

EOSC 442 – Final Project Preliminary Results (example of a previous submission).

1. Title, Research Questions and Data

Canadian Capital City Temperature Anomalies Compared to the Global Average Rising Temperature

It has been proven by many scientists that global average temperature is increasing. We wanted to see if and/or how this affects us living in Canada. We will look at temperature data for the 13 capital cities in Canada (10 provinces plus 3 territories) from 1976 – 2006. By looking at this data, we will determine if temperatures of Canadian cities have been following the same trend as the global average temperature. We will also look at how the temperature has changed in each Canadian city compared to the others and hypothesize what has caused these changes.

Our research questions are:

- Do Canadian capital cities follow the global average increasing temperature trend?
- How does temperature in the 13 Canadian capital cities differ from each other?

We will use 13 different datasets that we will compile into one consisting of mean temperatures in degree Celsius for Canadian capitals from 1976-2006. The datasets were obtained from the Government of Canada Climate website (<http://climate.weather.gc.ca/climateData>). It was collected by climate stations set up by the Canadian government.

For all 13 cities, we used the data obtained from stations at the international airports in each city. In general, the Canadian climate stations at each international airport had the most data points with the widest time range. Each capital's dataset had its own time frame and resolution. The overlapping dates of all datasets are 1976-2006. When we compare this data to the global mean temperature, this range will be good to use since all cities have data from that range. However, in order to look at specific trends in individual cities we will graph the entire time range given in each dataset. Below is a list of the time ranges in each dataset for each city:

Victoria: 1940-2012
Edmonton: 1959-2012
Winnipeg: 1938-2007
Fredericton: 1951-2008
St. John's: 1942-2012
Halifax: 1953-2012
Toronto: 1937-2012
Charlottetown: 1943-2012
Quebec City: 1975-2008
Regina: 1983-2007
Yellowknife: 1942-2007

Iqaluit: 1946-2007

Whitehorse: 1942-2007

All datasets contain monthly mean temperatures for every year. In order to analyze the dataset we will have many graphs. One will include a compilation of all mean temperature for all 13 cities from 1976-2006. We will compare this trend to the global average mean temperature over the same timeline. We will also have 13 individual provincial graphs and compare how temperatures within Canadian cities differ amongst each other. These individual graphs will also allow us to hypothesize regional causes about each city, which may be included in our final discussion. This will allow for further research into what causes each cities temperature to change or not change.

2. Data Analysis

The raw data we used for our project was downloaded from Canada Climate in a .csv file. This contained monthly mean temperature data in degrees Celsius for each capital city, as well as many numerous other columns containing various data. We used the function `fopen` to open each .csv file and used `textscan` to delete headers and whitespace. With the loaded data, we extracted column {8} which contained the mean temperature data.

Within the raw data we did find some missing data points, which were denoted by the number “-99.99”. To remove these missing values we masked all values equal to “-99.99” and applied the same mask to the date numbers.

To understand the data we plotted it first. For example we were able to see the seasonal trends and also see a slight temperature increase over the years. Another observation we made was that some cities have bigger seasonal temperature variations while others have smaller difference between their maximum and minimum.

Using a for-loop we created a date vector with monthly variability from 1976-2006. To be able to graph we used `datenum` to convert our date vector into date numbers. We plotted temperature versus date for every capital city and `datetick` to plot the graphs in an understandable format. We modified the x-axis to fit the graph and then added titles.

Further into our project we will calculate and plot temperature anomalies for each city against the global temperature trend using a data set downloaded here:

<http://cdiac.ornl.gov/ftp/trends/temp/jonescru/global.txt>

We will also look at correlations between the Canadian cities' yearly anomalies.

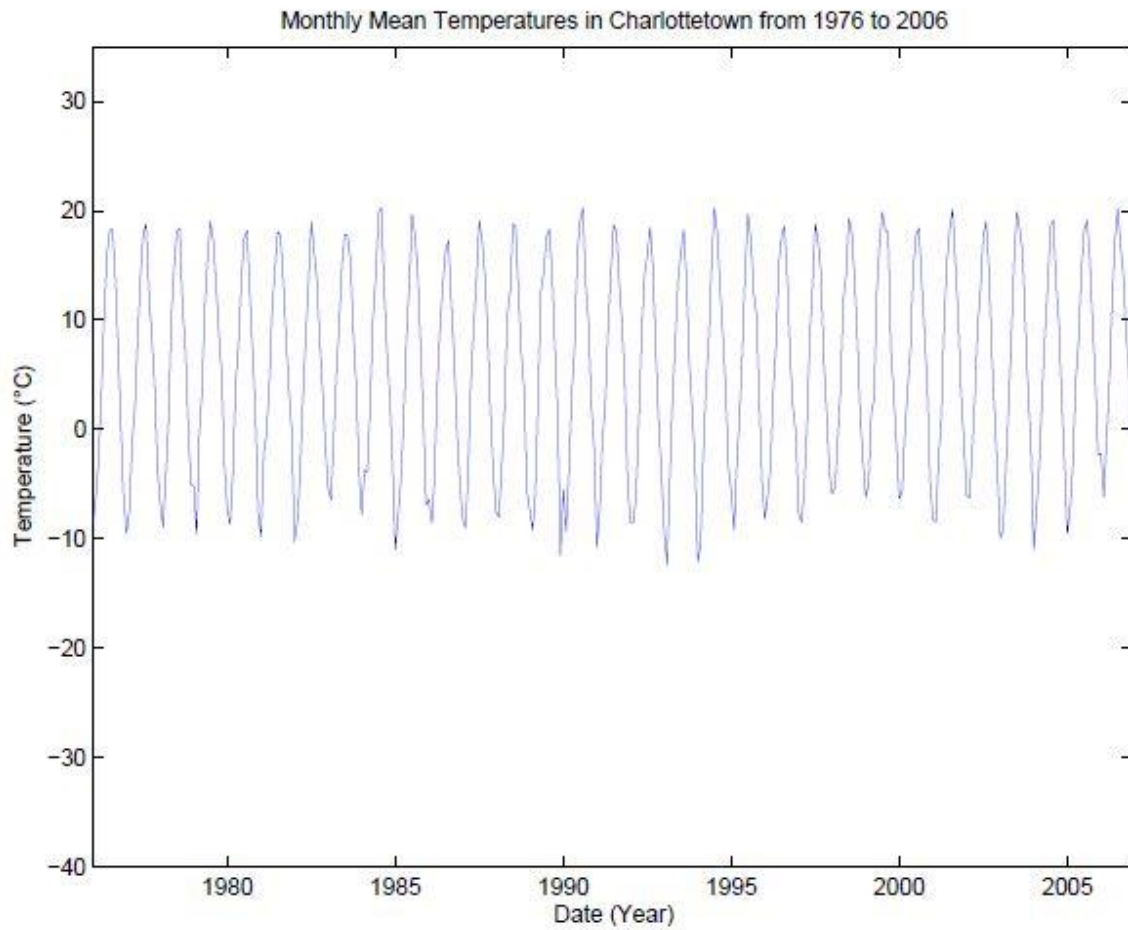


Figure 1: Monthly mean temperature (in °C) in Charlottetown from 1976 to 2006. This data was extracted from the Environment Canada National Climate Data and Information Archive.

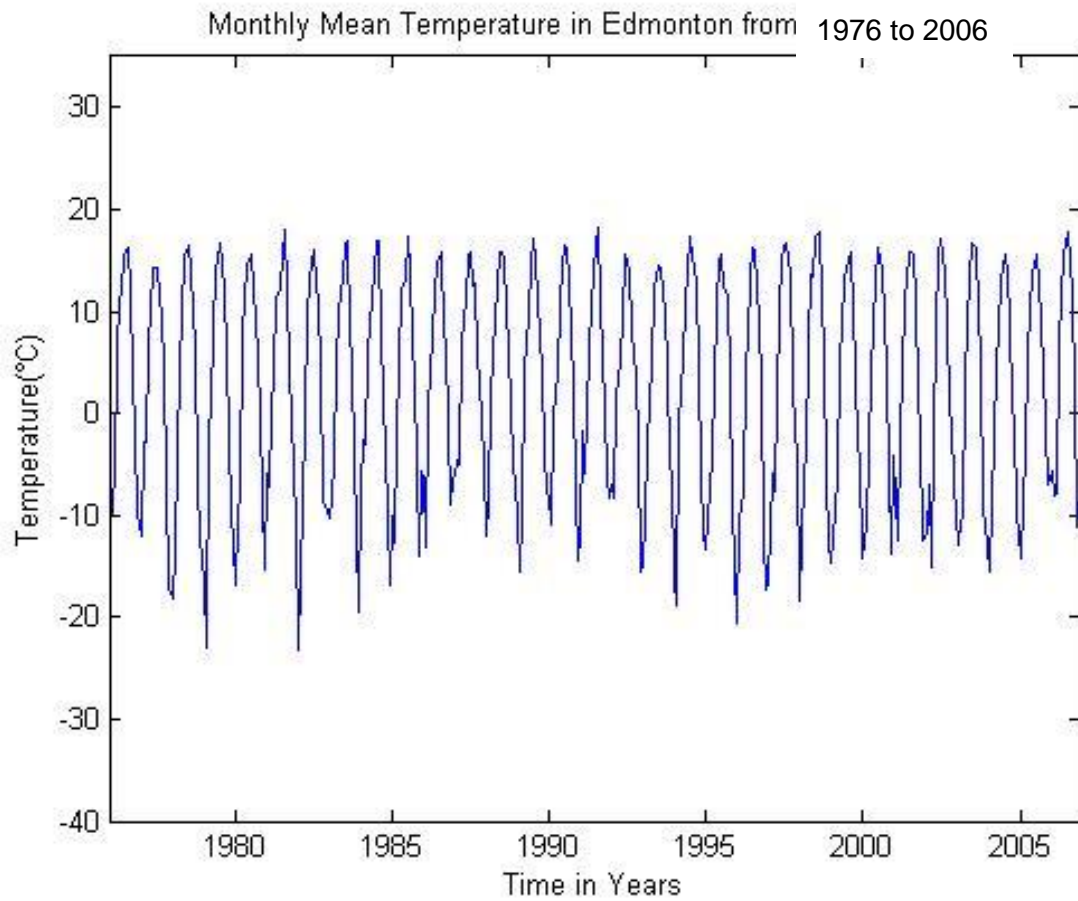


Figure 2. Monthly mean temperature (in °C) in Edmonton, Alberta from 1976 to 2006. This data was extracted from the Environment Canada National Climate Data and Information Archive.

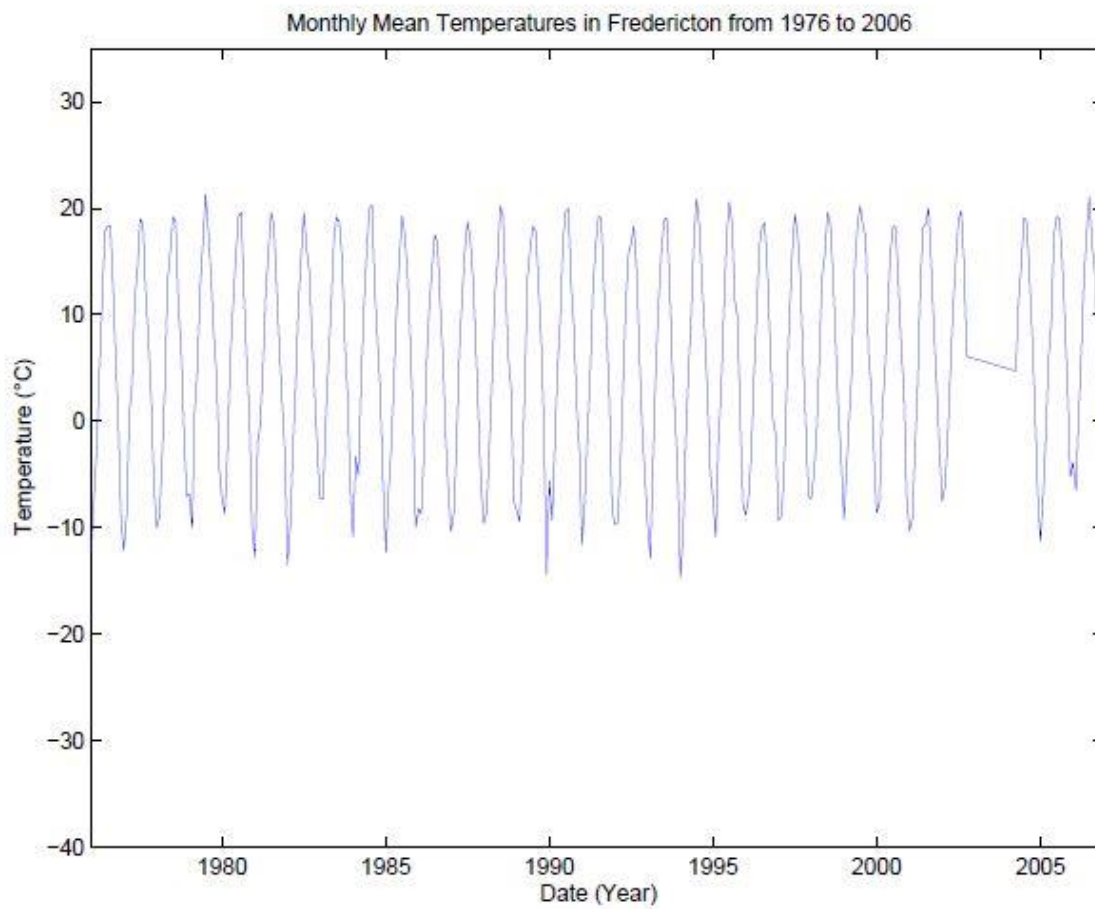


Figure 3: Monthly mean temperature (in °C) in Fredericton, New Brunswick from 1976 to 2006. This data was extracted from the Environment Canada National Climate Data and Information Archive.

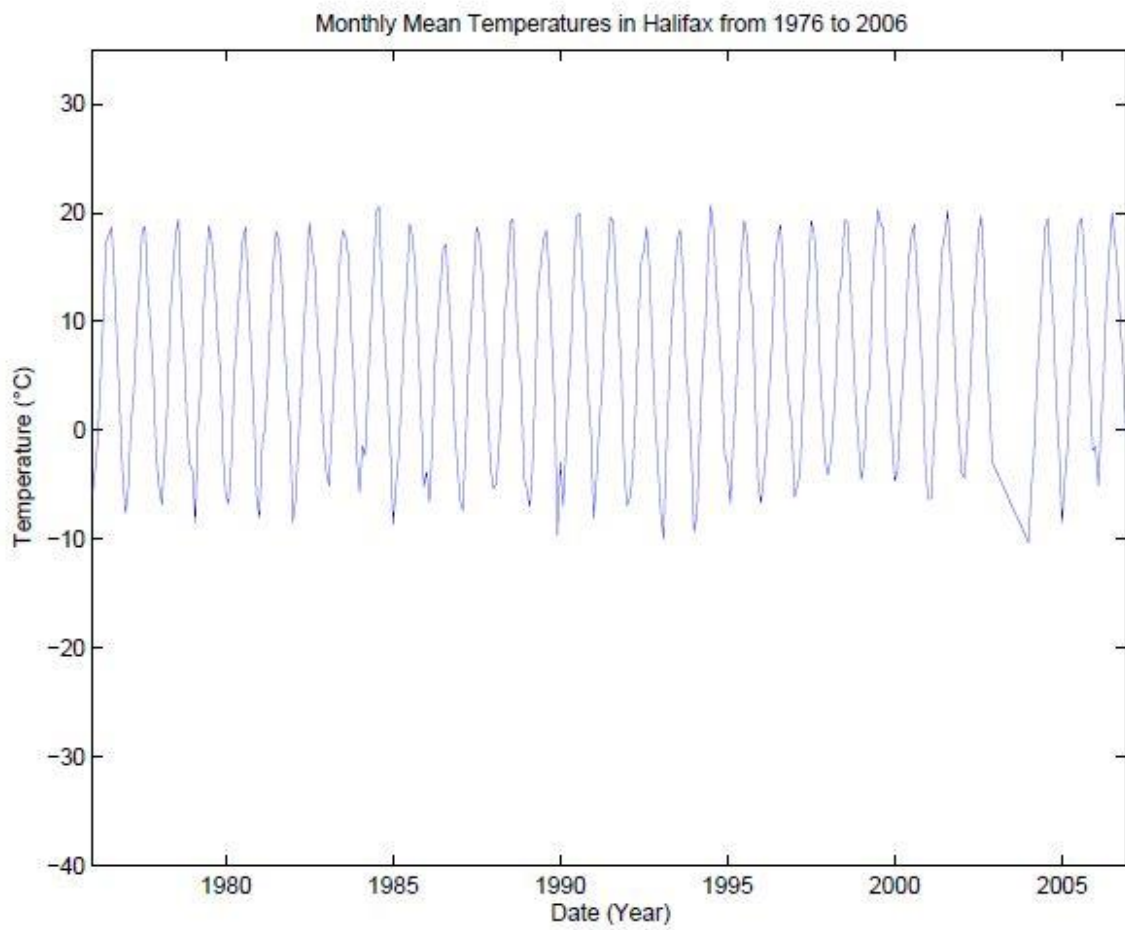


Figure 4: Monthly mean temperature (in °C) in Halifax, Nova Scotia from 1976 to 2006. This data was extracted from the Environment Canada National Climate Data and Information Archive.

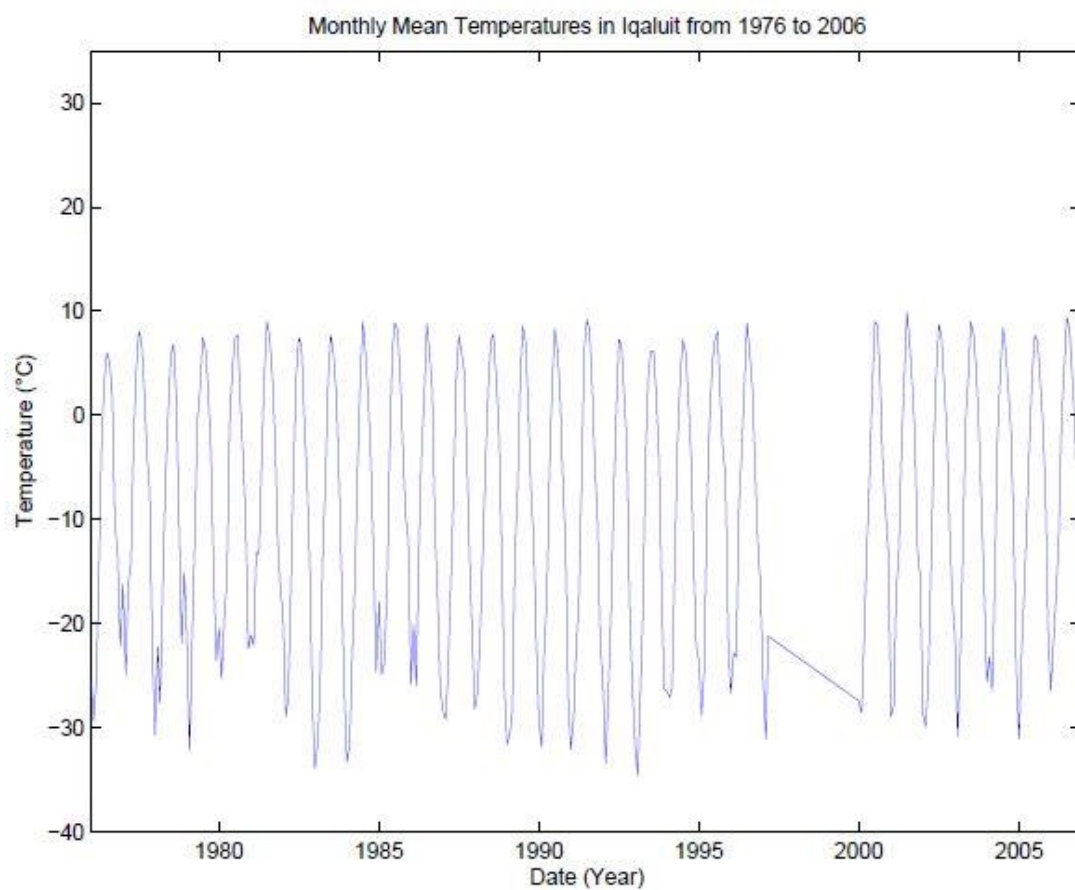


Figure 5: Monthly mean temperature (in °C) in Iqaluit, Nunavut from 1976 to 2006. This data was extracted from the Environment Canada National Climate Data and Information Archive.

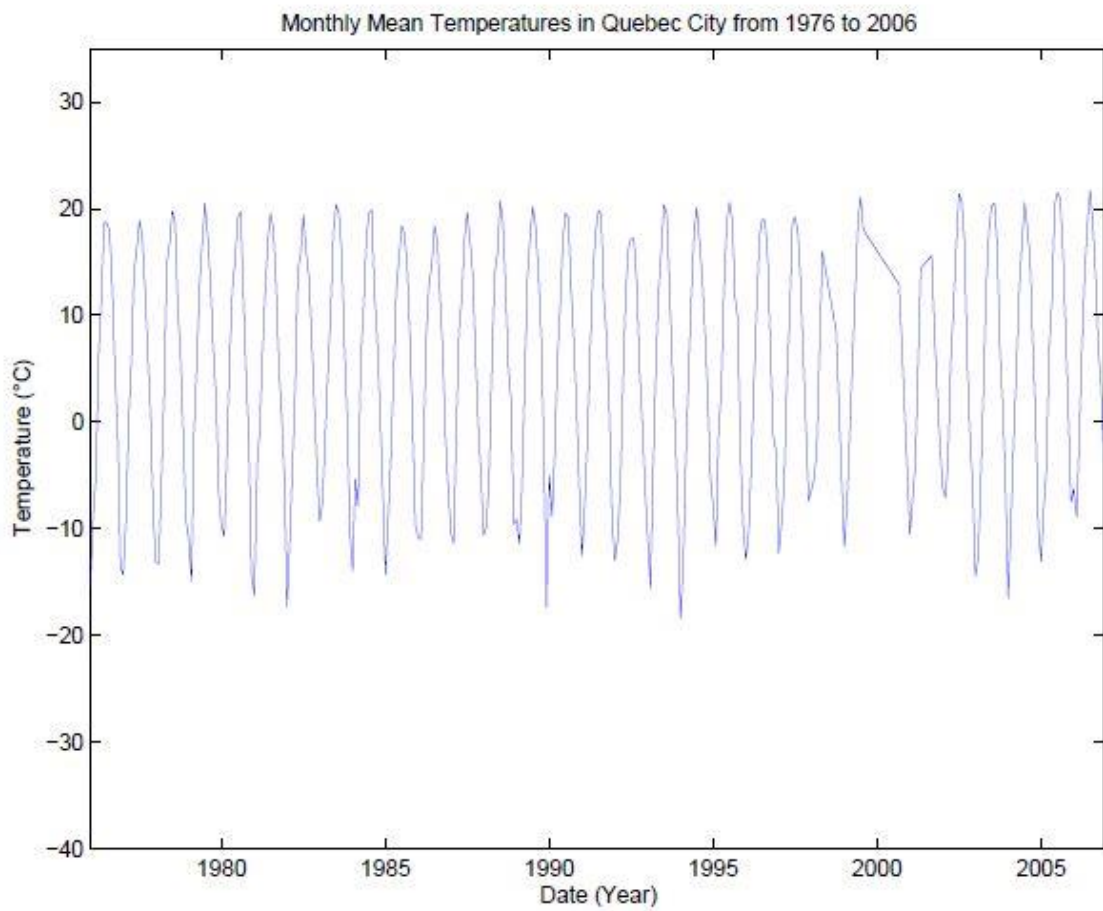


Figure 6: Monthly mean temperature (in °C) in Quebec City, Quebec from 1976 to 2006. This data was extracted from the Environment Canada National Climate Data and Information Archive.

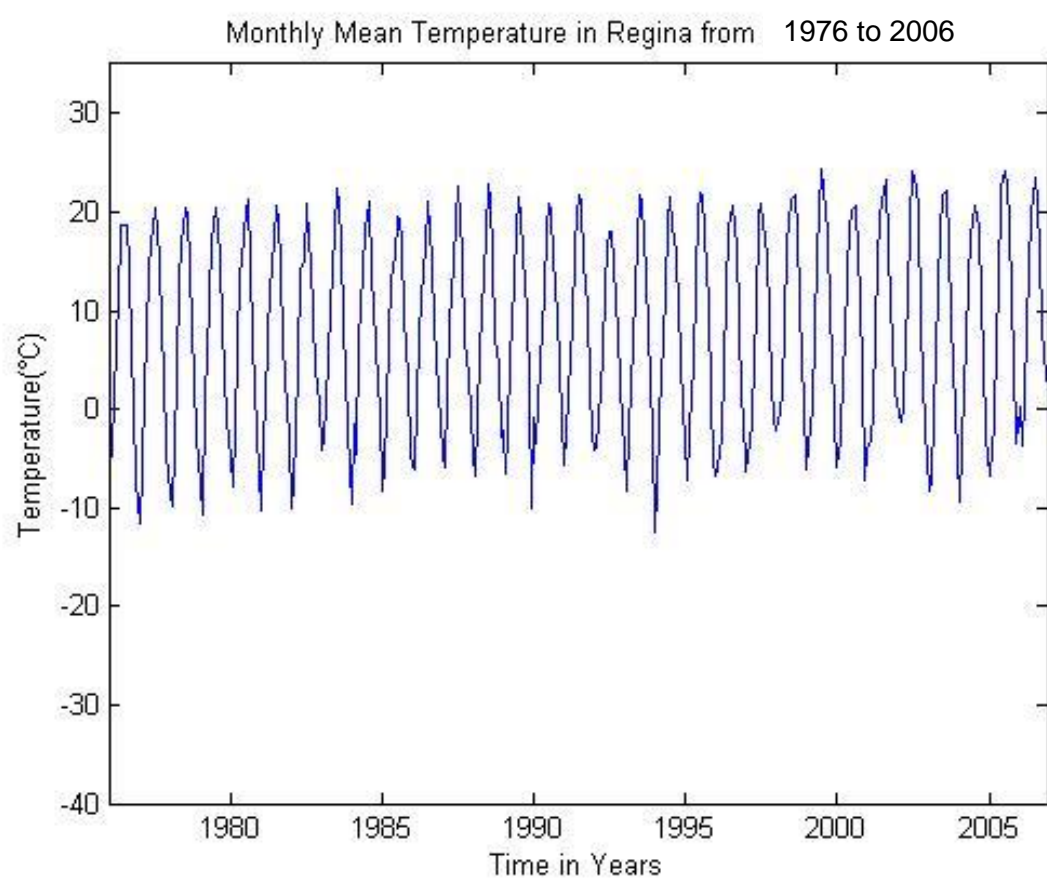


Figure 7. Monthly mean temperature (in °C) in Regina, Saskatchewan from 1976 to 2006. This data was extracted from the Environment Canada National Climate Data and Information Archive.

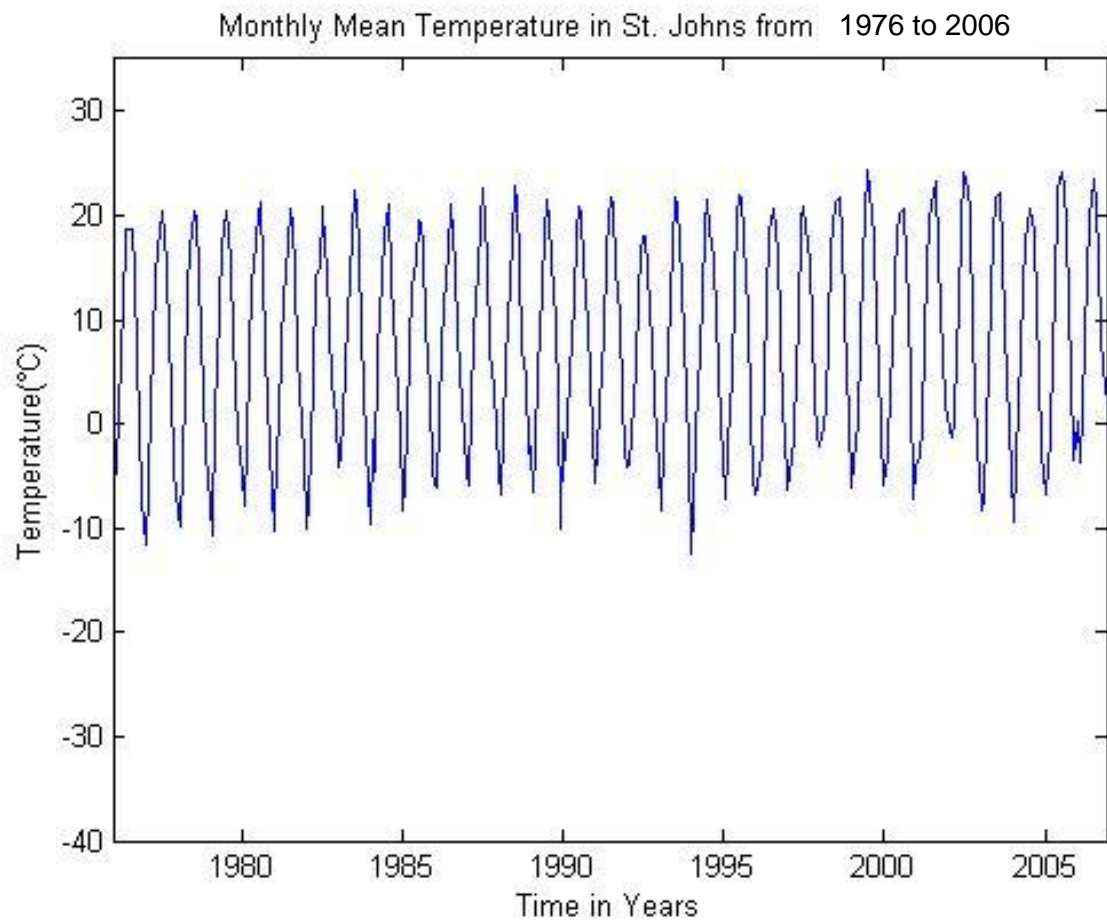


Figure 8. Monthly mean temperature (in °C) in St. John's, New Foundland from 1976 to 2006. This data was extracted from the Environment Canada National Climate Data and Information Archive.

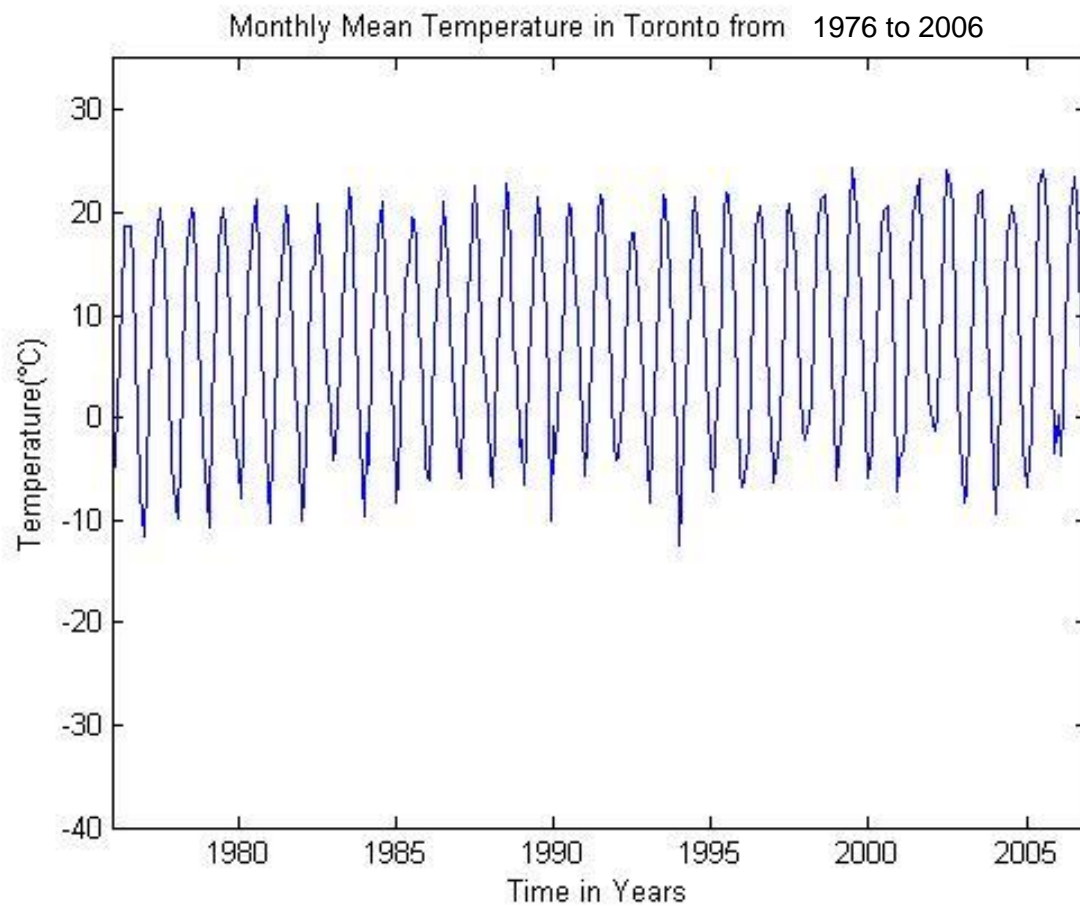


Figure 9. Monthly mean temperature (in °C) in Toronto, Ontario from 1976 to 2006. This data was extracted from the Environment Canada National Climate Data and Information Archive.

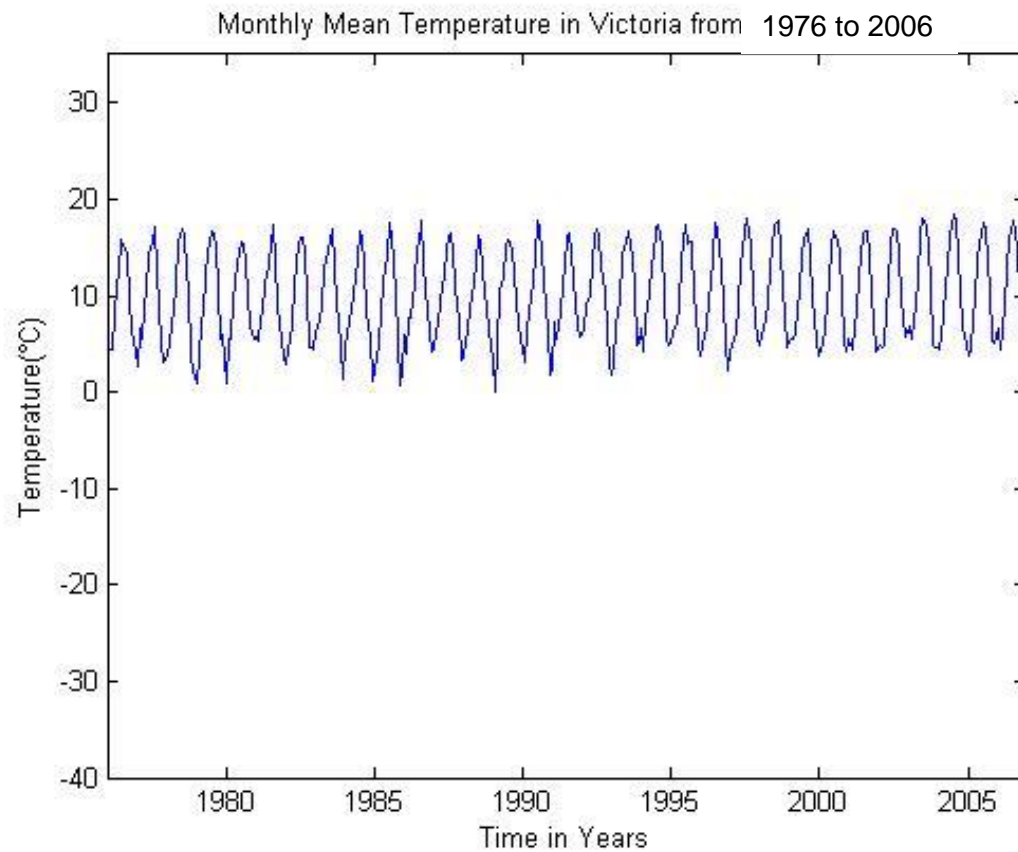


Figure 10. Monthly mean temperature (in °C) in Victoria, British Columbia from 1976 to 2006. This data was extracted from the Environment Canada National Climate Data and Information Archive.

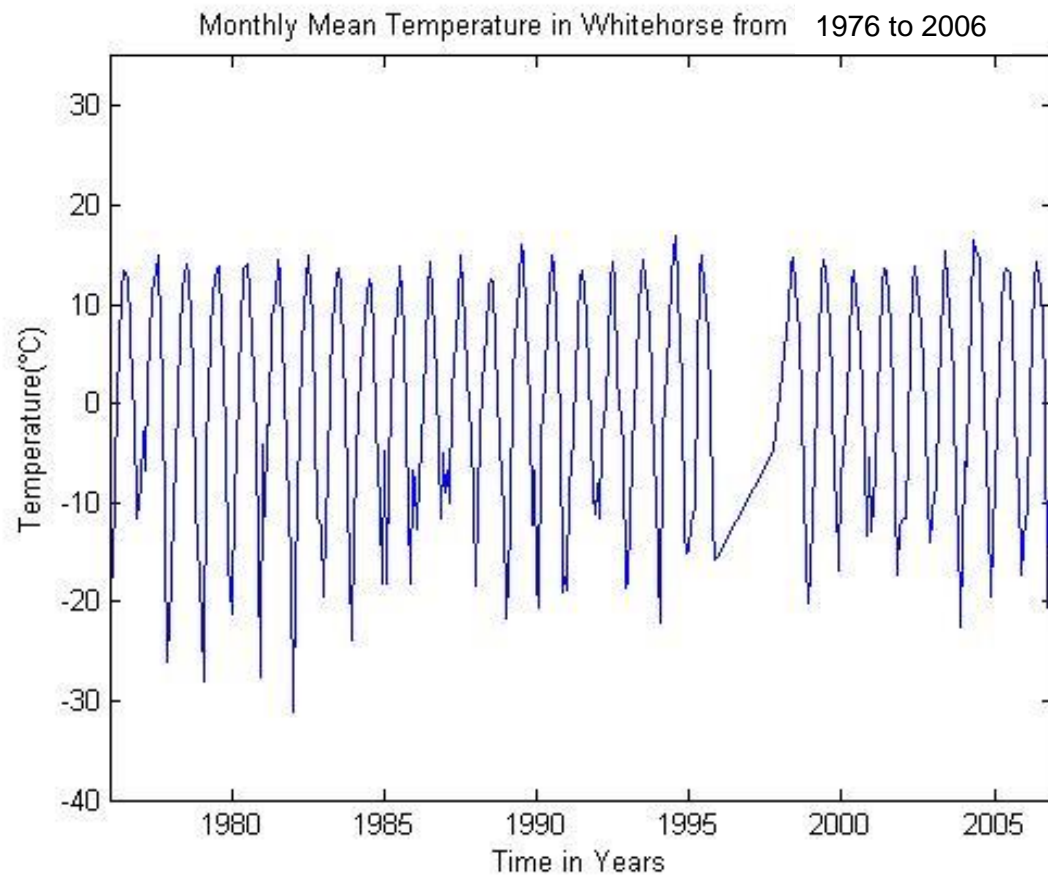


Figure 11. Monthly mean temperature (in °C) in Whitehorse, Yukon from 1976 to 2006. This data was extracted from the Environment Canada National Climate Data and Information Archive.

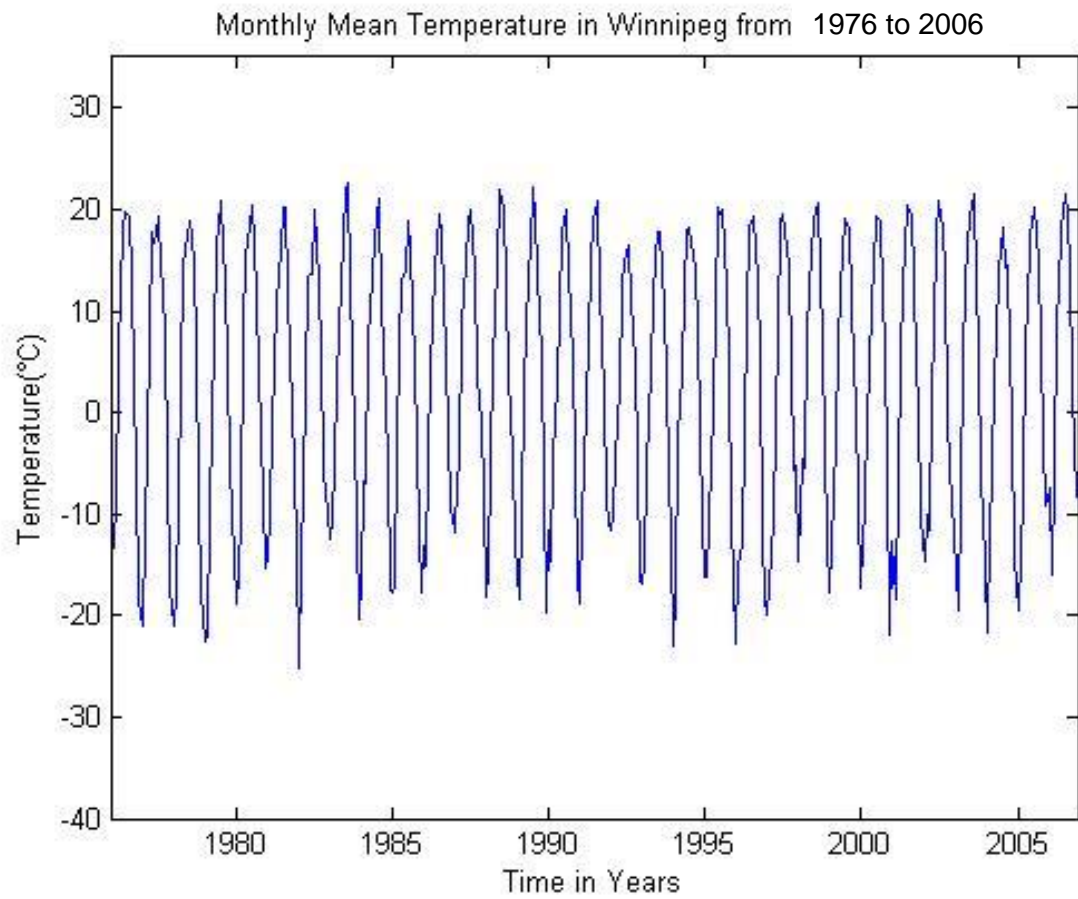


Figure 12. Monthly mean temperature (in °C) in Winnipeg, Manitoba from 1976 to 2006. This data was extracted from the Environment Canada National Climate Data and Information Archive.

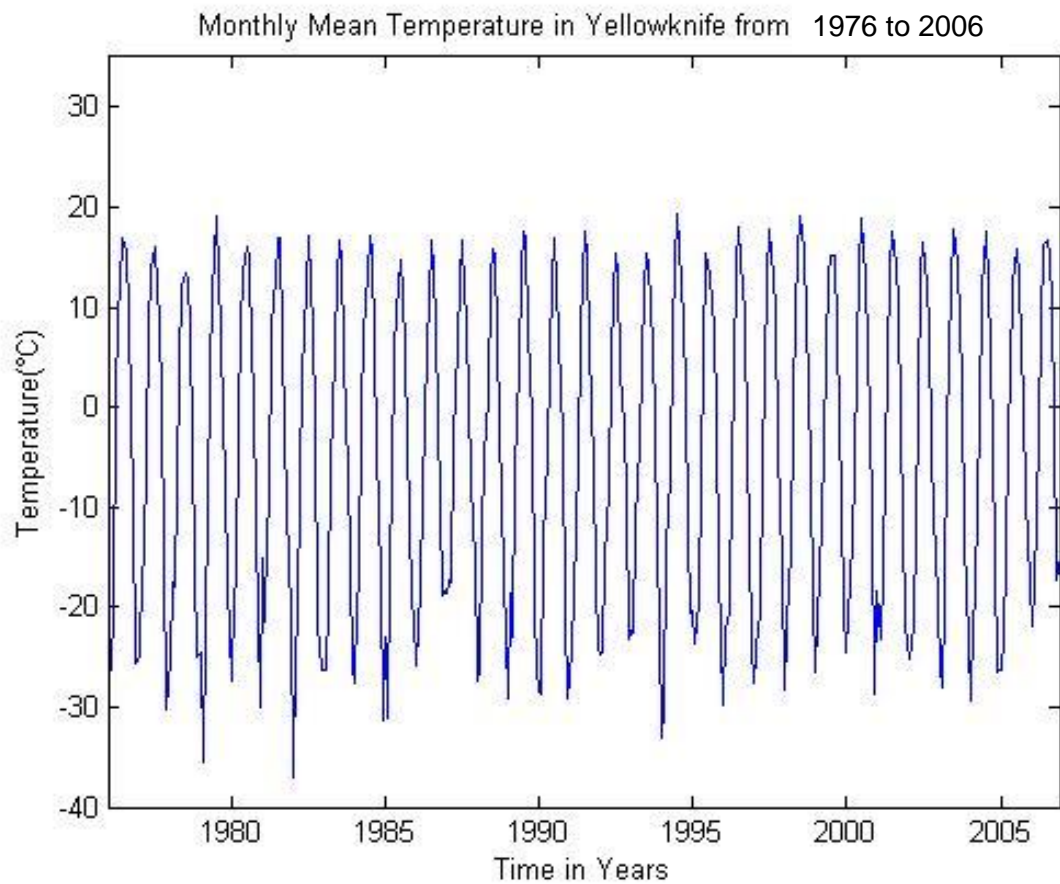


Figure 13. Monthly mean temperature (in °C) in Yellowknife, Northwest Territories from 1976 to 2006. This data was extracted from the Environment Canada National Climate Data and Information Archive.