Exploring Weather Trends

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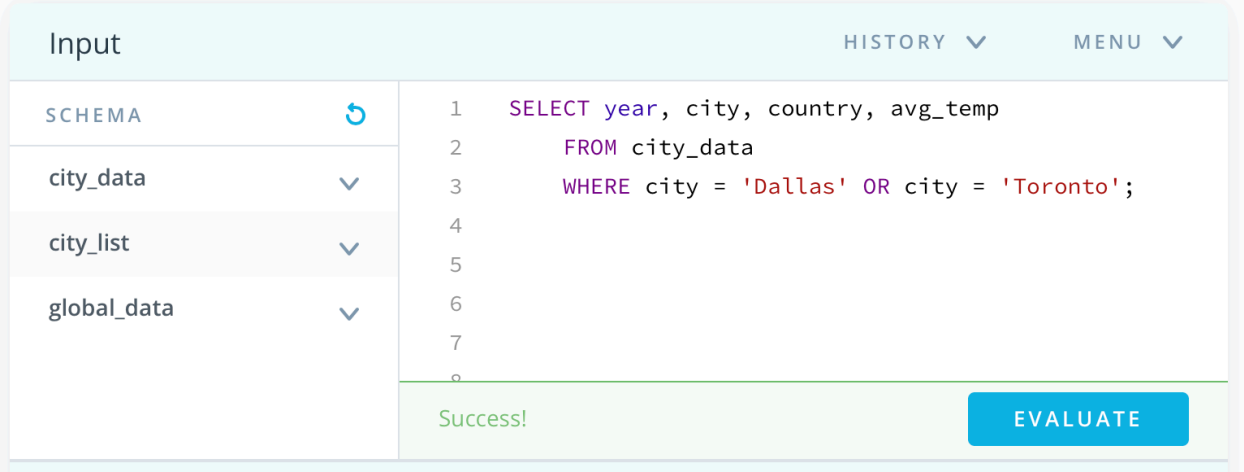
Introduction

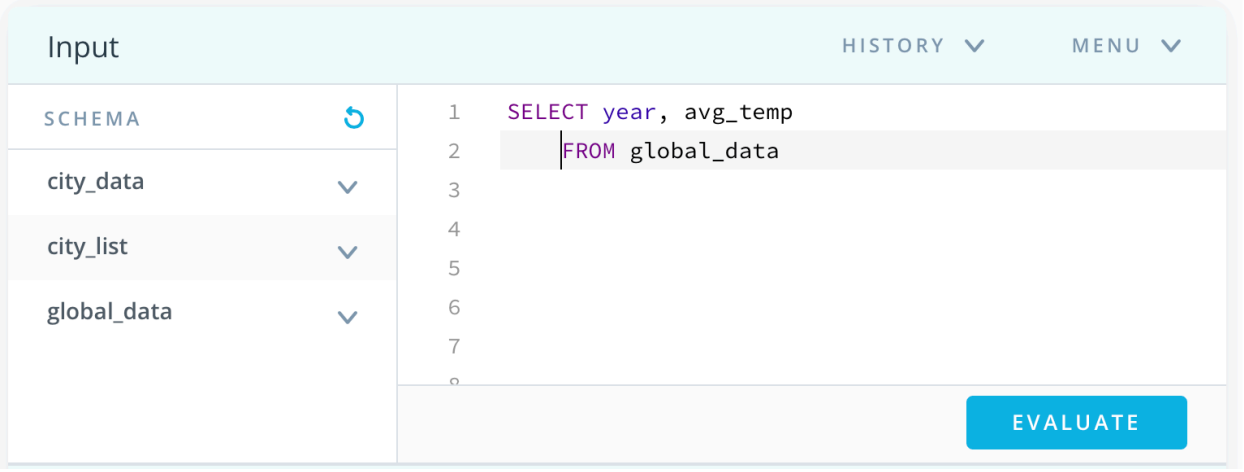
This project is an analysis of temperature changes, both globally and in select cities. I chose two cities in North America. The first city, Toronto Canada, has a cooler climate, while Dallas United States is a warmer climate. The available data has yearly average temperatures from approximately 1750 to 2015, although some cities have inconsistent data in the years surrounding 1750.

Process

SQL queries were used to extract data into CSV files. First, the years and average temperature were extracted for Dallas and Toronto:



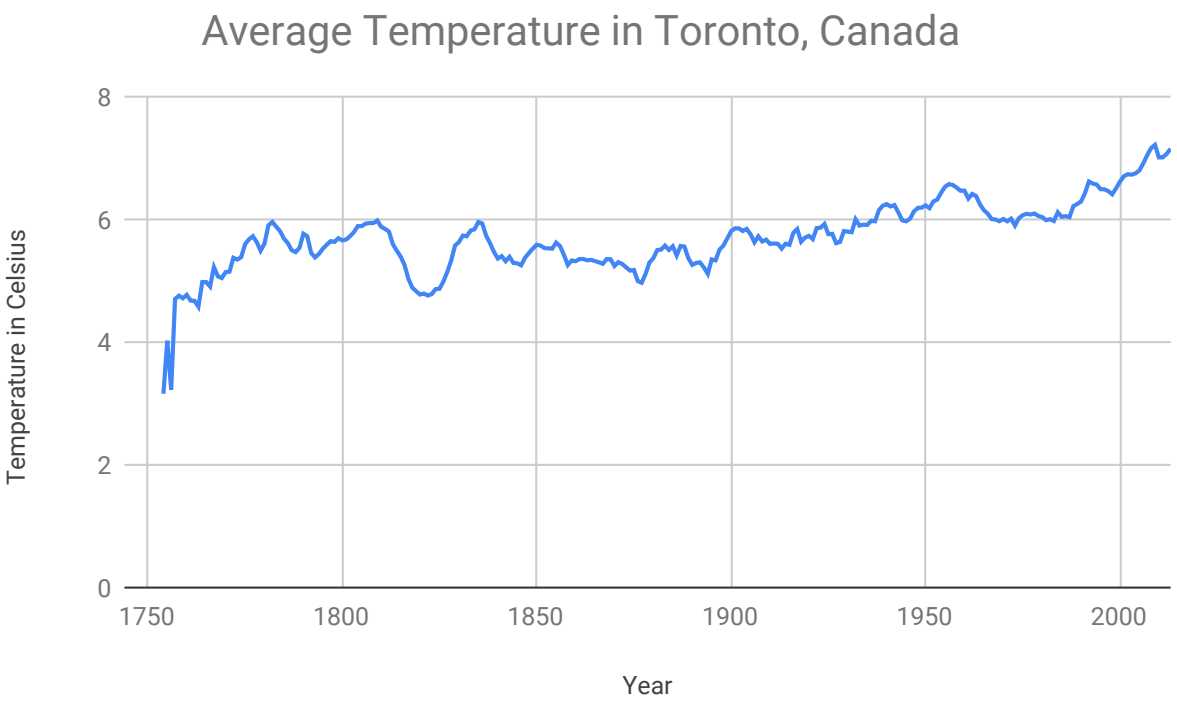
Then the year and average temperature was queried from global data:



The CVS files were opened in Google Sheets, and a 10 year moving average was calculated for Toronto, Dallas and globally. This creates a smoother line graph to allow for temperature trends to be seen more easily. The formula used in Google Sheets was: '=AVERAGE(D2:D12)', and then applied to cells below to create a moving average.

Data Analysis

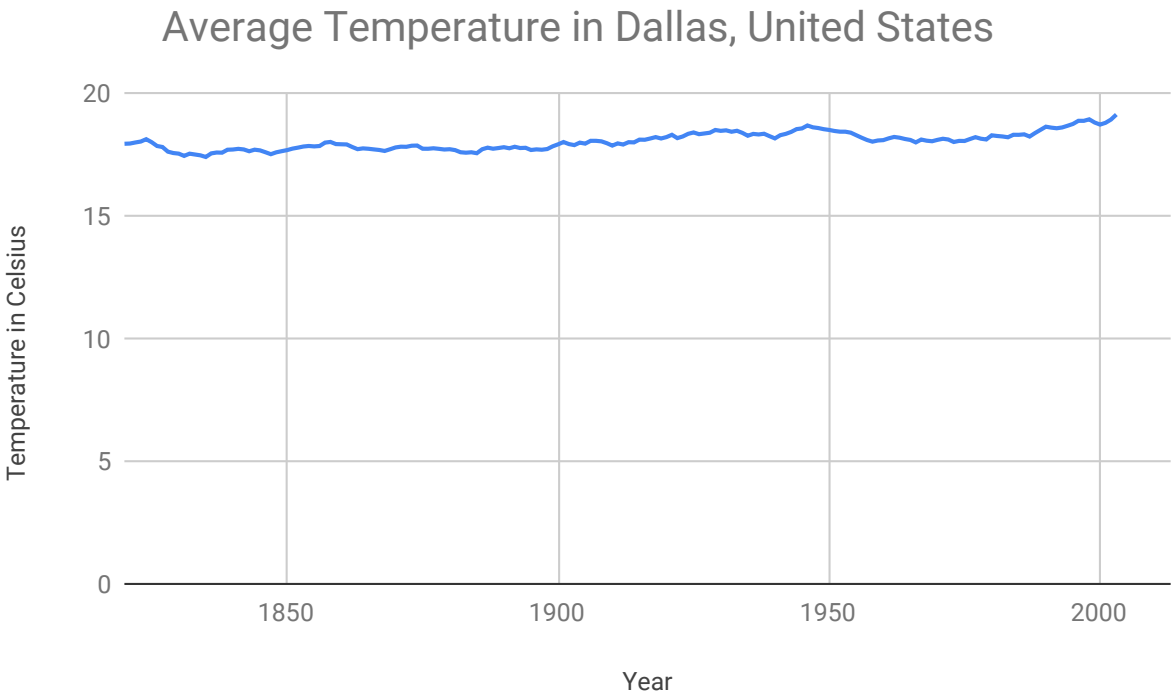
Toronto



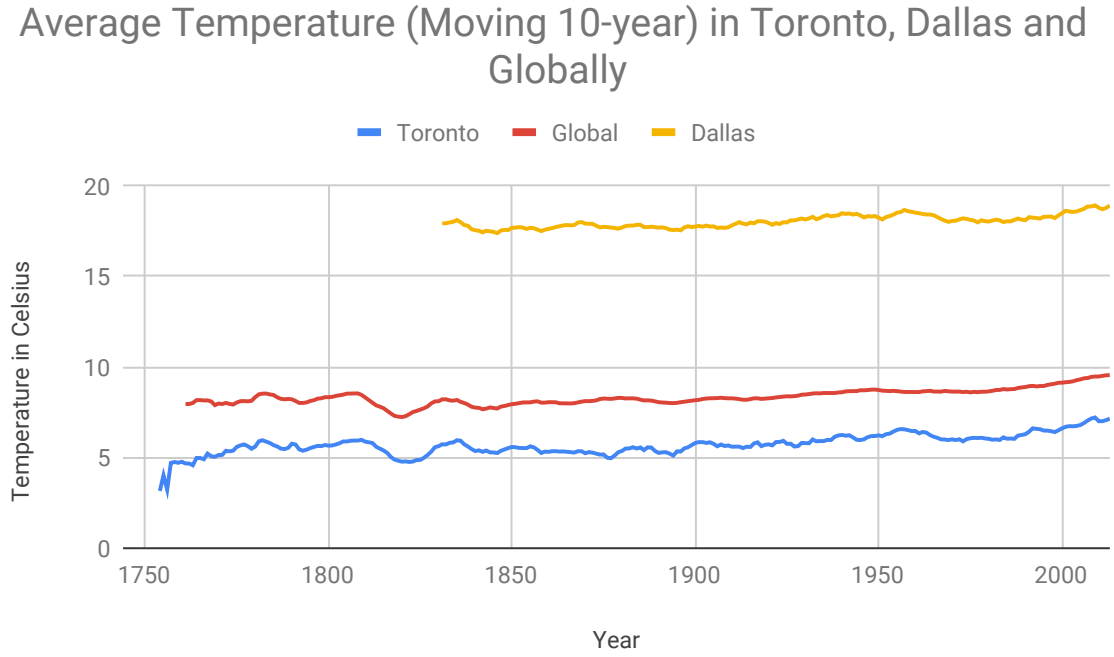
Prior to 1900, there were generally no years with an average temperature over 6C. There were also many fluctuations in temperatures, with no clear trend. Starting at the year 1900, there is a strong linear positive relation in the average temperatures in Toronto. Around the year 2000, the average temperature has increased exponentially.

Dallas

There were fewer years available with average temperatures for Dallas, Texas, starting in 1820. Due to the city's location, closer to the equator, the average temperature is much higher than Toronto. There is less of a clear warming trend in Dallas, although there is a positive linear relation beginning in the 20th century.



Comparison



The final line graph compares the global moving 10 year averages to Toronto and Dallas. The averages globally and in Toronto show a remarkable similar fluctuation. They both dip in between 1800 and 1850, and increase in the latter half of the 20th century. Dallas remains consistent in comparison, and also increases in the 20th century.

Conclusion

While Toronto and Dallas have markedly different average temperatures, they both show an increase in average temperatures over time, especially around the year 2000. The correlation coefficient for Dallas is 0.89, and for Toronto it is 0.75. They both show a clear similarity to the global increase in average temperatures.

Although it is out of the scope of this project, it is possible that effects of carbon dioxide in the atmosphere, along with explosive population growth, is compounding the heating of Earth. However, the cause of this increase in temperature cannot be inferred solely with this data. I am hopeful that data analysis will provide important insight into the warming trends that have been recorded in recent years.