Overview of available Western science-based climate data for northern Canada

Historical climate data and future climate projections are available for northern Canada.

The sparse weather station network does affect data availability and products that use observations, but there are still many options for understanding climate change to support decision-making in the North.

We have high confidence in temperature and temperature-related climate indices.

We have a good understanding of the physical processes controlling temperature, which is a spatially consistent variable with good observational records.

We have medium confidence in precipitation and precipitation-related indices.

Precipitation is heavily influenced by local topography and can vary widely over short distances. For this variable, the sparse weather station network makes it hard to build a reliable picture of local conditions.

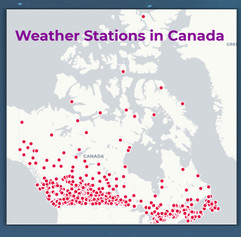
There will always be some uncertainty in climate information.

- **Model uncertainty** - Earth's climate system consists of many different components, which may be represented differently in different climate models leading to different, plausible, results.
- **Emissions scenario uncertainty** - Future greenhouse gas emissions could follow a number of different pathways.

Despite these sources of uncertainty, we know that Canada's climate is changing rapidly and today's climate is already different from the past. When planning for the future, future climate projections will support better decision-making than relying on historical data alone.

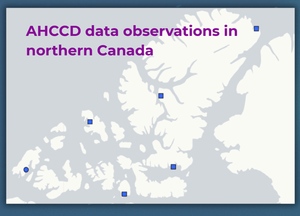
There are different types of historical data

Weather stations gather observational data at specific locations, often at airports.



But...sometimes the observations are affected by things that are not related to weather conditions, like a new instrument being installed.

To understand how weather conditions are changing, we need to remove the influence of factors that are not related to weather from the data record. This results in processed observations such as the **Adjusted and Homogenized Canadian Climate Data (AHCCD)** dataset.



The processed data is great for understanding weather trends over long periods of time!

What about areas that don't have a weather station nearby?

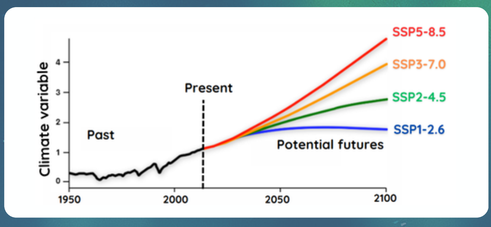
Weather station data represent the conditions at the location of the weather station. We can use statistical techniques to fill in the gaps between station observations, creating **Gridded Historical Data.**

Gridded historical data can also be calculated by combining observations with a numerical weather model. The model fills in the gaps between observations, producing **Reanalysis Data** for all modelled weather variables.

Reanalysis and Gridded historical data both provide spatially complete historical climate information for those residing in northern Canada!

And there are future climate projections

Climate models simulate the Earth's climate in the future. Future climate conditions depend on current and future greenhouse gas emissions, estimated by **Shared Socio-economic Pathways (SSPs)** representing different technological, socioeconomic, and policy futures.



Northern Canada is warming about three times as fast as the rest of the world and is being impacted accordingly. Climate models help us explore how the future climate may change in response to the SSPs.

Regional Climate Models (RCMs) cover smaller regions of Earth at finer spatial resolutions (usually 10 to 50km grid boxes).

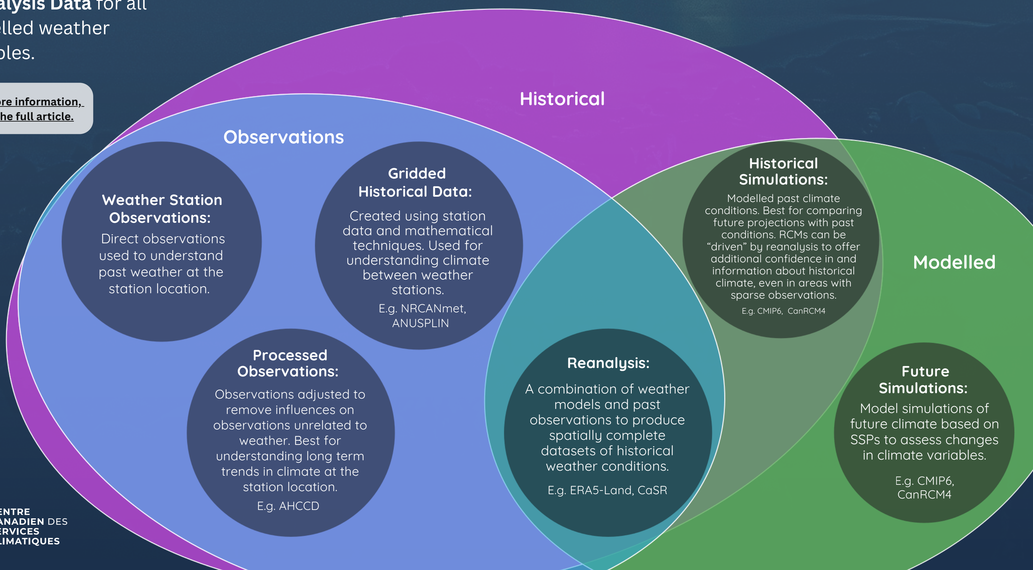
Global Climate Models (GCMs) cover the whole Earth at coarser resolutions (usually around 100km grid boxes).

What if you need local projections?

This is where **Downscaling** comes in! Downscaling uses Gridded Historical Data to transform coarser-scale GCM or RCM information to the finer spatial scales needed for local decision-making.

Future climate projections on ClimateData.ca have been downscaled for use in local climate change adaptation planning, including in the North.

For more information, see the full article.



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