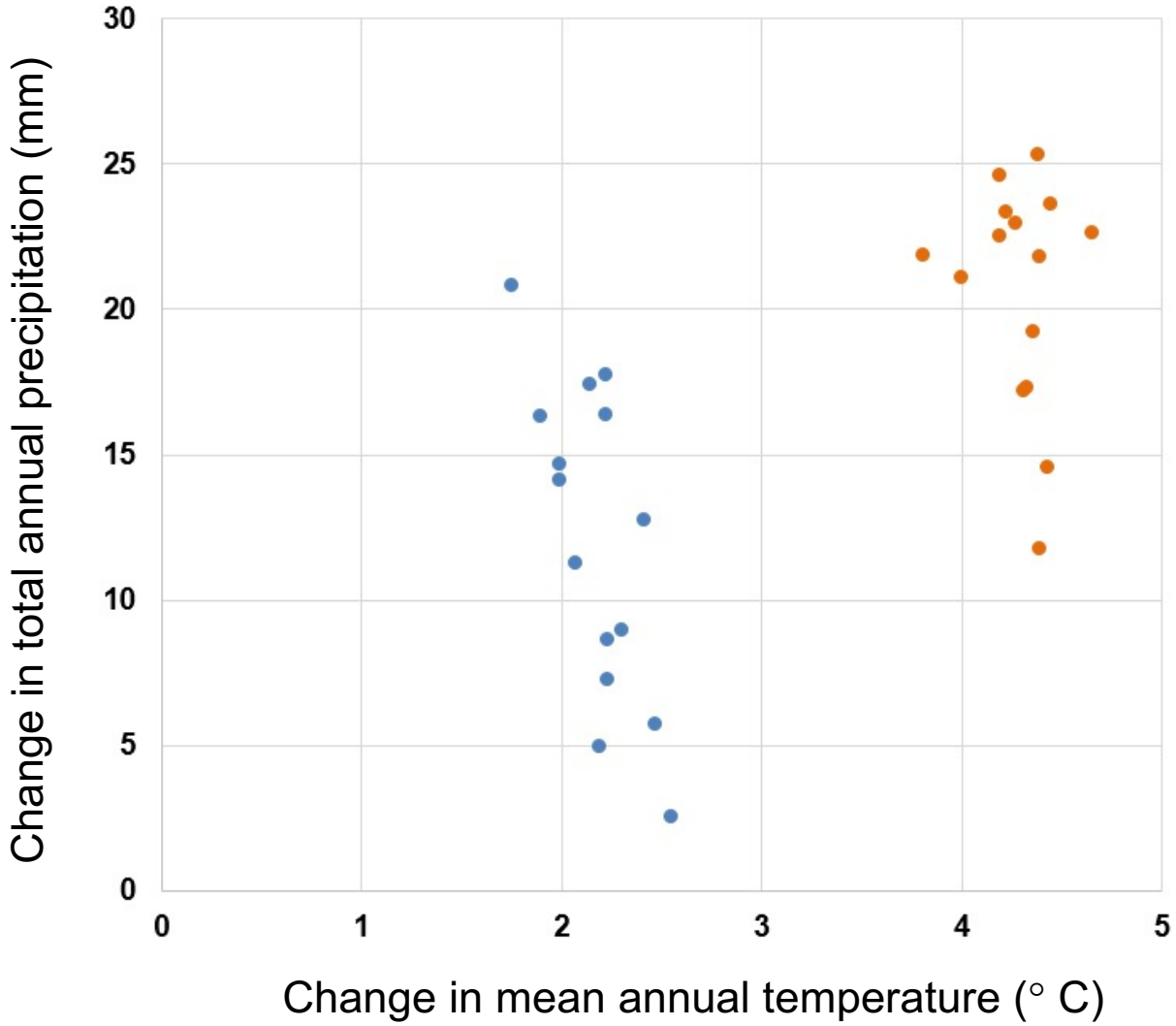


Projected climate changes for the NSRB

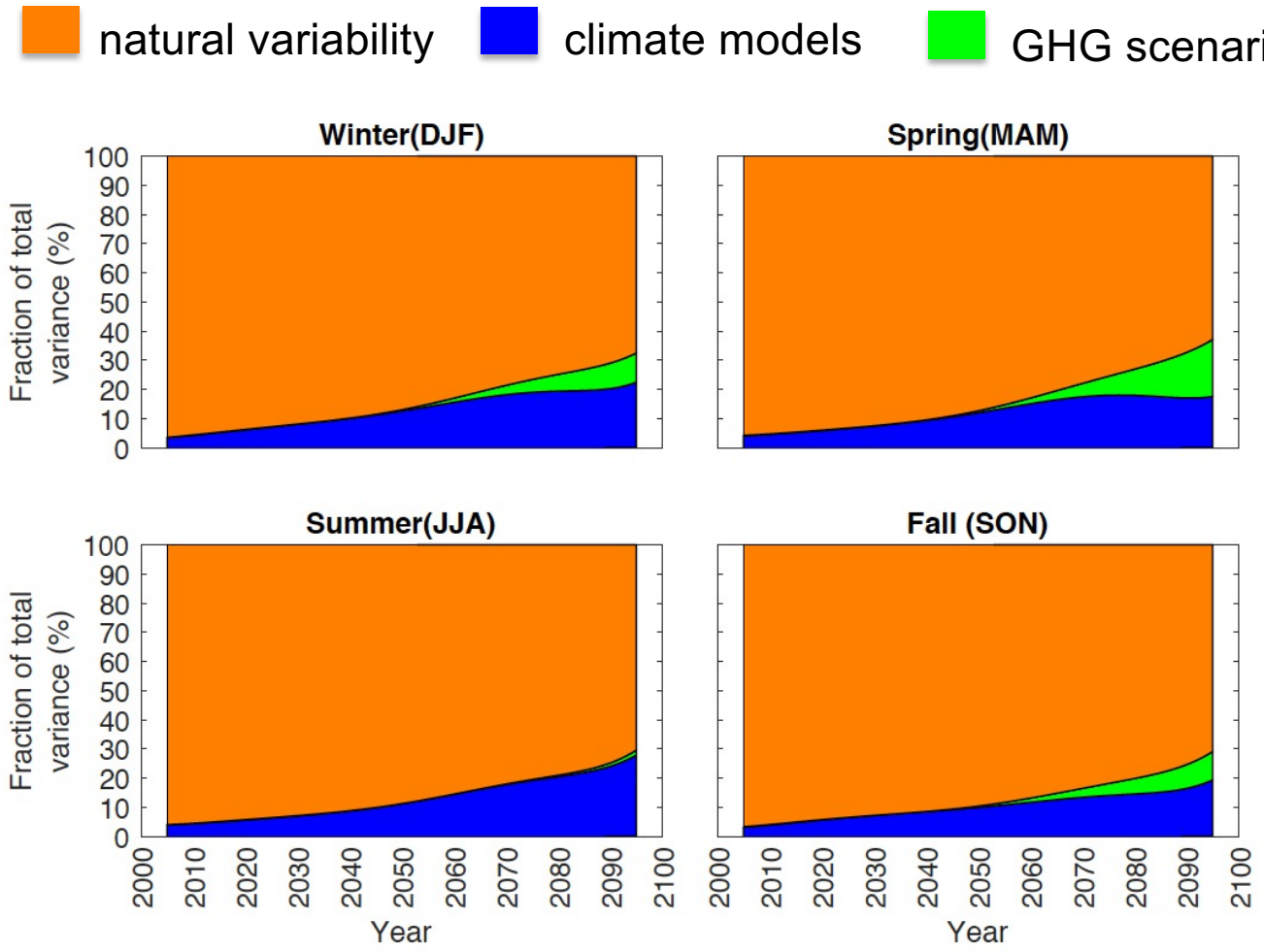
An ensemble of 15 runs of CanRCM4 (RCP 8.5)

- Near future (2021-2050)
- Far future (2051-2080)

Relative to a historical baseline period of 1980 to 2010



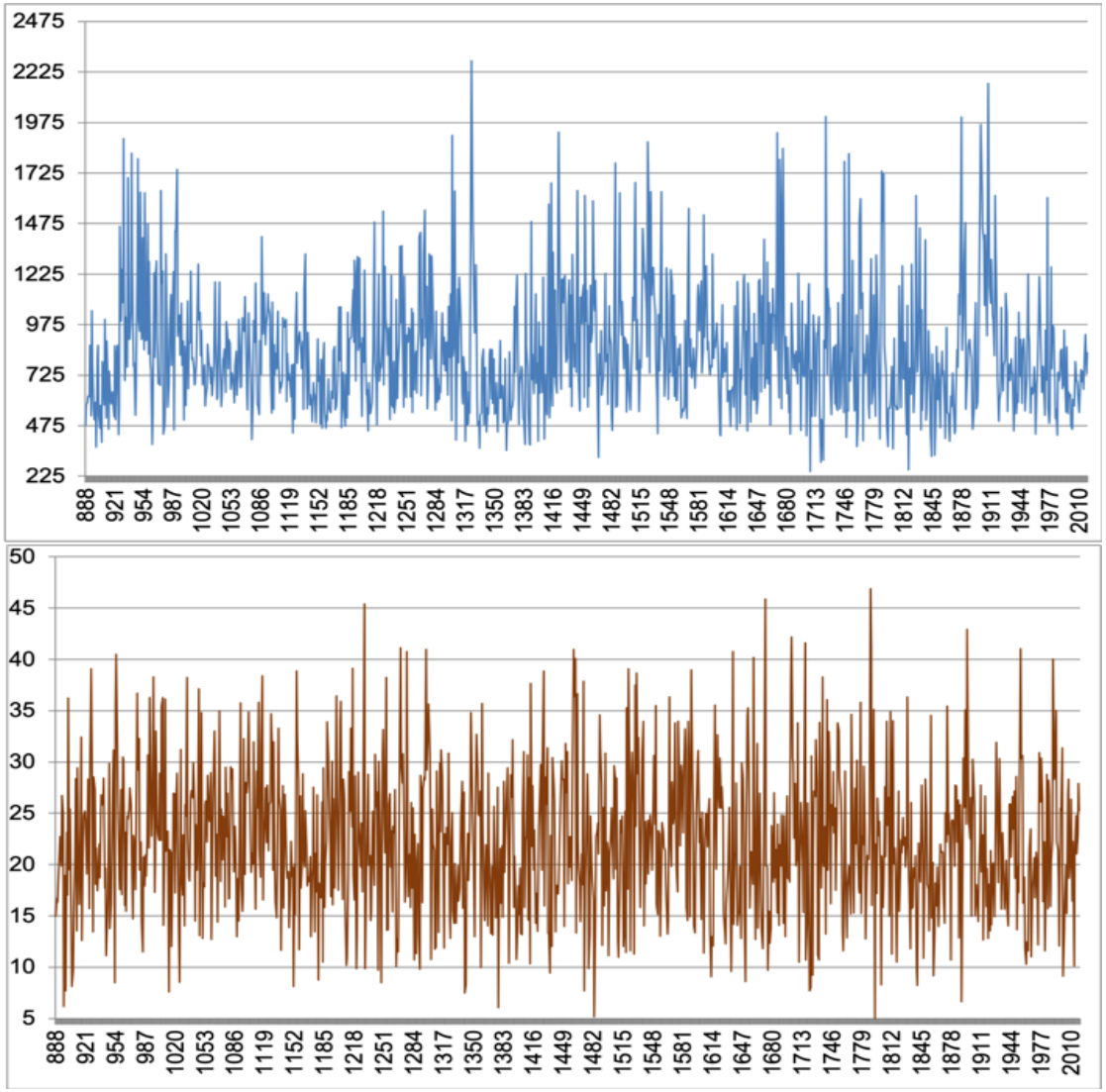
Sources of Uncertainty - Precipitation, Canadian Prairies



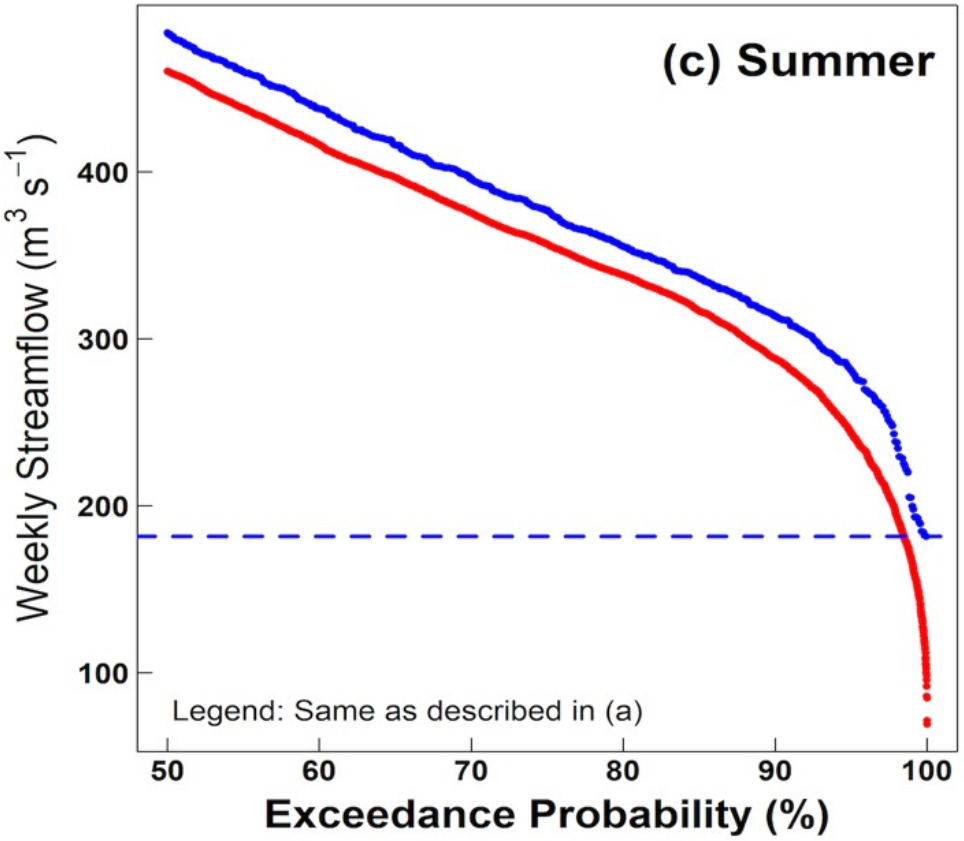
Barrow and Sauchyn, 2019

The instrumental record is neither an adequate nor an unbiased sample of the range and character of ***natural climate variability*** *that might be expected with the climate system configured as it is now.* - Hughes and Diaz (2008) Climate variability and change in the drylands of Western North America

Maximum and **Minimum** Weekly Flows (m^3/s), North Saskatchewan River near Deer Creek, 888-2019

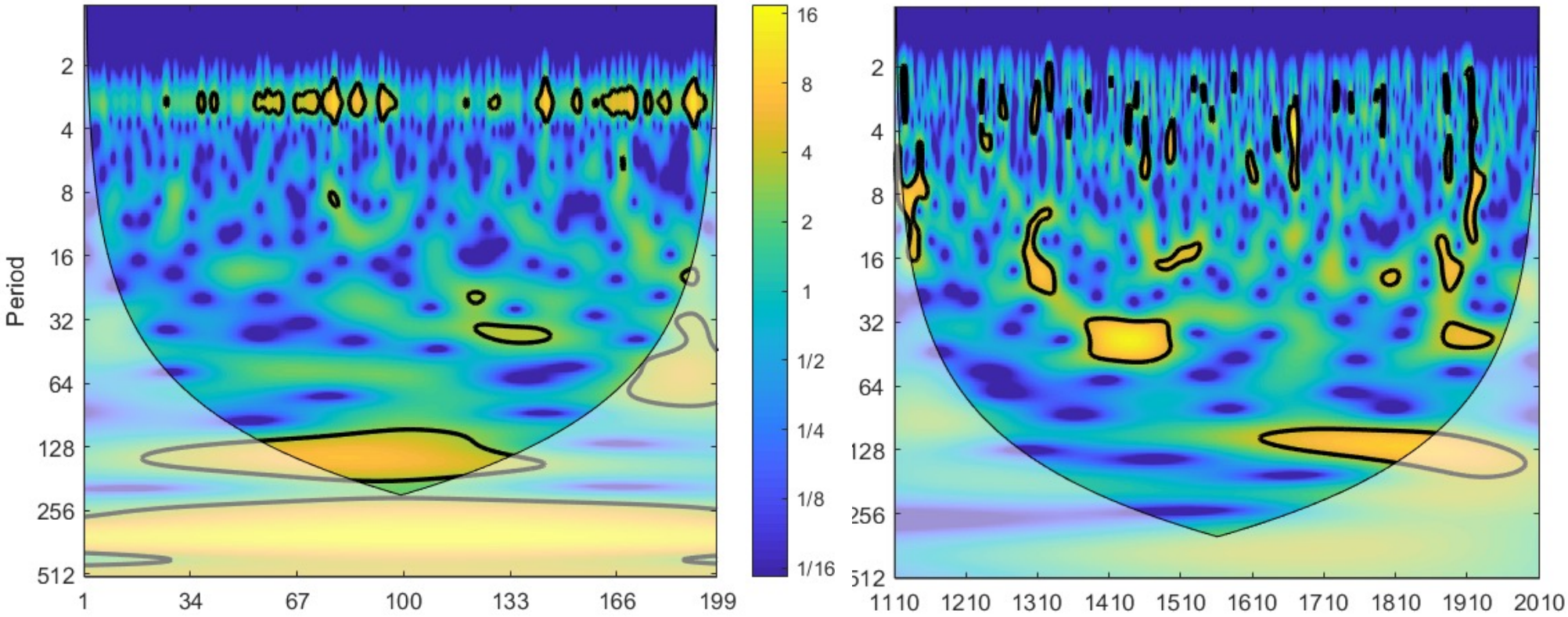


Frequency distribution of seasonal proxy (red dots) and historical (blue dots) low flows*



- flows equalled or exceeded at least 50% of the time, derived from the seasonal flow duration curve
- the blue dashed line the historically observed lowest flow

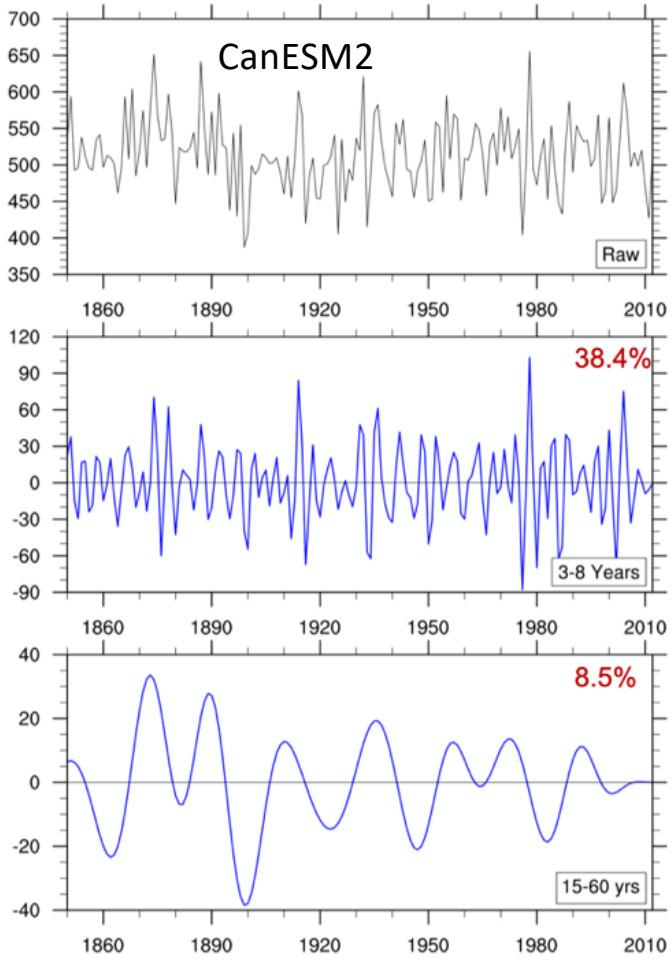
Wavelet transform of winter modeled (left) and proxy (right) flow of the NSR



Modes of Variability in Modeled versus Paleo Hydrology, NSRB

interannual (3-8 yrs)

decadal (15-60 yrs)



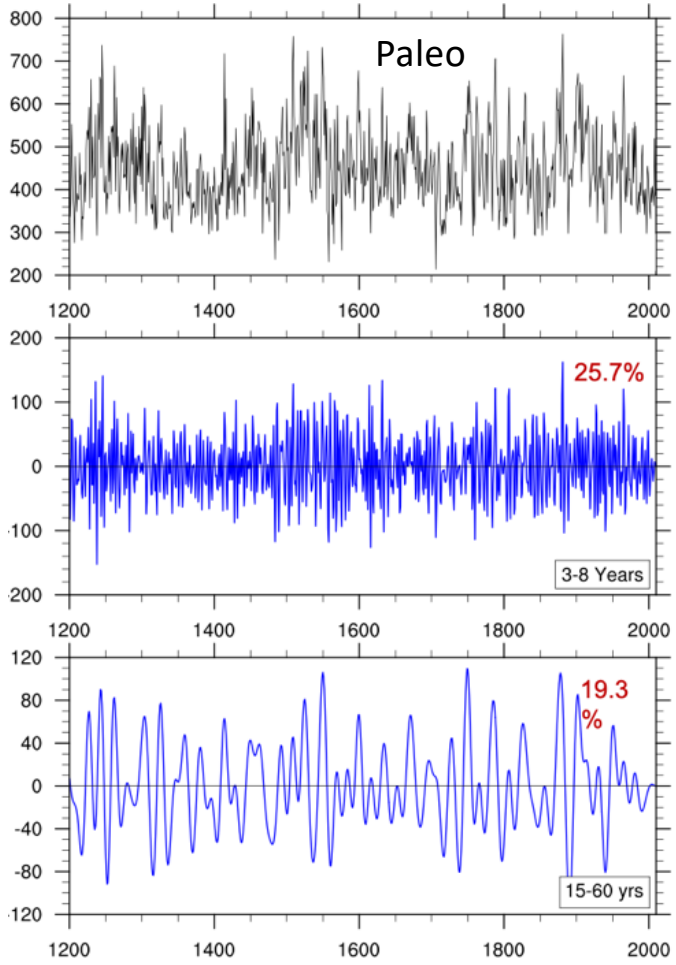



Photo: Jim Sauchyn