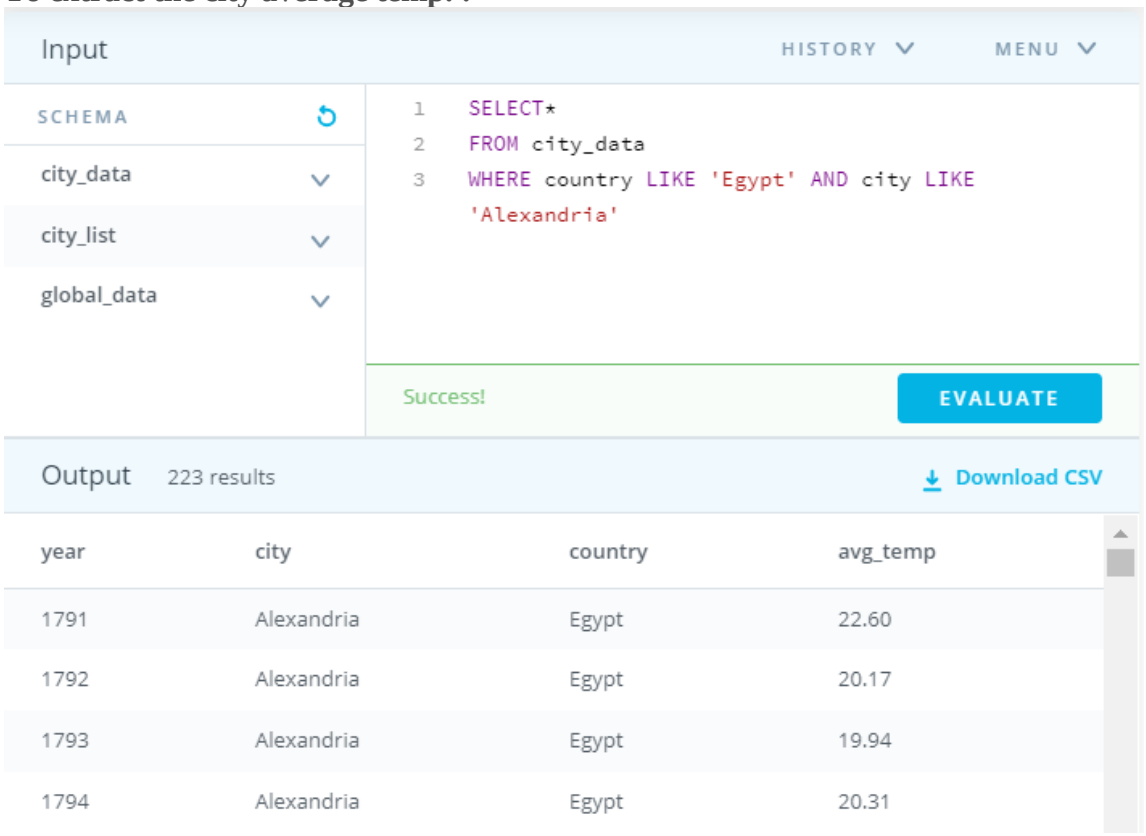
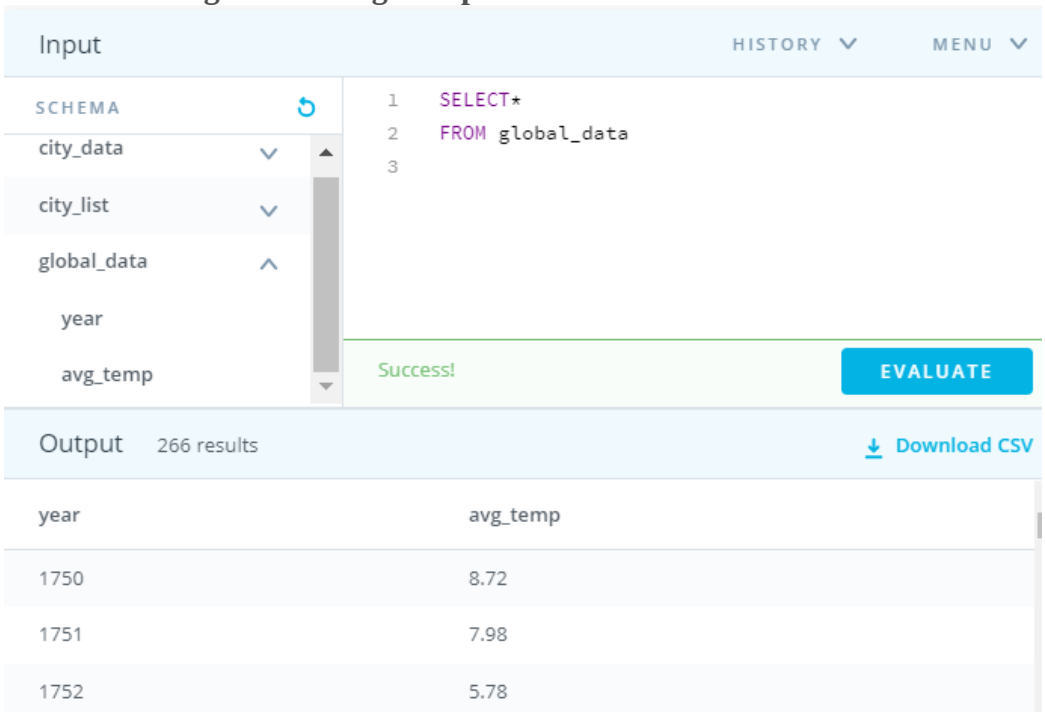
- **SQL Queries used :**

To extract the city average temp. :



To extract the global average temp. :



How the data were prepared for the visualization:

- I downloaded the csv file containing the data and upload it on Google ‘s spreadsheets and manipulated the data

- I gathered the average temp for my city(Alexandria- Egypt) and the global average temp in one spread sheet ,

- Data for the Alexandria average temperature is 233 row , where the global data has 266 rows

- I calculated the average moving temperature for 10 years for each of them using the average formula in excel and applied the formula on all of the data

  For the global moving average it has 266 rows as the global average temp. Number of rows
  For the city moving average it has 223 rows as the city average temp. Number of rows

  There is a gap of 9 values in both moving averages columns and there is no gaps at the end of both moving averages that can be seen in the screenshot below
  (As the first row is occupied by labels, the global data extend to row 267, and the city data extend to row 224)

1	year	avg_temp_GLOBAL	10_year _MA_global	avg_temp_CITY	10_year_MA_city
2	1750	8.72		22.6	
3	1751	7.98		20.17	
4	1752	5.78		19.94	
5	1753	8.39		20.31	
6	1754	8.47		20.22	
7	1755	8.36		20.39	
8	1756	8.85		20.48	
9	1757	9.02		20.67	
10	1758	6.74		20.66	
11	1759	7.99	8.03	20.52	20.596
12	1760	7.19	7.877	20.83	20.419
13	1761	8.77	7.956	20.94	20.496
14	1762	8.61	8.239	20.94	20.596
15	1763	7.5	8.15	20.7	20.635
16	1764	8.4	8.143	20.35	20.648
17	1765	8.25	8.132	20.4	20.649
18	1766	8.41	8.088	20.36	20.637
19	1767	8.22	8.008	19.69	20.539
20	1768	6.78	8.012	19.03	20.376
21	1769	7.69	7.982	19.12	20.236
22	1770	7.69	8.032	19.19	20.072
23	1771	7.85	7.94	19.02	19.88
24	1772	8.19	7.898	19.55	19.741

1	year	avg_temp_GLOBAL	10_year _MA_global	avg_temp_CITY	10_year_MA_city
206	1954	8.56	8.647	20.62	20.581
207	1955	8.63	8.652	20.85	20.607
208	1956	8.28	8.612	20.52	20.638
209	1957	8.73	8.605	21.29	20.704
210	1958	8.77	8.607	21.46	20.804
211	1959	8.73	8.621	20.74	20.805
212	1960	8.58	8.642	21.45	20.886
213	1961	8.8	8.659	21.46	21.023
214	1962	8.75	8.67	21.22	21.071
215	1963	8.86	8.669	21.06	21.067
216	1964	8.41	8.654	21.08	21.113
217	1965	8.53	8.644	21.15	21.143
218	1966	8.6	8.676	21.51	21.242
219	1967	8.7	8.673	21.74	21.287
220	1968	8.52	8.648	21.67	21.308
221	1969	8.6	8.635	22.46	21.48
222	1970	8.7	8.647	21.18	21.453
223	1971	8.6	8.627	21.55	21.462
224	1972	8.5	8.602	21.44	21.484
225	1973	8.95	8.611		
226	1974	8.47	8.617		
227	1975	8.74	8.638		
228	1976	8.35	8.613		

1	year	avg_temp_GLOBAL	10_year _MA_global	avg_temp_CITY	10_year_MA_city
252	2000	9.2	9.153		
253	2001	9.41	9.176		
254	2002	9.57	9.249		
255	2003	9.53	9.315		
256	2004	9.32	9.343		
257	2005	9.7	9.378		
258	2006	9.53	9.427		
259	2007	9.73	9.48		
260	2008	9.43	9.471		
261	2009	9.51	9.493		
262	2010	9.7	9.543		
263	2011	9.52	9.554		
264	2012	9.51	9.548		
265	2013	9.61	9.556		
266	2014	9.57	9.581		
267	2015	9.83	9.594		
268					
269					

Ex: for the first value in moving average (found in the row of B11)→ =average (B2:B11),

For second value in moving average (found in the row of B12) →=average (B3:B12)…excreta

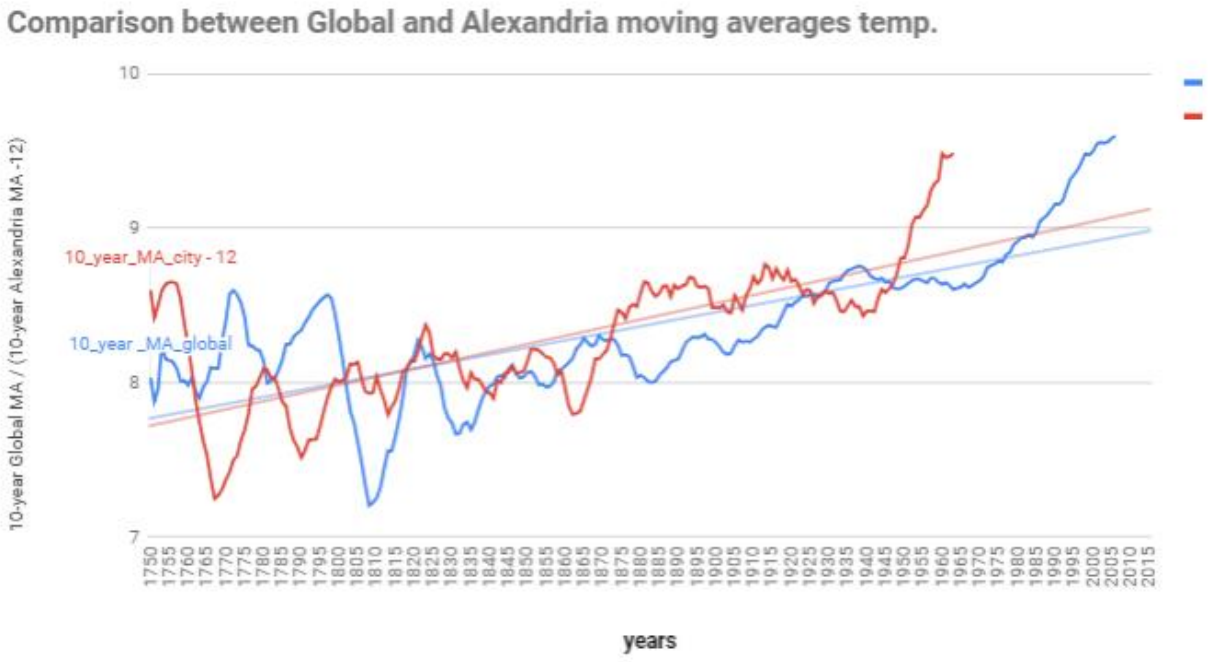
- The key considerations when deciding to visualize the data :
    - I needed to smooth the average temperature but not too much were details can be lost or too little were the general patterns won't be obvious , I tried taking different moving averages on different periods but I settled on the moving average every 10 years

    - For the comparison of global and city moving averages , I needed to plot together in the same graph as y-axis against the years as x-axis

    - Taking care of the details that make the graph user-friendly , and understandable , naming the labels and the graph with descriptive names

- **Line chart** with local and global temperature trends : red for global trends and blue for city trends

And decreasing the city moving average by 12 Celsius to monitor the pattern



- Observations on the chart :

  1- Alexandria average temp. Have a mean of 20.3 where the global average temp have a mean of 8.34 , there is a seemingly constant difference of 12 degree Celsius

  2-from period (1750-1800) → the global and city averages have same pattern of increasing and decreasing until year 1760 , where the patterns of the global and city averages seem to contradict The overall intensity of changes in patterns in the city averages is higher

  That make sense as in global averages it takes in consideration different countries that can have extreme different avg temperature that results in a chart with less intense changes when taking the average

  3-for period(1800-1850) → the global and city average patterns seems to be the same but again the intensity of the city average temp. patterns is higher

  4-for period(1850-1940)→the global and city averages patterns contradict
  5-for period(1940-2015)→ the patterns are the same but the gap in intensities increases
  6- the overall average temperature patterns shows that the temperature is increasing on earth as year passes

  7-Predicting the weather in my city based on the past patterns and the global average :
  First : at year 1760 average temperature was 20.4 , and global one was 8.2 , there is seemingly constant difference between both of 12 degree Celsius

At year 1967 Alexandria average was 21.4 and global one was 8.6 , so they both increase but Alexandria incremental value is greater than that of the global

At recent years from 1980 to 2015 there is no recorded measurements of Alexandria temp. but the global temp. average witnessed a rise from 8.6 up to 9.4 in this period only The rate of how temperature increases increased dramatically over the years

Given that and knowing that the incremental value of Alexandria average temp. is greater than that of the global average

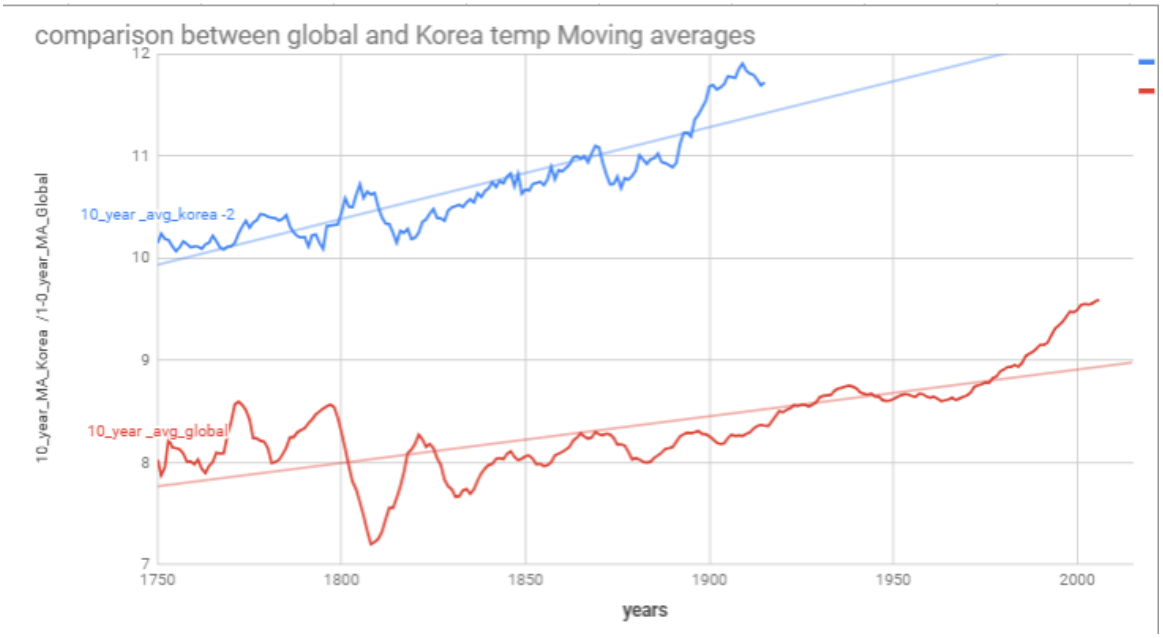
The average weather of recent years in Alexandria may range from 21.5 to 25 degree Celsius

8-The correlation coefficient is a statistical measure of the degree to which changes to the value of one variable predict change to the value of another. In positively correlated variables, the value increases or decreases in tandem. In negatively correlated variables, the value of one increases as the value of the other decreases.

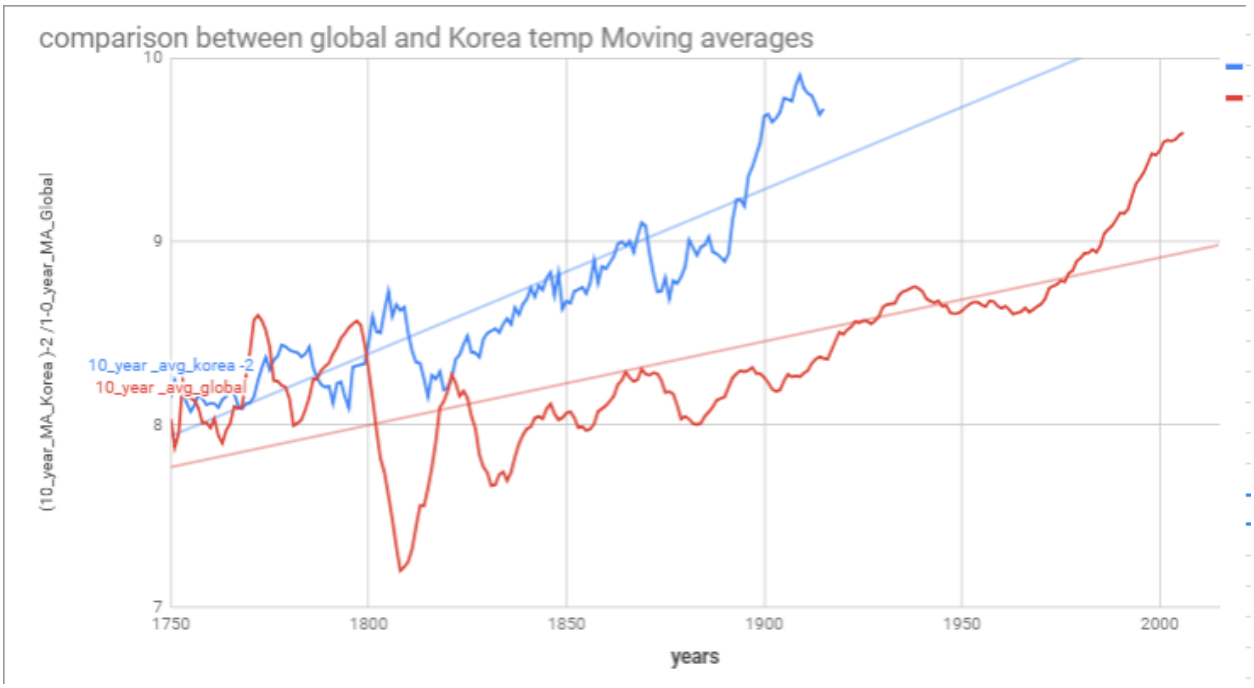
- The correlation coefficient between the global moving average and the city moving average is 0.4193782478

Which indicates that overall the city average temp. is directly proportional to the global average temp and we can somehow predict the average temp. of Alexandria using global weather averages

9-Using another country statistics with different weather as korea



Decreasing the values of MA temp. in Korea by 2 degree Celsius for better comparison of pattern



Again the overall pattern of the weather in Korea agrees with the global weather

1- There are only 2 degree Celsius difference on average between average temp. of the global and Korea's average

2- the difference in intensities increases as time passes that shows in how the two data lines are getting further apart with time

The correlation coefficient here is 0.1810196496

Where the changes in the global weather averages don't help much in prediction in weather in Korea