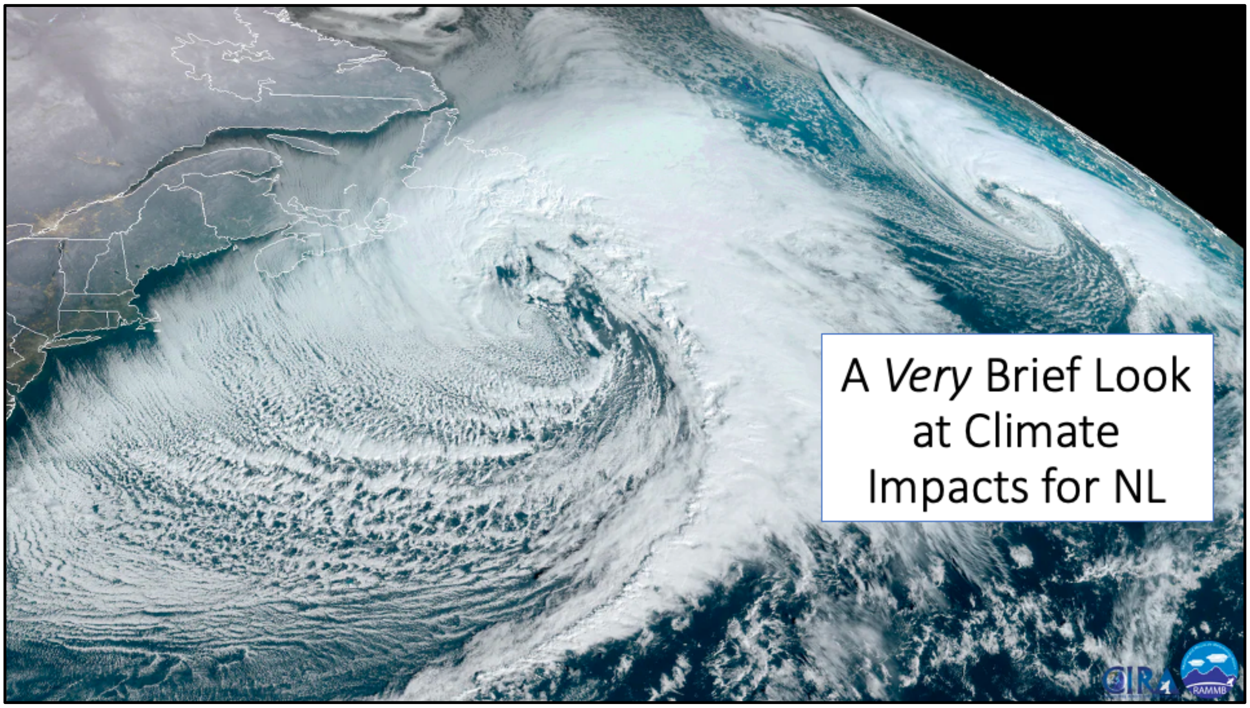

A *Very* Brief Look
at Climate
Impacts for NL

# Key Background Statement:

1) Climate is changing rapidly
2) *We're* the cause…
3) …specifically, our use of fossil fuels (oil, gas, coal etc)

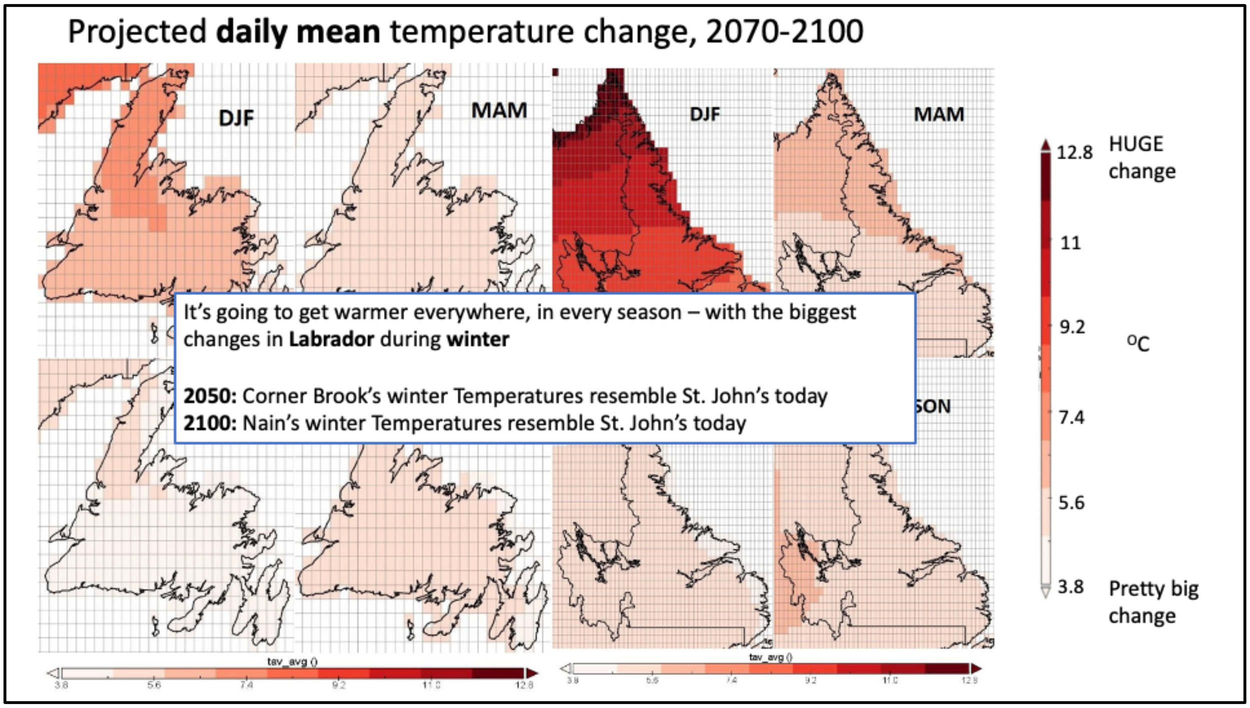
So what does it mean for Newfoundland & Labrador?

NL projections are based on multiple physical (6) and statistical (6) refinements of general circulation/Earth system model (GCM) output; this is referred to as a 12-member 'ensemble' of dynamic & statistically downscaled climate projections.

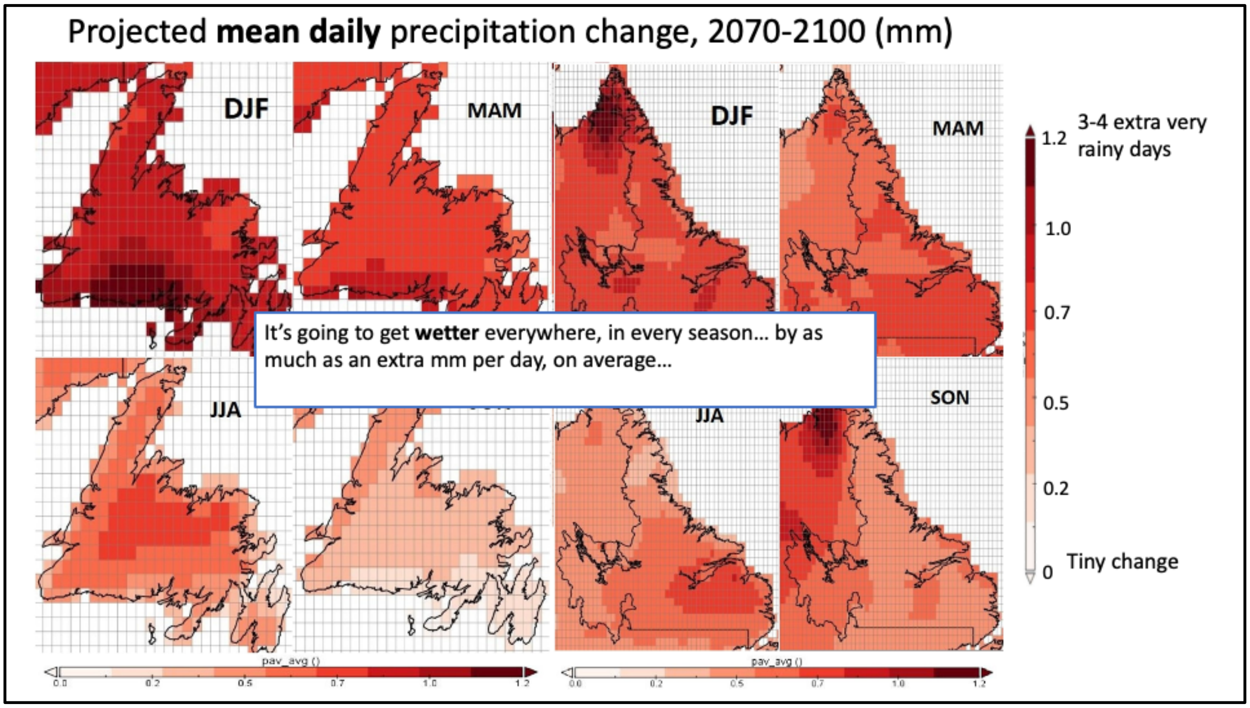
All projections were based on the same assumptions about future greenhouse emissions (shown: a 'business as usual' projection, as this remains the path we're currently on. Specifically, RCP 8.5)

Following slides focus on projected *changes:* the climatology of 2070-2100 and the recent past (1976-2005). The average change predicted across all 12 ensemble members is shown.

NOTE: NL data, methods + all kinds of additional information is available in Finnis & Daraio, 2018 which can be found here:
https://www.turnbackthetide.ca/tools-and-resources/whatsnew/2018/Final_Report_2018.pdf




Changes in daily mean temperature, 2070-2100 vs 1976-2005. Four seasons are shown:
Winter (Dec/Jan/Feb, or DJF)
Spring (MAM)
Summer (JJA)
Fall (SON)




Changes in daily mean precipitation, 2070-2100 vs 1976-2005.

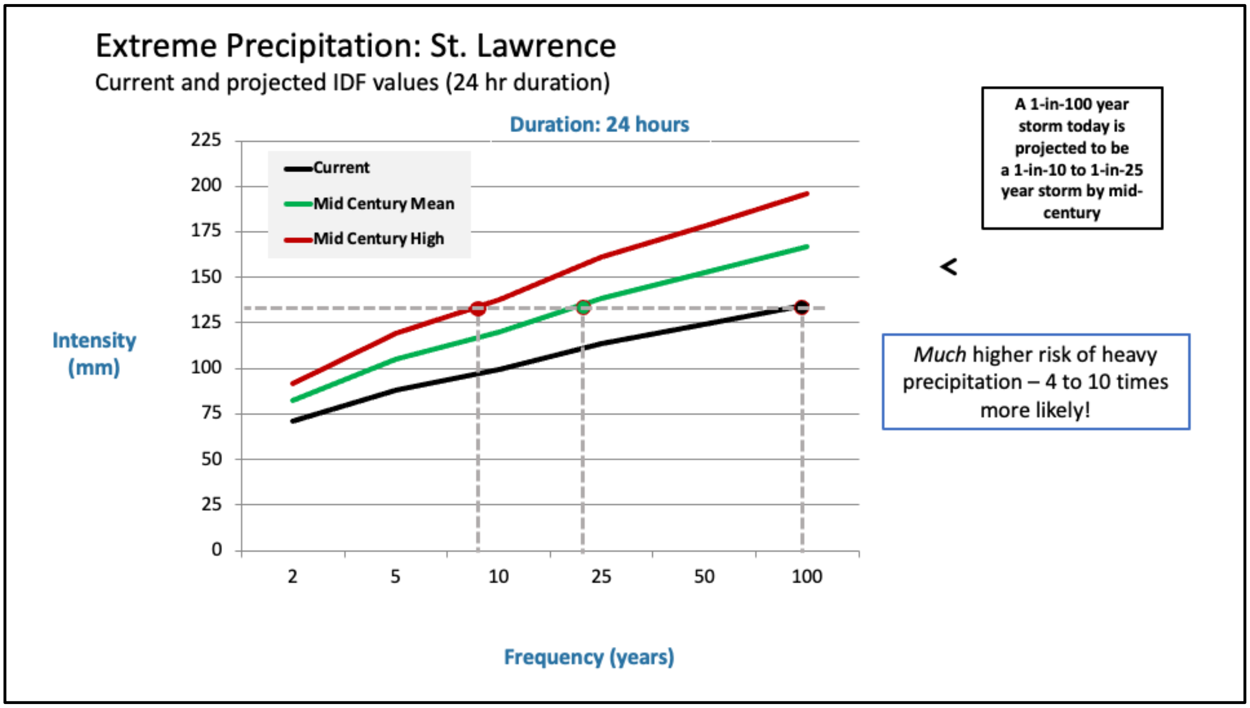


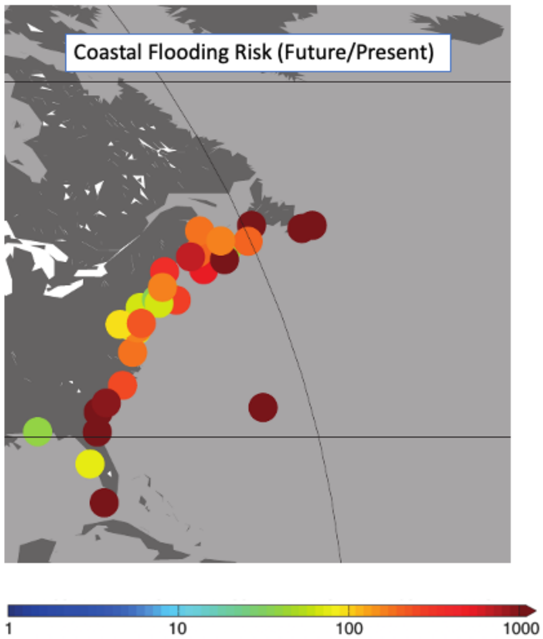

Illustration of projected changes in extreme precipitation, 2070-2100 vs 1976-2005. Plot shows the relationship between *rarity* or *likelihood (*frequency – here, shown as a return period) of a given precipitation event vs. the intensity of precipitation produced (mm of rain/hour). Higher intensity events are less likely/more rare. Here, we're looking at projections for St. Lawrence; similar data is available for many other NL locations in Finnis & Daraio, 2018)

The black line shows our current climate, based on available observations. Green shows the ensemble average estimate for 2070-2100; Red shows the upper end of ensemble member estimates.

Interpretation: the *current t*100 year event (1/100 chance of occurring in a given year) matches ~the 25 year event (1/25 chance of occurring in a given year) on the average expected future line (green) – and the 10 year event (1/10 chance; red line) in our more pessimistic models.

That’s a 4-10x increase in the frequency of our current 100 year event.

Message: MUCH higher chance of rain-driven flooding.



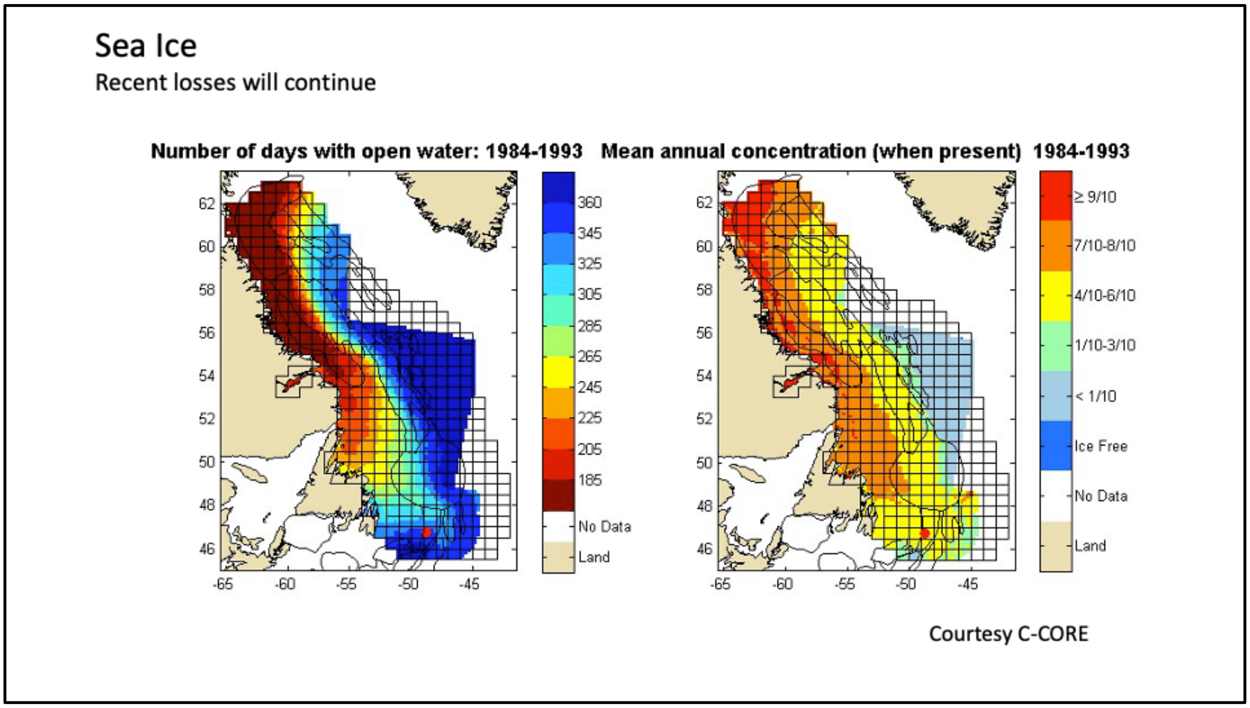

Intergovernmental Panel on Climate Change, AR5

**Sea Level Rise & Storm Surges**
0.5-0.75m increase in sea level by 2100

**0.5m Rise:** Risk of coastal flooding increases *dramatically – more than* 100 times higher than present!

**0.75m Rise:** *Future low tide* becomes *current high tide.*

Sea level rise increases the risk of storm surge (wind + tide) driven flooding on the coast. The last IPCC report (https://www.ipcc.ch/report/ar5/syr/) provides details; see pg. 1200 for a discussion of the plot shown here, and pg. 1181 for projected sea level rise out to 2100. Here, we've considered two scenarios: RCP 4.5 (which assumes concerted global effort to reduce emissions), and RCP 8.5 ('business as usual'; limited effort to curb emissions).




OBSERVED changes in sea ice cover, courtesy of C-CORE. See presentation for an animation, but what we see is a steady decline in i) the number of days with sea ice cover and ii) lower avg ice concentration (more 'broken' ice) when/where it is present.

This is part of an ongoing (and dramatic!) decline in Arctic sea ice cover. The National Snow & Ice Data Center (NSIDC) in the US has some tools that can help you visualize this loss:
https://nsidc.org/arcticseaicenews/

## But wait – there's *more!*

Weather

- Freeze/Thaw cycles
- Precipitation type
- Winds?

All sorts of possible surprises!

Ecological Shifts

- Animals
- Fish
- Plants
- Insects

This is just a quick sample of the changes we can expect. Many other things can be expected to shift as temperatures, precipitation, sea ice, and sea level change - and interact in various ways.

- Less snow, more rain
- More melt days
- More heat for the growth of plants & insects
- Shifting habitats
- Ocean acidification
- Changes in storm tracks
- Changes in ocean currents


Climate continues to change, expect unusual events: e.g. heavy winter thaws (left image; Nain, Feb 2010) heavy precipitation events (middle; Terra Nova, Oct 2016), and coastal flooding/erosion (right; CBS, Jan 2021).