Assessment of Near 0°C Temperature and Precipitation Characteristics across Canada

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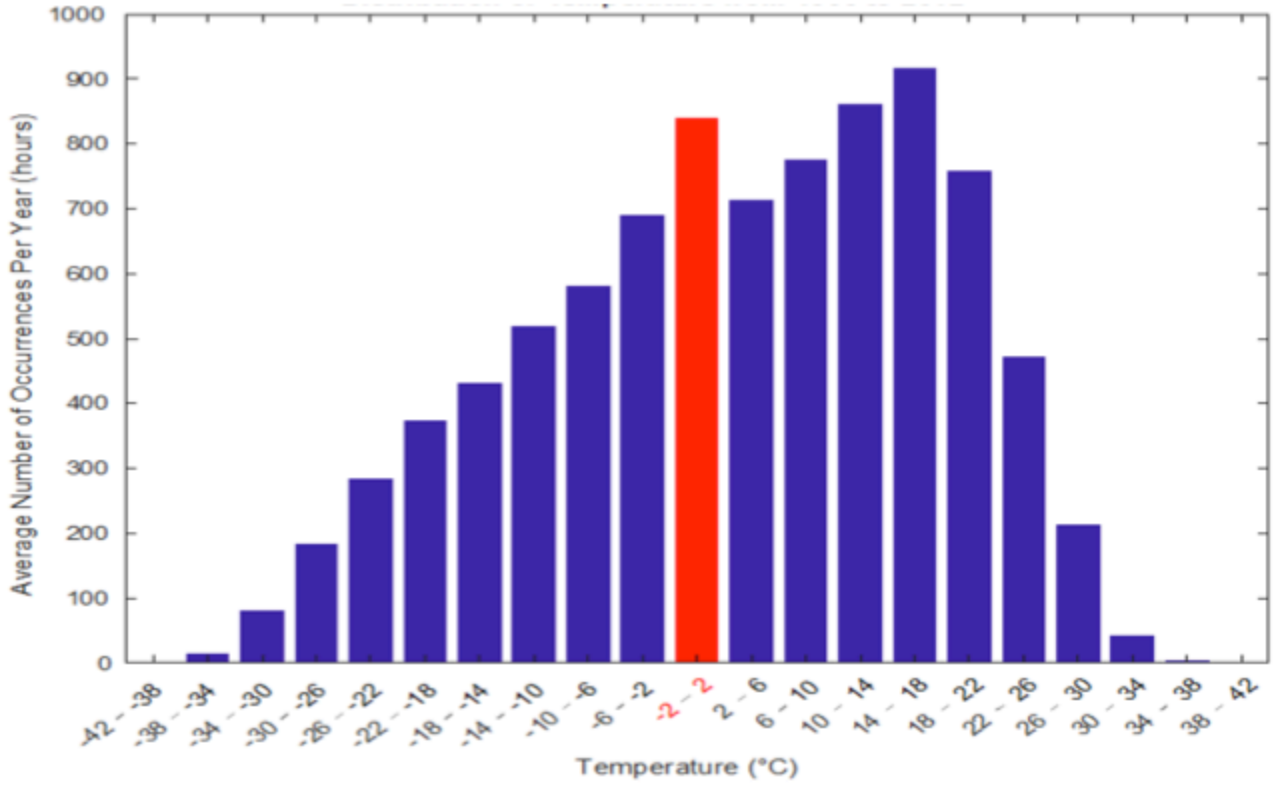
5 - University of Quebec at Montreal, Montreal

Hourly Temperature Distribution

Winnipeg
1953 - 2012



NEXT

IMPORTANT

SkyTracker
RAIN
ICE
SNOW
Weekend Storm
Saturday PM to Sunday AM
April 15 2018
TORONTO
WINDSOR

Rationale and Objective

Surprisingly, relatively little analysis has been conducted on this issue from a broad perspective, including over Canada

So, our objective is:

To develop a Canada-wide perspective on near 0°C conditions with a particular focus on its associated precipitation

Datasets

Surface:

- Environment and Climate Change Canada hourly reporting stations
- Dry bulb temperature, moisture, precipitation occurrence/type

Issues:

- Period of record
- Manual versus automatic observations
- Site location changes
- Merging information from nearby sites
- Precipitation measurement

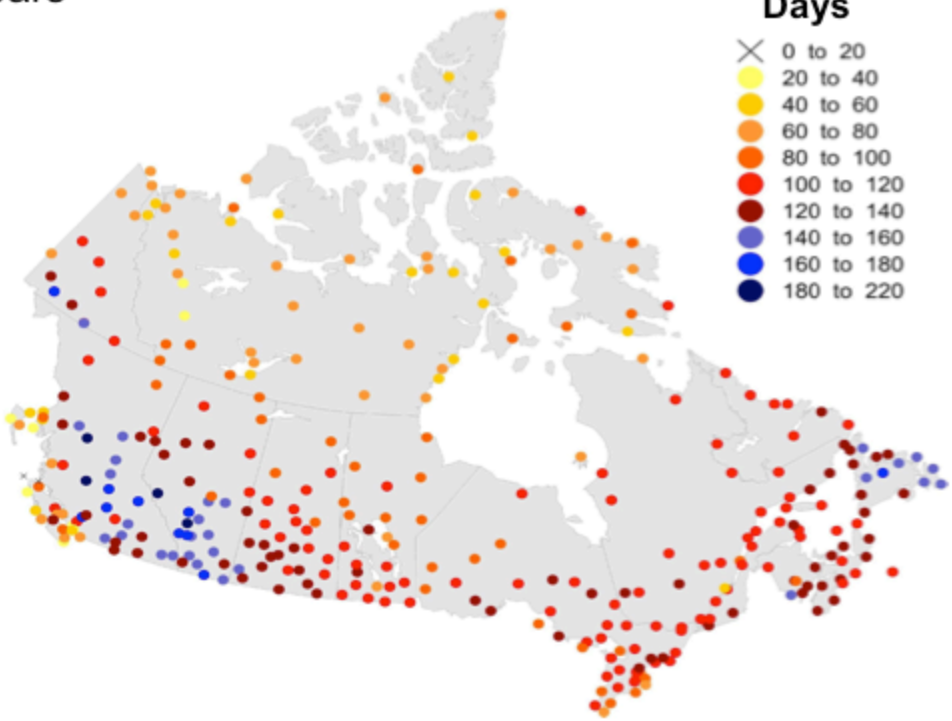
Datasets:

- For ‘climatology’ 1981-2015 with at least 25 years of data
- 343 hourly reporting stations and 227 with weather type information

Average Annual Number of Days with near 0°C Conditions

Period: 1981 – 2015, minimum 25 years

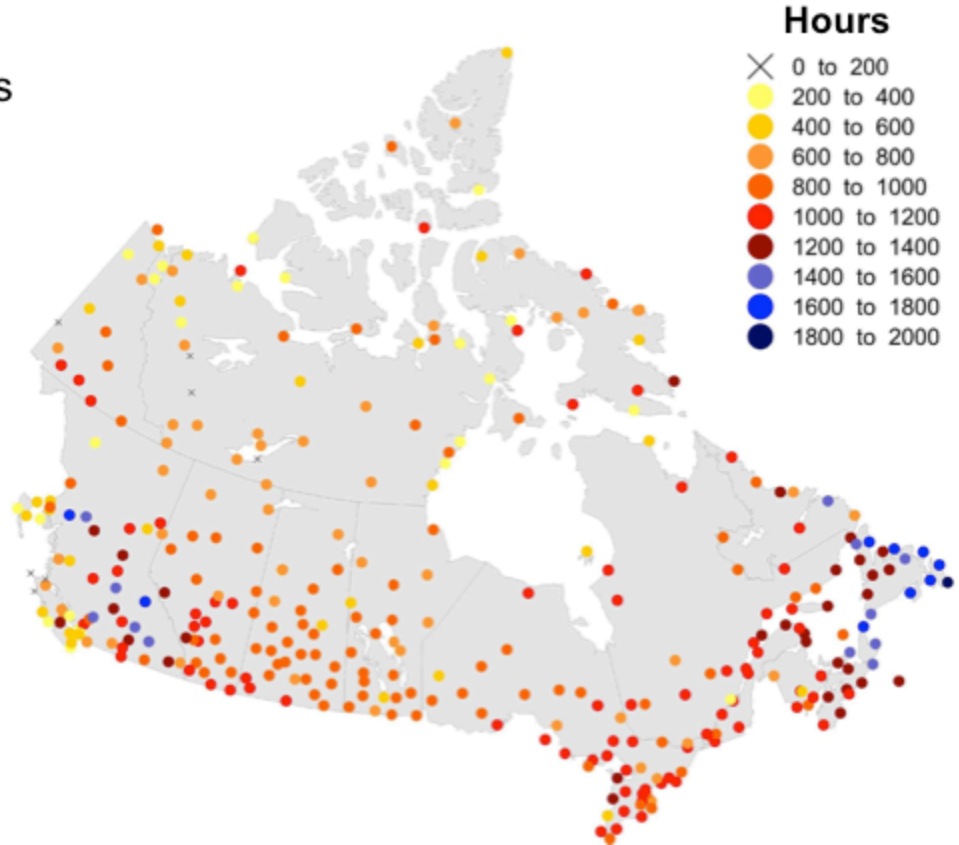
$-2°C \leq T \leq 2°C$



Average Annual Period of Time Near 0°C (h)

Period: 1981 – 2015, minimum 25 years

$-2°C \leq T \leq 2°C$

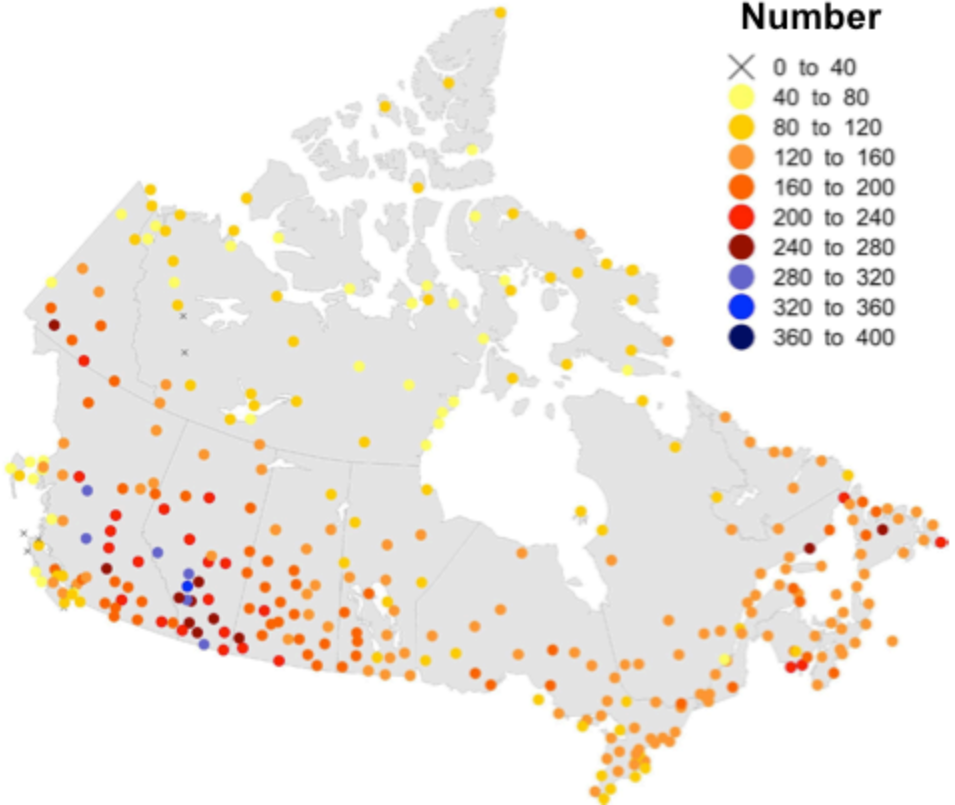


Average Annual Number of Events near 0°C

Period: 1981 – 2015, minimum 25 years

$-2°C \leq T \leq 2°C$

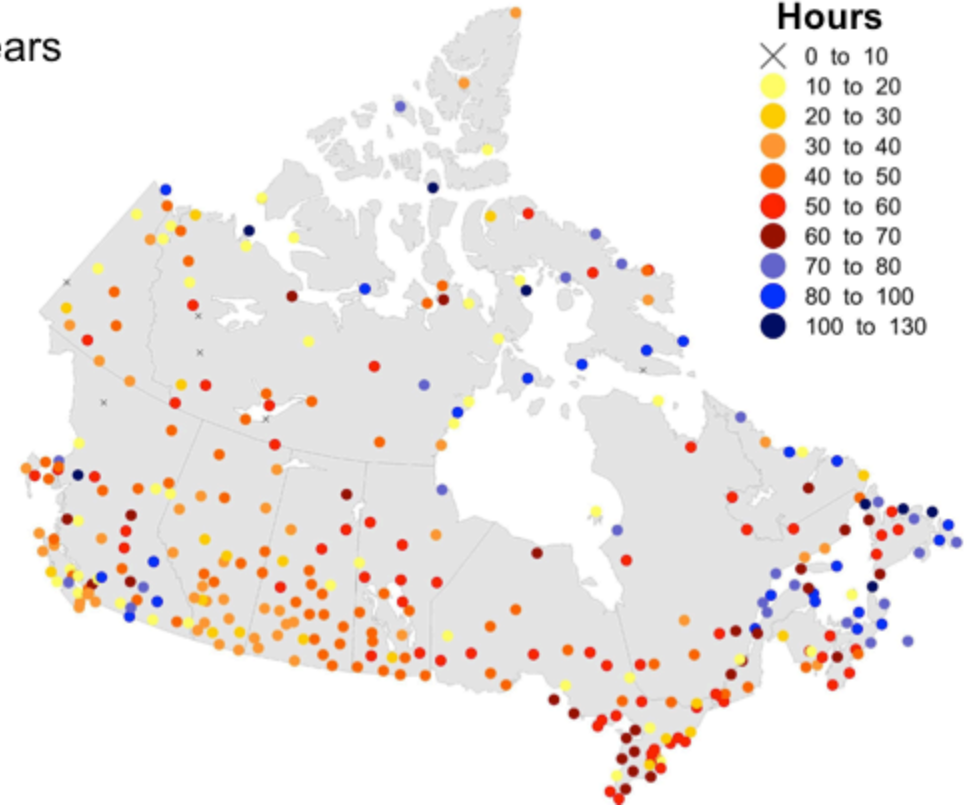
Event - a period with continuous temperatures within the temperature threshold boundaries



Maximum Duration of Events near 0°C (h)

Period: 1981 – 2015, minimum 25 years

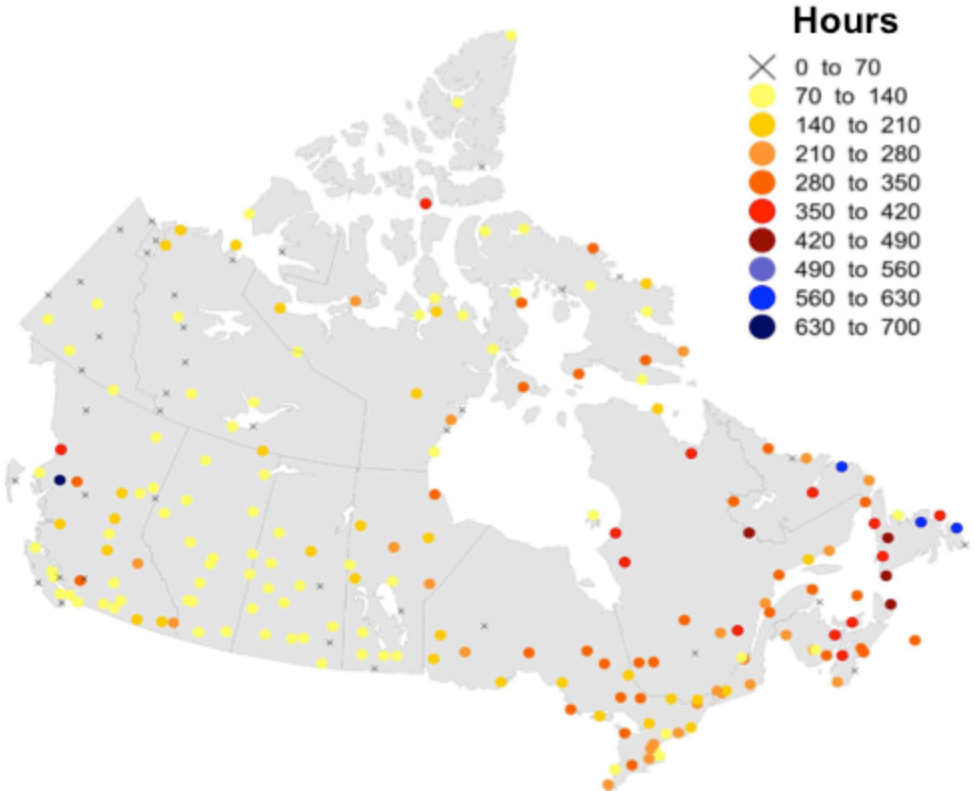
$-2°C \leq T \leq 2°C$



Average Annual Precipitation Hours near 0°C:
based of 12 weather type hourly observations

$$-2°C \leq T \leq 2°C$$

86	Rain (R)	INT: [0 1 2 3]
87	Rain Showers (RW)	INT: [0 1 2 3]
88	Drizzle (L)	INT: [0 1 2 3]
89	Freezing Rain (ZR)	INT: [0 1 2 3]
90	Freezing Drizzle (ZL)	INT: [0 1 2 3]
91	Snow (S)	INT: [0 1 2 3]
92	Snow Grains (SG)	INT: [0 1 2 3]
93	Ice Crystals (IC)	INT: [0 1 2 3]
94	Ice Pellets (IP)	INT: [0 1 2 3]
95	Ice Pellet Showers (IPW)	INT: [0 1 2 3]
96	Snow Showers (SW)	INT: [0 1 2 3]
97	Snow Pellets (SP)	INT: [0 1 2 3]



Fraction of Near 0°C Conditions with Precipitation (%)

Period: 1981 – 2015, minimum 25 years

$-2°C \leq T \leq 2°C$

86	Rain (R)	INT: [0 1 2 3]
87	Rain Showers (RW)	INT: [0 1 2 3]
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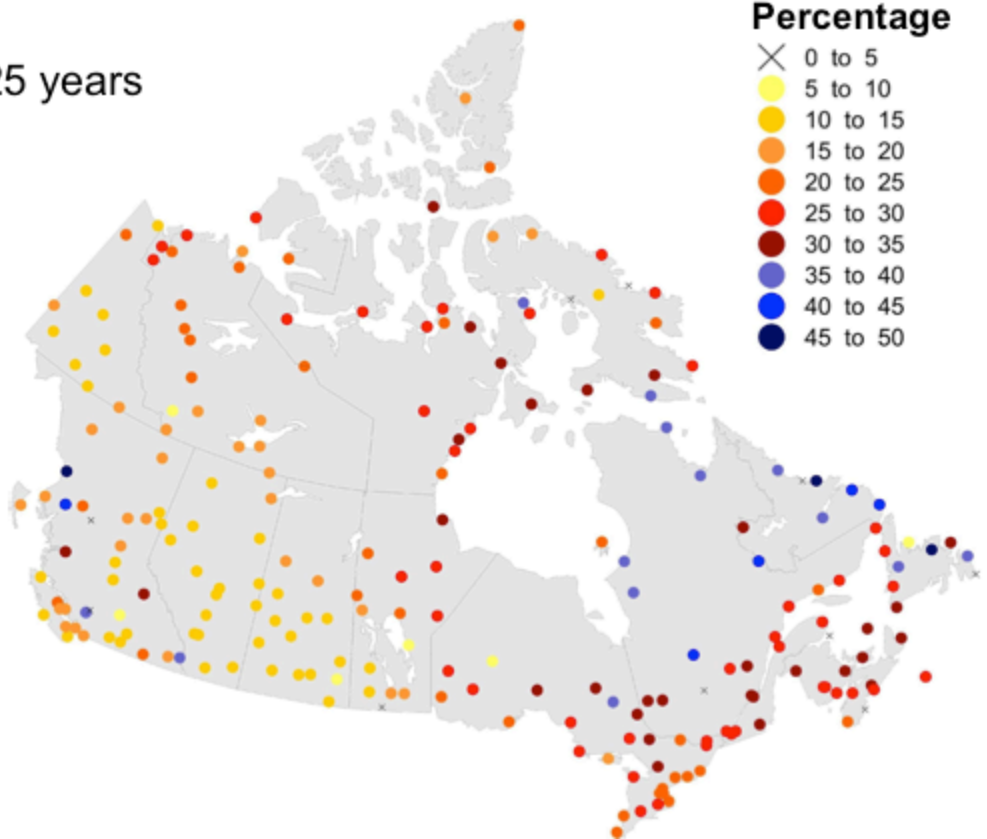
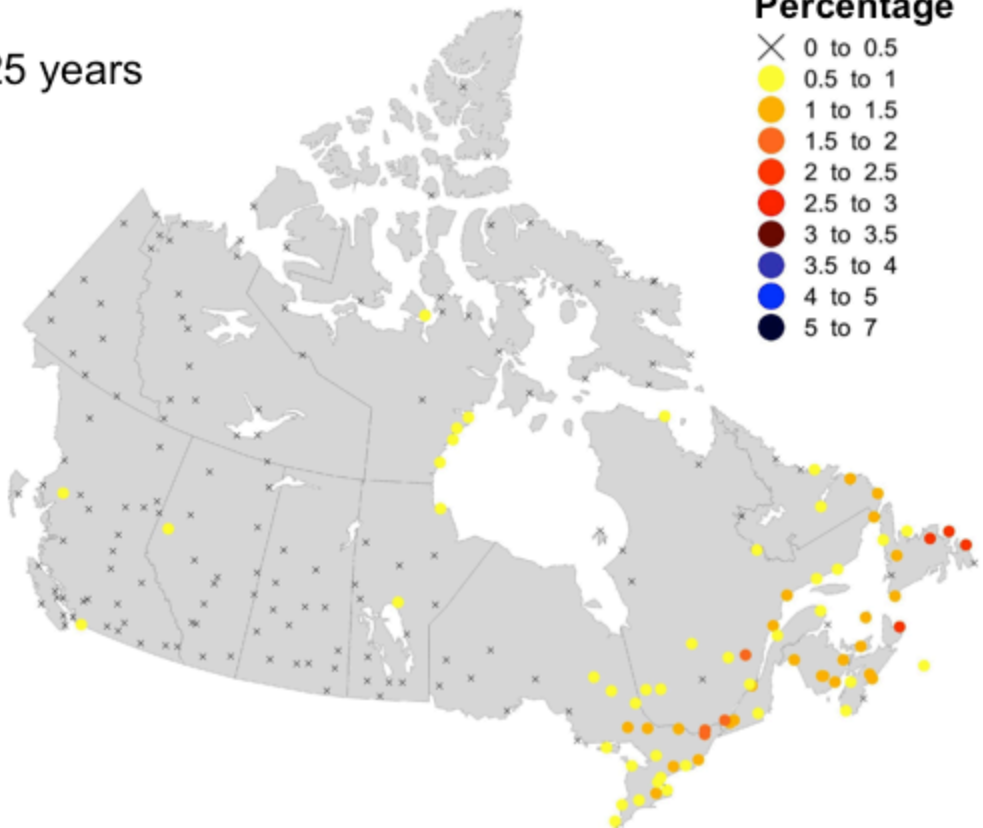


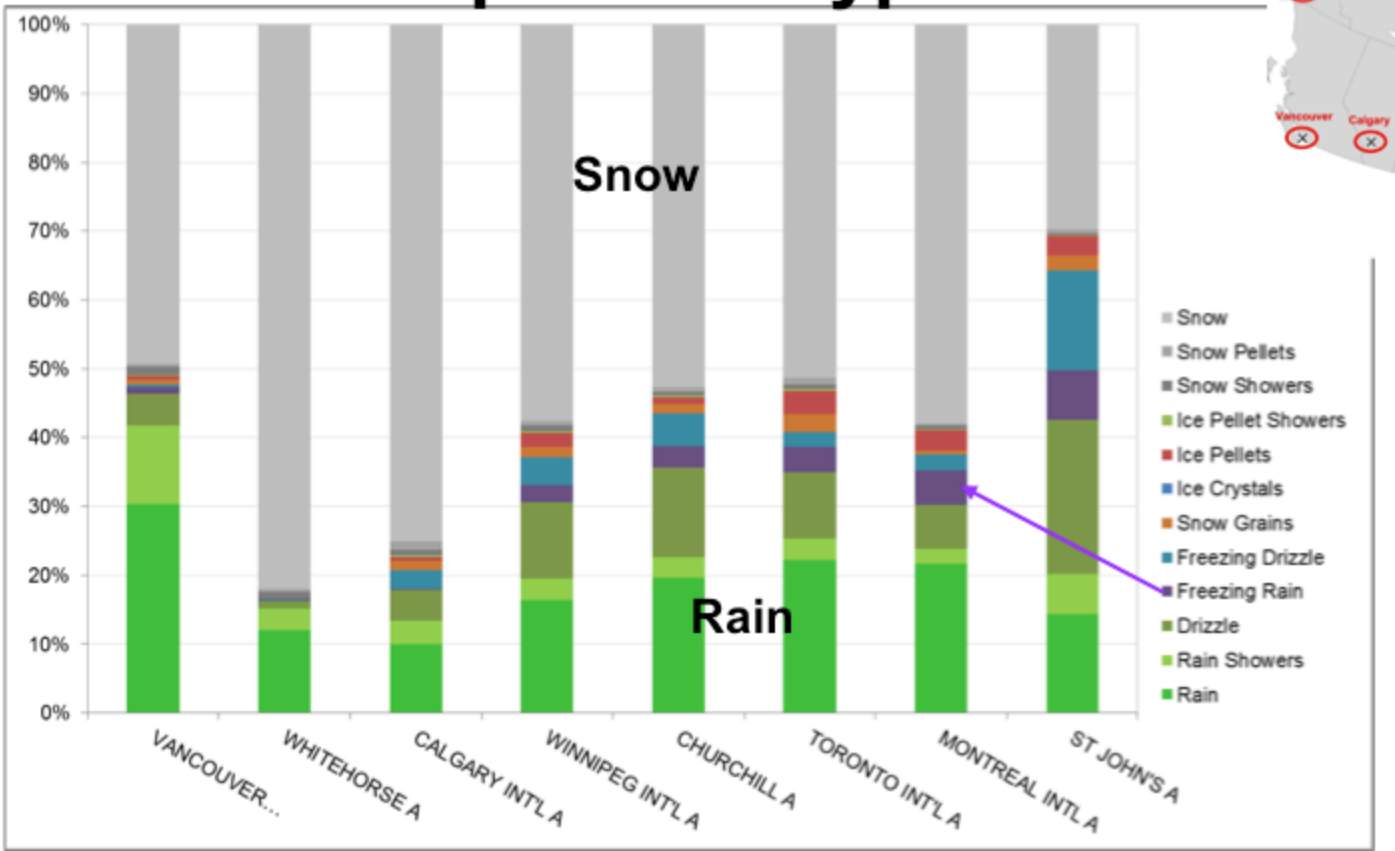
Fraction of Near 0°C Conditions with Freezing Rain (%)

Period: 1981 – 2015, minimum 25 years

$-2°C \leq T \leq 2°C$



Fractional Occurrence of Precipitation Types



$-2°C \leq T \leq 2°C$

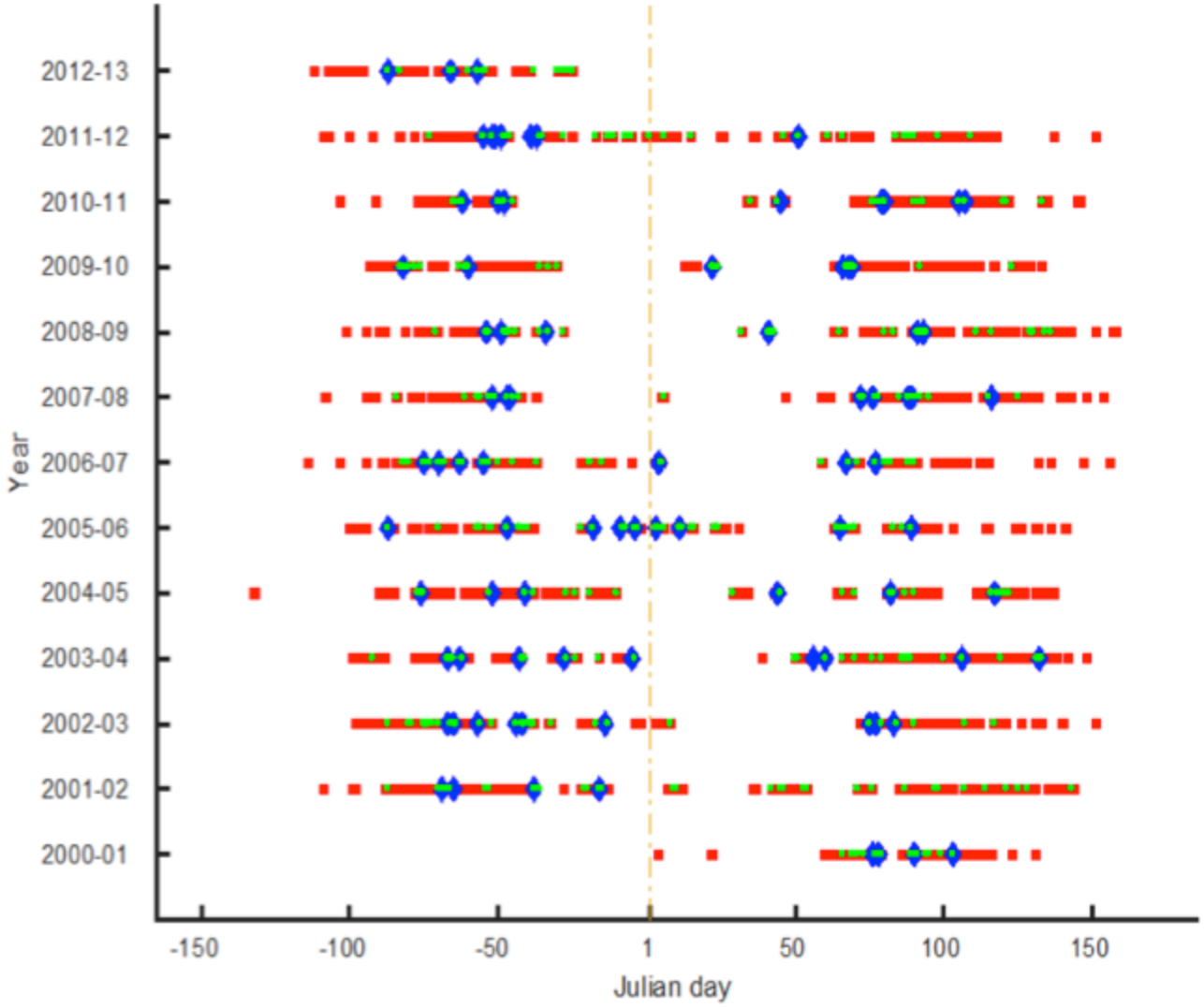
Winnipeg

Temperature ≤ ±2°C:

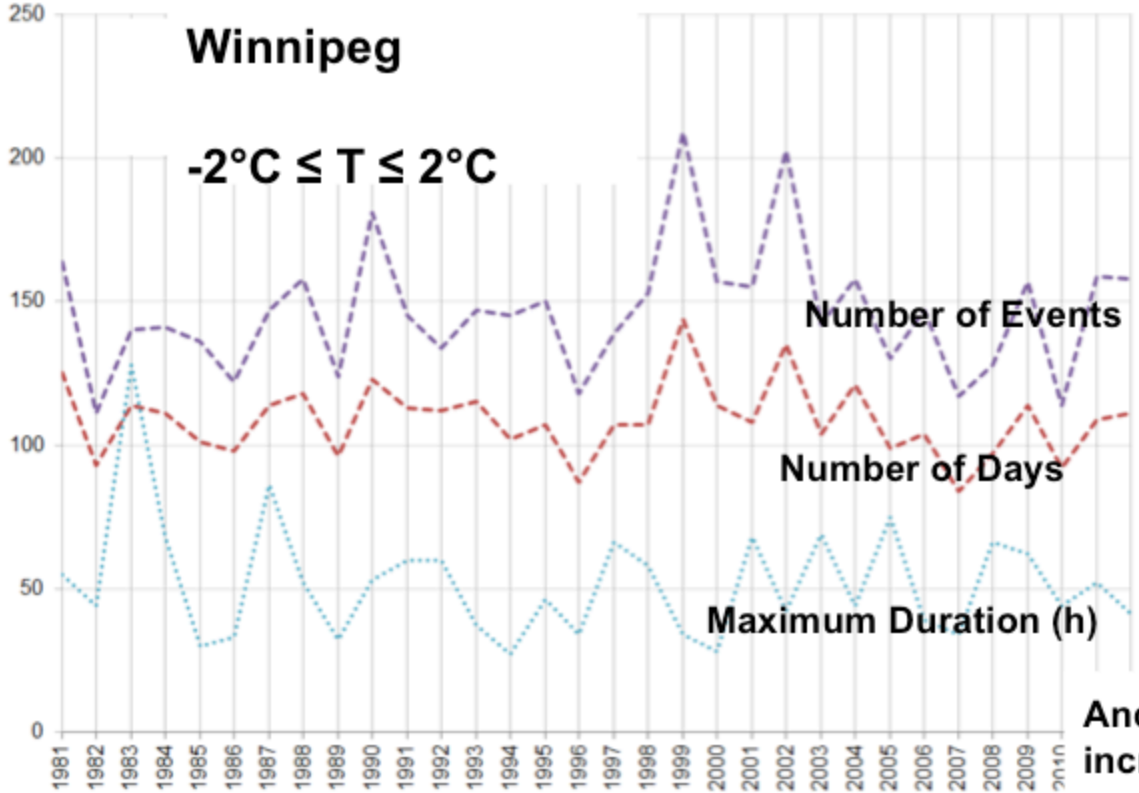
Occurrences

Top 5% in duration

Precipitation



Temperatures Near 0°C



And: No significant increase in freezing rain

Concluding Remarks

An assessment of critical near 0°C conditions across Canada is being carried out:

important for freeze/thaw, hazards

Several points can be made:

The country is characterized by highly variable near 0°C features

occurrences, events, duration, patterns

Associated precipitation is often critical but highly variable

occurrences, types, patterns

Future conditions need to be better addressed

build on solid foundation