Data Analysis Project 1

Explore Weather Trends

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Nov, 2018

Section 1. Fetch the data

I used SQL to fetch the data. SQL commands are below:

Select * from city_data;

Select * from city_list;

Select * from global_data;

Three csv files are generated. I named them city_data.csv, city_list.csv and global_data.csv.

Section 2. Load the data to Excel

I used Excel to load these csv files. Below are the steps:

1. I live in Austin Texas. I found my city in the city_list.csv file. Austin temperature is the local temperature I am going to explore.
2. I opened city_data.csv and copied all the temperature data relating to Austin.
3. I pasted Austin temperature data into a new csv file, Austin_data.csv, for future use.
4. I opened global_data.csv file. I copied the global temperatures for the relating years to Austin_data.csv and aligned them to Austin's data according to the year. The data runs from 1820 until 2013. Below is a portion of the file.

Year	Austin Avg (°c)	Global Avg (°c)
1820	18.83	7.62
1821	20.75	8.09
1822	25.48	8.19
1823	19.34	7.72
1824	19.9	8.55
1825	20.15	8.39
1826	19.87	8.36
1827	20.52	8.81
1828	20.02	8.17
1829	19.71	7.94
1830	20.39	8.52
1831	18.96	7.64
1832	19.55	7.45
1833	20.03	8.01
1834	20.22	8.15
1835	18.35	7.39
1836	18.75	7.7

5. I added 7-year moving average to both Austin temperature and global temperature.

Year	Austin Avg (°c)	Aus 7 years MA(°c)	Global Avg (°c)	Glb 7 years MA(°c)
1820	18.83		7.62	
1821	20.75		8.09	
1822	25.48		8.19	
1823	19.34		7.72	
1824	19.9		8.55	
1825	20.15		8.39	
1826	19.87	20.92	8.36	8.22
1827	20.52	20.86	8.81	8.30
1828	20.02	20.75	8.17	8.31
1829	19.71	19.93	7.94	8.28
1830	20.39	20.08	8.52	8.39
1831	18.96	19.95	7.64	8.26
1832	19.55	19.86	7.45	8.13
1833	20.03	19.88	8.01	8.08

6. In addition, I am curious whether there is significant difference if the moving average increased to 14 years. I added 14 years moving average as below.

Year	Austin Avg (°c)	Aus 7 years MA(°c)	Aus 14 years MA(°c)	Global Avg (°c)	Glb 7 years MA(°c)	Glb 14 years MA(°c)
1820	18.83			7.62		
1821	20.75			8.09		
1822	25.48			8.19		
1823	19.34			7.72		
1824	19.9			8.55		
1825	20.15			8.39		
1826	19.87	20.92		8.36	8.22	
1827	20.52	20.86		8.81	8.30	
1828	20.02	20.75		8.17	8.31	
1829	19.71	19.93		7.94	8.28	
1830	20.39	20.08		8.52	8.39	
1831	18.96	19.95		7.64	8.26	
1832	19.55	19.86		7.45	8.13	
1833	20.03	19.88	20.25	8.01	8.08	8.10
1834	20.22	19.84	20.35	8.15	7.98	8.14
1835	18.35	19.60	20.18	7.39	7.87	8.09
1836	18.75	19.46	19.70	7.7	7.84	8.06
1837	19.34	19.31	19.70	7.38	7.67	8.03
1838	18.52	19.25	19.60	7.51	7.66	7.96
1839	19.38	19.23	19.54	7.63	7.68	7.90
1840	19.5	19.15	19.52	7.8	7.65	7.86

Section 3. Line chart

I created a pivot table and draw a line chart by using 7-year and 14-year moving average. Shown in Fig 1. The line of 14-year moving average is more smooth.
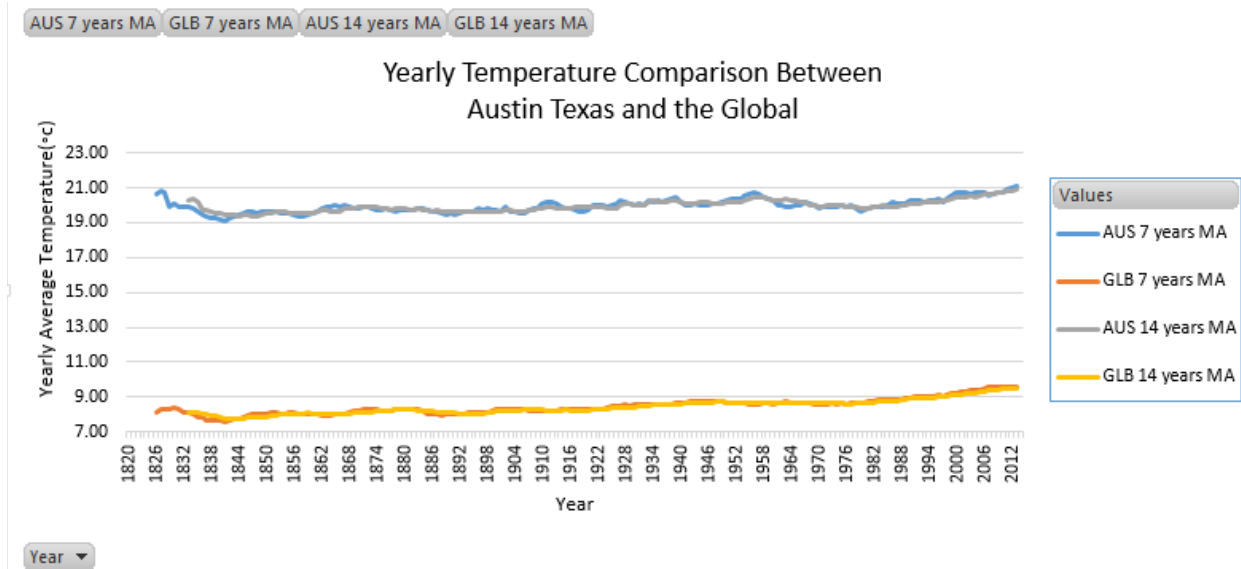

Fig. 1 Yearly Temperature Comparison Between Austin and the Global

Section 4. Observations

Observation 1:

Austin has subtropical climate. The yearly average temperature is higher than global temperature consistently. The average gap is 11.53˚c.

By sorting the temperature difference between Austin and the world, I found the biggest gap is 17.29˚c in 1822 and the smallest gap is 10.17˚c in 1983. I was looking for any block of consecutive years has a bigger or smaller temperature difference than the others. But I cannot find it.

Biggest gap in 1822:

Year	Austin Avg (˚c)	Global Avg (˚c)	Difference(˚c)
1822	25.48	8.19	17.29
1933	21.39	8.34	13.05
1954	21.37	8.56	12.81
1927	21.23	8.52	12.71
1862	20.26	7.56	12.7
1907	20.63	7.95	12.68
1821	20.75	8.09	12.66
1956	20.93	8.28	12.65
2013	22.18	9.61	12.57
1861	20.3	7.85	12.45
1911	20.57	8.18	12.39
1950	20.74	8.37	12.37
1909	20.54	8.18	12.36
1921	20.91	8.57	12.34
1934	20.91	8.63	12.28
1916	20.5	8.23	12.27

Smallest gap in 1983:

1973	19.66	8.95	10.71
1919	19.08	8.38	10.7
1976	19.04	8.35	10.69
1968	19.15	8.52	10.63
1958	19.39	8.77	10.62
1914	19.19	8.59	10.6
1940	19.31	8.76	10.55
1997	19.73	9.2	10.53
1979	19.14	8.73	10.41
2010	20.1	9.7	10.4
1903	18.58	8.22	10.36
2007	19.98	9.73	10.25
1983	19.2	9.03	10.17

Observation 2:

Though there are years that temperature dropped from previous years, the overall trend of Austin temperature is increasing, same as the global trend. Fig 2 displays trend by using 25-year and 50-year moving average. The temperature started to increase more aggressively after 1980. It shows the same trend in both graphs.
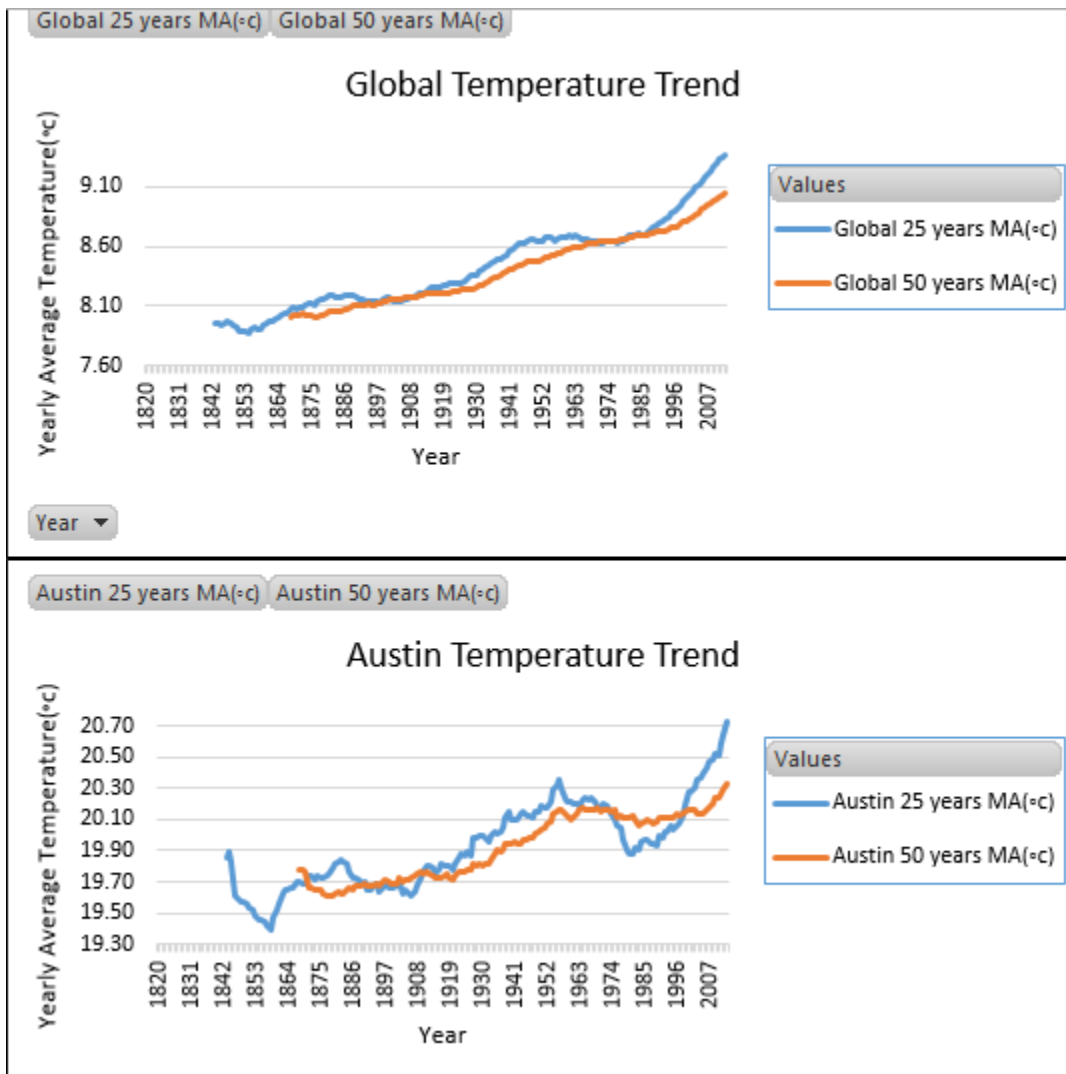
Fig 2. Global and Austin Temperature Trend

Observation 3:

By calculating the highest and lowest temperature from 1820 to 2013, I found Austin temperature fluctuates between 25.48°c and 18.35°c. The global temperature fluctuates between 9.73°c and 7.38°c. Austin temperature fluctuates more. Fig 2 above also supports this observation.

	Austin (°c)	Global (°c)
Max	25.48	9.73
Min	18.35	7.38

Observation 4:

In order to understand the trend among different continents, I pulled the data from Shanghai (China), Paris (France) and Dar Es Salaam (Tanzania). The 25-year moving average for five data sets are piloted in

Fig 3. Global average is the lowest. Paris is the coldest city while Dar Es Salaam is hottest. The difference is consistent across the years.
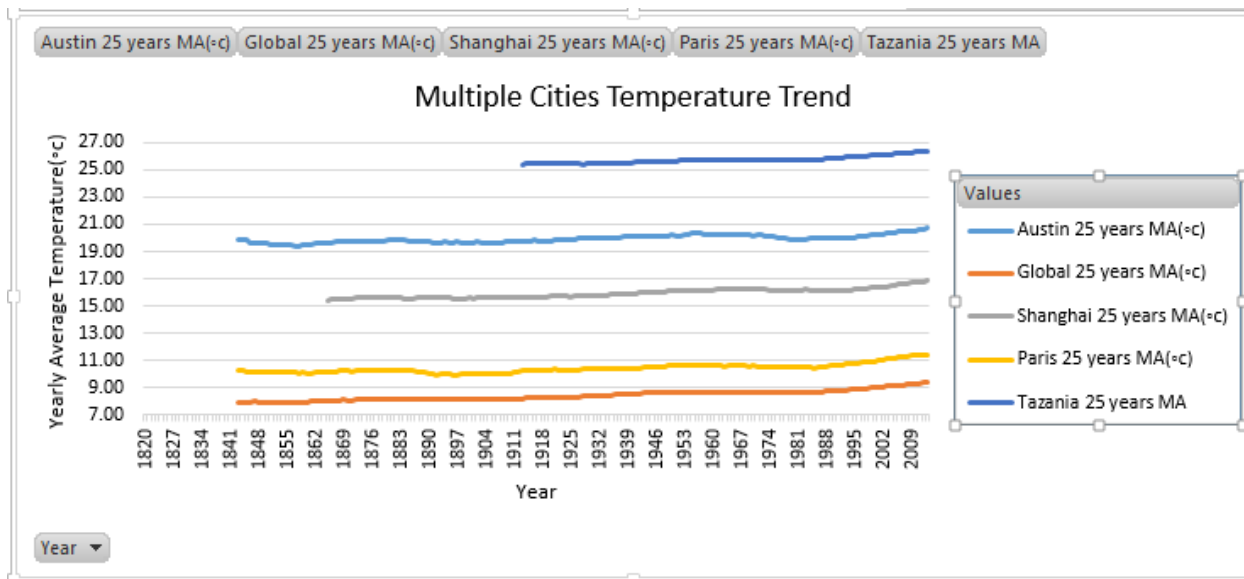

Fig 3. Multiple Cities Temperature Trend

In order to see the details more clearly, I grouped the cities sharing the similar temperature range and made three graphs. I can see though the overall trend of temperature is increasing, it accelerated in the 80's, which matches the observation 2. Therefore, different continents share the same trend.

Shanghai and Austin Temperature Trend
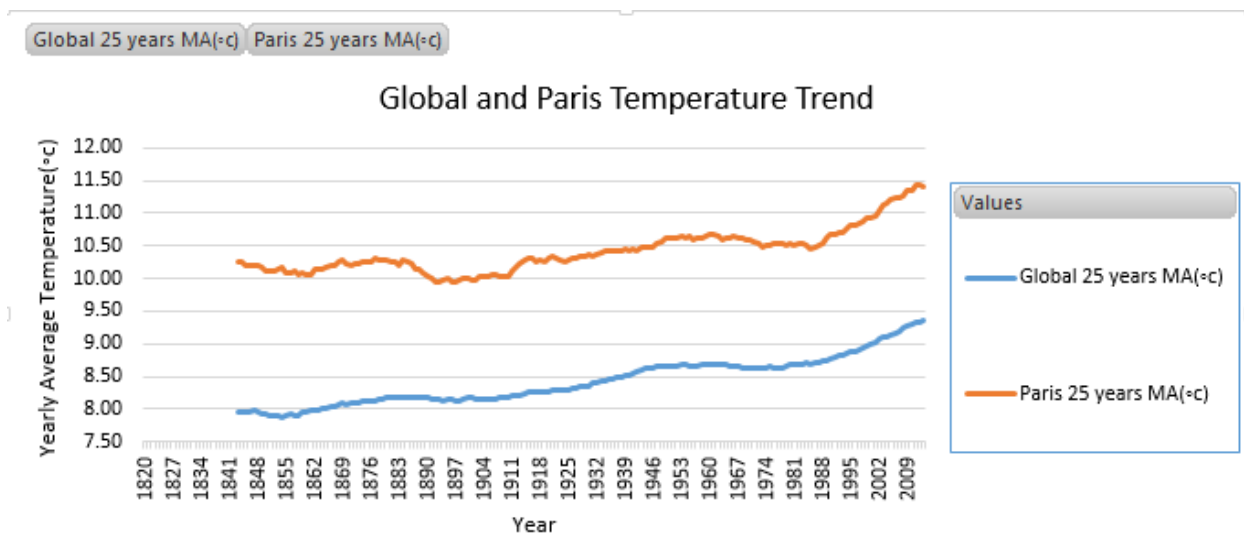
Values
—— Shanghai 25 years MA(◦c)
—— Austin 25 years MA(◦c)
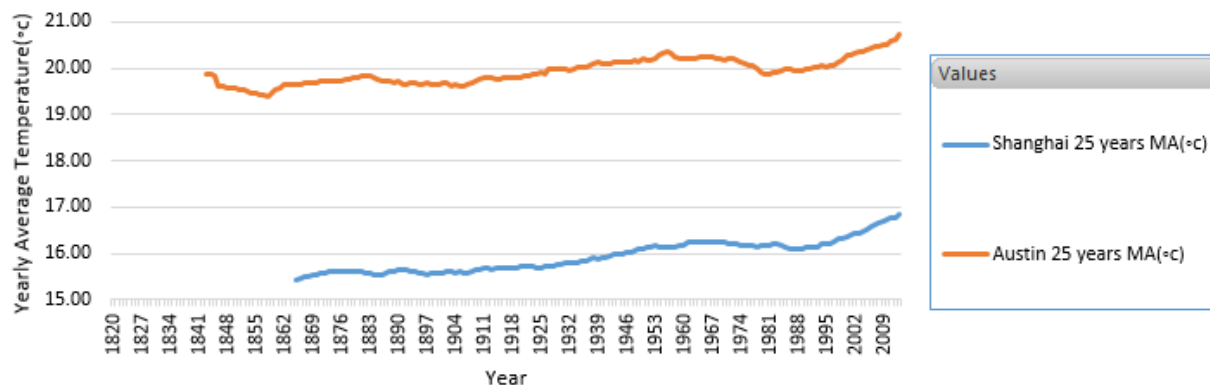
Year ▾

Tazania 25 years MA

Tanzania Temperature Trend