

Weather Trends: Global vs. Toronto Temperatures

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Introduction: The purpose of the research is to investigate weather data, to analyze local temperatures relative to global trends.

Outline of Steps Taken:

- 1.) An initial SQL query was used to find the nearest city to my location in Canada:

```
SELECT city, country
FROM city_list
WHERE country = 'Canada'
```

- 2.) Extracted global data and data for Toronto:

```
SELECT *
FROM city_data
WHERE city = 'Toronto'
```

```
SELECT *
FROM global_data
```

- 3.) Created a database, Weather Trends, in SQL Server, imported .csv files.
- 4.) Populated tables, converted to right data types:

```
USE [Weather Trends]
GO

--global data
CREATE TABLE global_data (
year int,
avg_temp float
)
INSERT INTO [dbo].[global_data]
SELECT *
FROM [dbo].[RAW.global_data]

-- city data
CREATE TABLE city_data_toronto (
year int,
city varchar(100),
country varchar(100),
avg_temp float
)
INSERT INTO [dbo].[city_data_toronto]
SELECT *
FROM [dbo].[RAW.city_data_toronto]
```

- 5.) Where there was missing data, SQL Server read as "0 °C," I included the following to reassign as "NULL," to not affect moving average temperature calculations in the next steps:

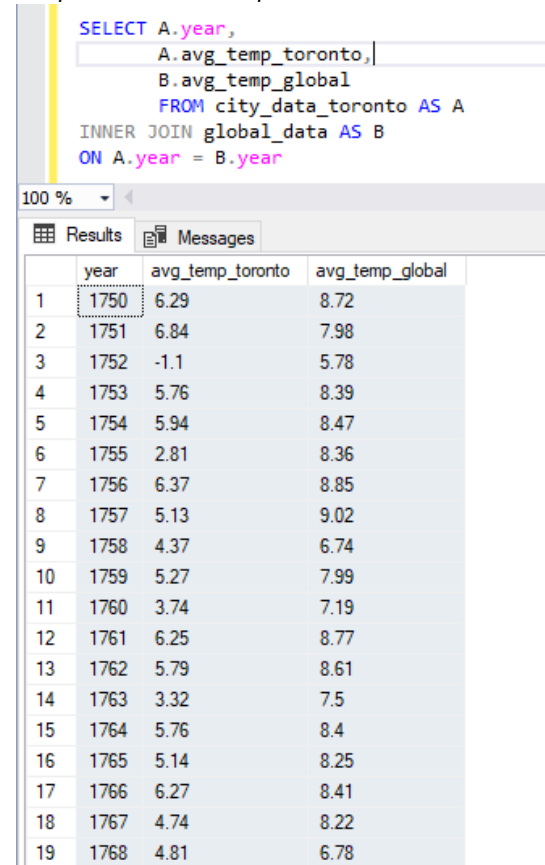
```
UPDATE [dbo].[RAW.city_data_toronto]
SET [avg_temp] =NULL
WHERE [avg_temp] = ''
```

```
INSERT INTO city_data_toronto
SELECT*
FROM [dbo].[RAW.city_data_toronto]
```

- 6.) Noticed different data ranges, global data is between 1750-2015 and Toronto, 1743-2013, also, some data was missing. To resolve this, since missing data and varying ranges would affect the visualization, I chose to do an "Inner Join," to capture only the cross-over data on "Year." For the output, I selected only values of interest:

```
SELECT A.year,
       A.avg_temp_toronto,
       B.avg_temp_global
FROM city_data_toronto AS A
INNER JOIN global_data AS B
ON A.year = B.year
```

Sample SQL Server Output:



```
SELECT A.year,
       A.avg_temp_toronto,
       B.avg_temp_global
FROM city_data_toronto AS A
INNER JOIN global_data AS B
ON A.year = B.year
```

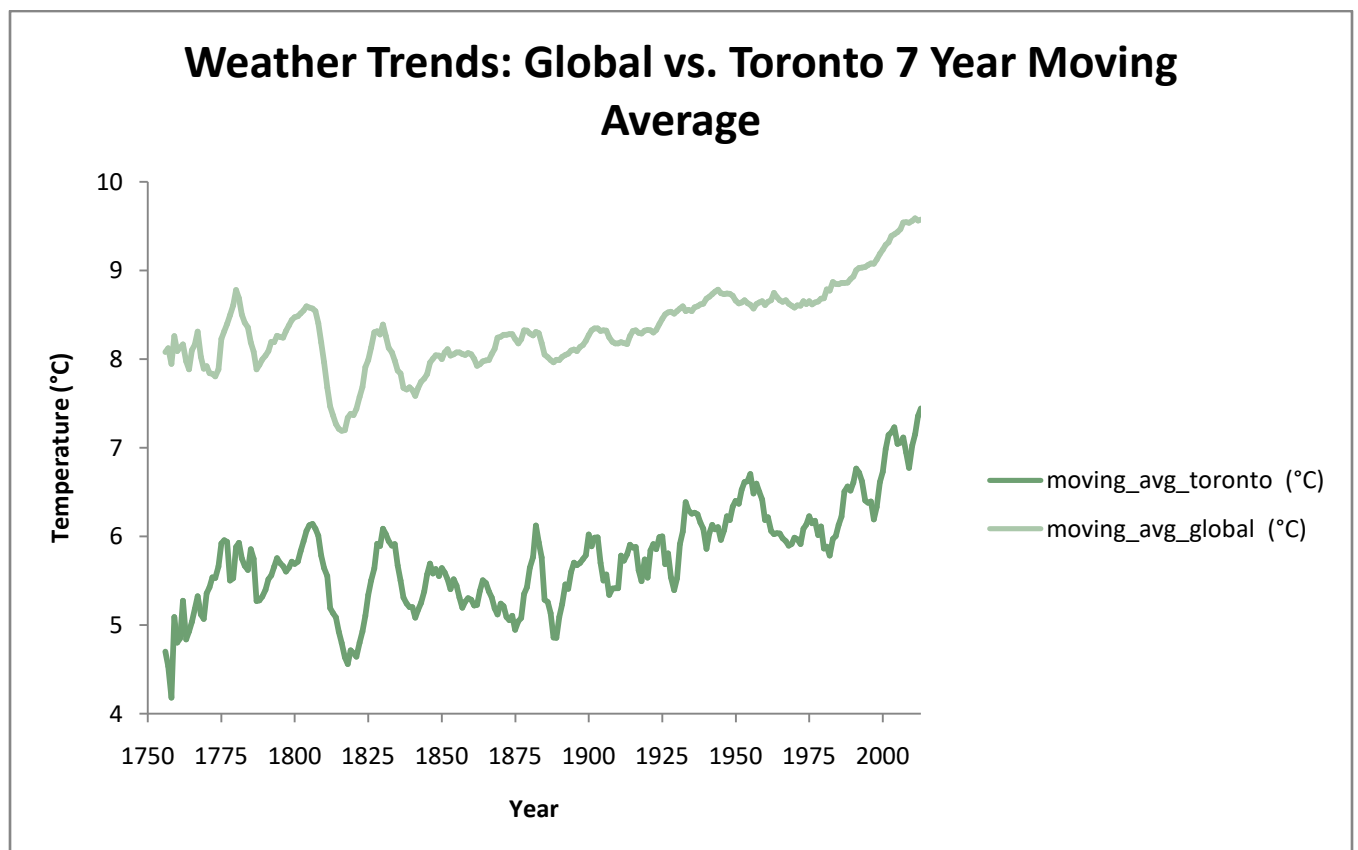
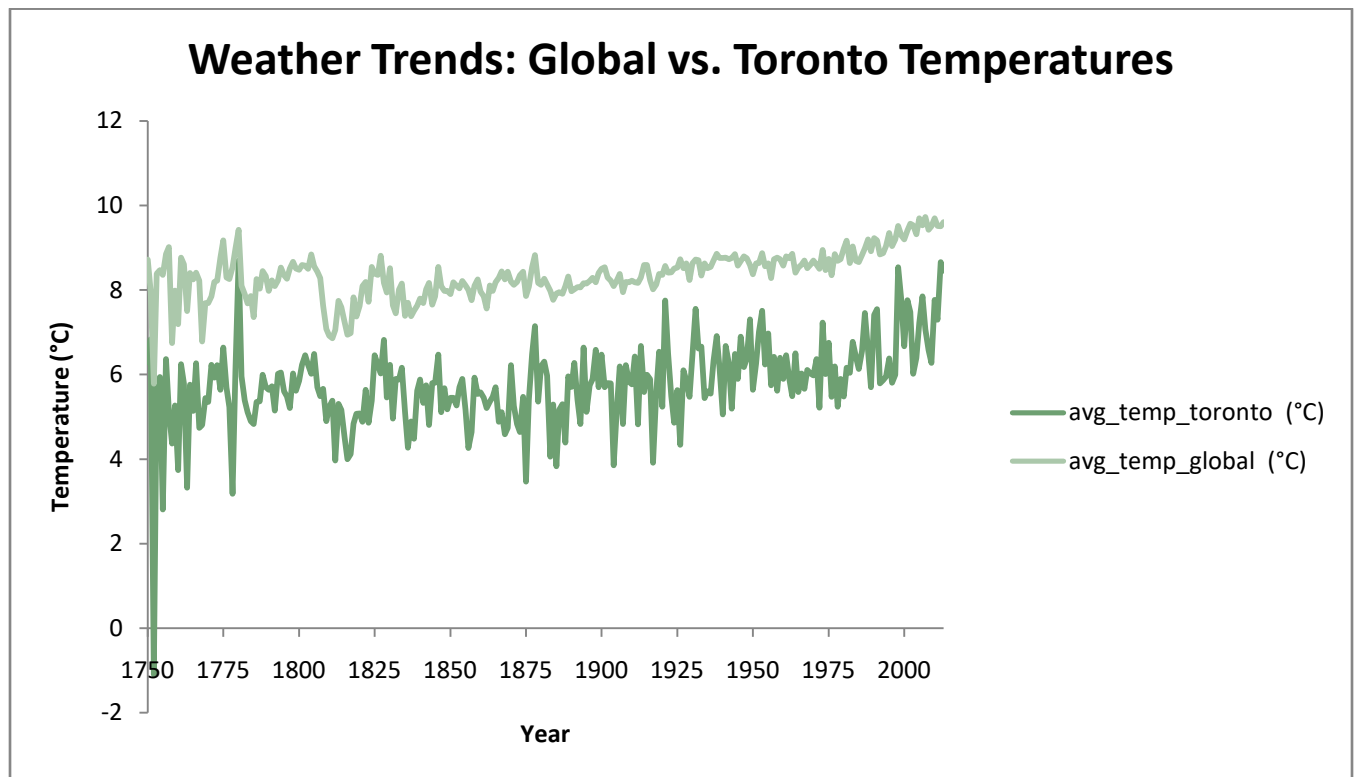
	year	avg_temp_toronto	avg_temp_global
1	1750	6.29	8.72
2	1751	6.84	7.98
3	1752	-1.1	5.78
4	1753	5.76	8.39
5	1754	5.94	8.47
6	1755	2.81	8.36
7	1756	6.37	8.85
8	1757	5.13	9.02
9	1758	4.37	6.74
10	1759	5.27	7.99
11	1760	3.74	7.19
12	1761	6.25	8.77
13	1762	5.79	8.61
14	1763	3.32	7.5
15	1764	5.76	8.4
16	1765	5.14	8.25
17	1766	6.27	8.41
18	1767	4.74	8.22
19	1768	4.81	6.78

- 7.) Exported data in .csv format to Excel. Calculated a seven year moving average by averaging the first seven years of temperature data and then applying the formula downward (=AVERAGE(B2:B8) for Toronto and =AVERAGE(D2:D8) for global).

Sample Excel Calculations:

C9		fx =AVERAGE(B3:B9)			
	A	B	C	D	E
1	Year	avg_temp_toronto (°C)	moving_avg_toronto (°C)	avg_temp_global (°C)	moving_avg_global (°C)
2	1750	6.29		8.72	
3	1751	6.84		7.98	
4	1752	-1.1		5.78	
5	1753	5.76		8.39	
6	1754	5.94		8.47	
7	1755	2.81		8.36	
8	1756	6.37	4.70	8.85	8.08
9	1757	4.13	4.54	9.02	8.12
10	1758	4.37	4.18	6.74	7.94
11	1759	5.27	5.09	7.99	8.26
12	1760	3.74	4.80	7.19	8.09
13	1761	6.25	4.85	8.77	8.13
14	1762	5.79	5.27	8.61	8.17
15	1763	3.32	4.84	7.5	7.97
16	1764	5.76	4.93	8.4	7.89
17	1765	5.14	5.04	8.25	8.10
18	1766	6.27	5.18	8.41	8.16
19	1767	4.74	5.32	8.22	8.31
20	1768	4.81	5.12	6.78	8.02
21	1769	5.44	5.07	7.69	7.89
22	1770	5.35	5.36	7.69	7.92
23	1771	6.23	5.43	7.85	7.84
24	1772	5.93	5.54	8.19	7.83
25	1773	6.22	5.53	8.22	7.81

8.) Created line charts for local and global temperature trends in Excel:



Observations:

<i>Descriptive Statistics (1750-2013)</i>		
	Global °C	Toronto °C
Mean	8.36	5.77
Median	8.37	5.78
Mode	7.98	5.70
Range	3.95	9.80
Minimum	5.78	-1.10
Maximum	9.73	8.70

It can be seen that the overall global temperature is higher than Toronto. Toronto has a greater range as well as more overall fluctuation in data. Because of sudden shifts and frequent fluctuations in temperatures, a moving average was created, to smooth out the time series (7 year), the most recent moving average is the forecast for the next period. Global temperatures show a more gradual/smooth overall increase in temperatures. Toronto data also shows an overall increase in temperatures, despite more frequent trend diversions. Even though in different temperature ranges and with much greater fluctuation, Toronto data still follows the overall trends of global data.