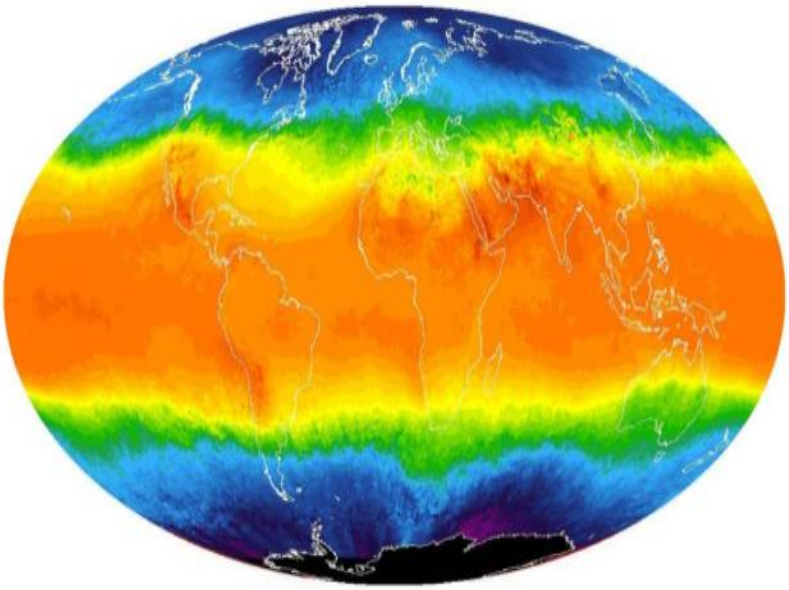
JUNE 1, 2020



Project: - Explore Weather Trends

By: Abhishek Tiwari

Q1. What tools did you use for each step? (Python, SQL, Excel, etc)

There are Following Steps which are take to extract dataset from SQL: -

Step 1: - I have use two SQL queries to extract my data from dataset

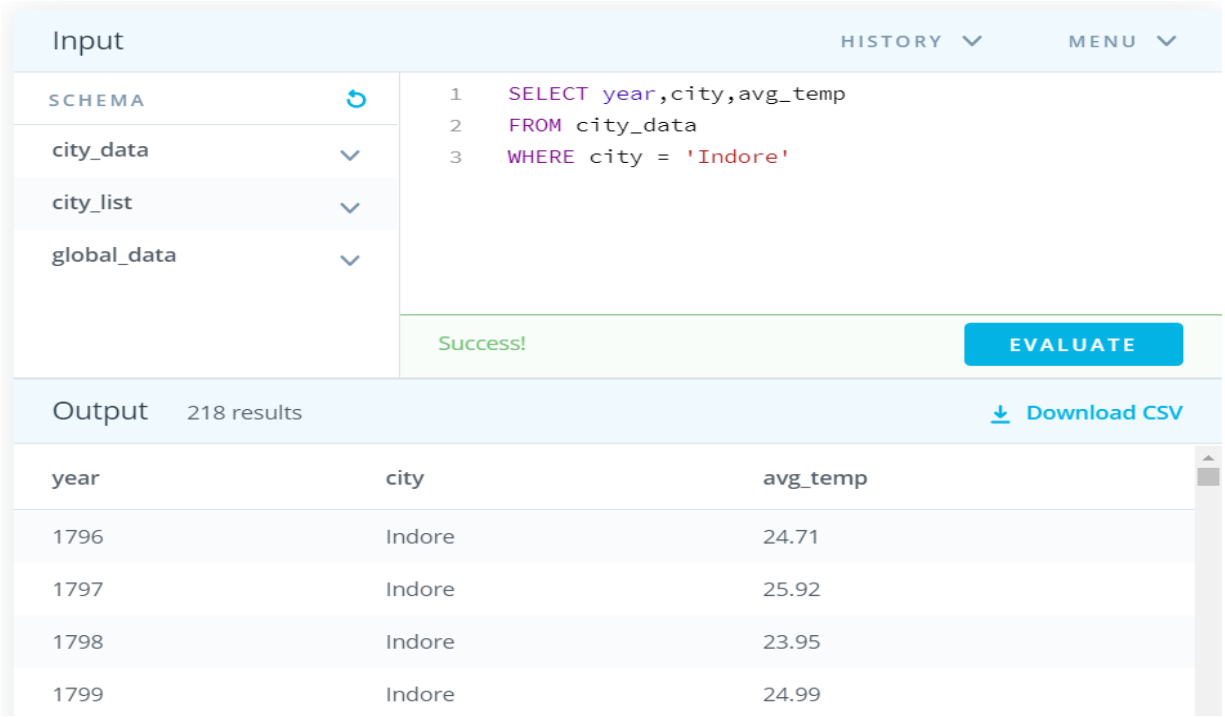
- For Global Data:

```
SELECT *
FROM global_data
```

- For Local data (For Indore):

```
SELECT year, city, avg_temp
FROM city_data
 WHERE city = 'Indore'
```

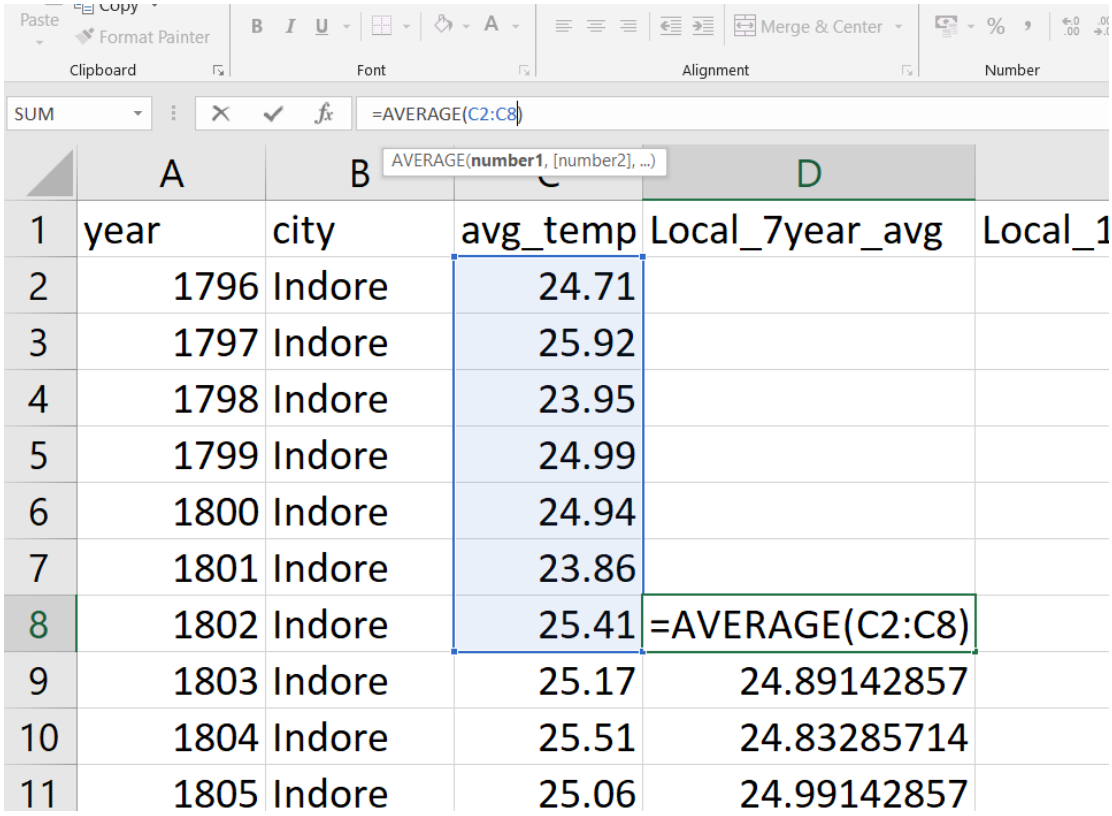
Step 2: - To download the data to csv file using "Download CSV" and before that EVALUATE it and after downloading the csv file then convert it into XSLX file via MS Excel.



(For Reference Only)

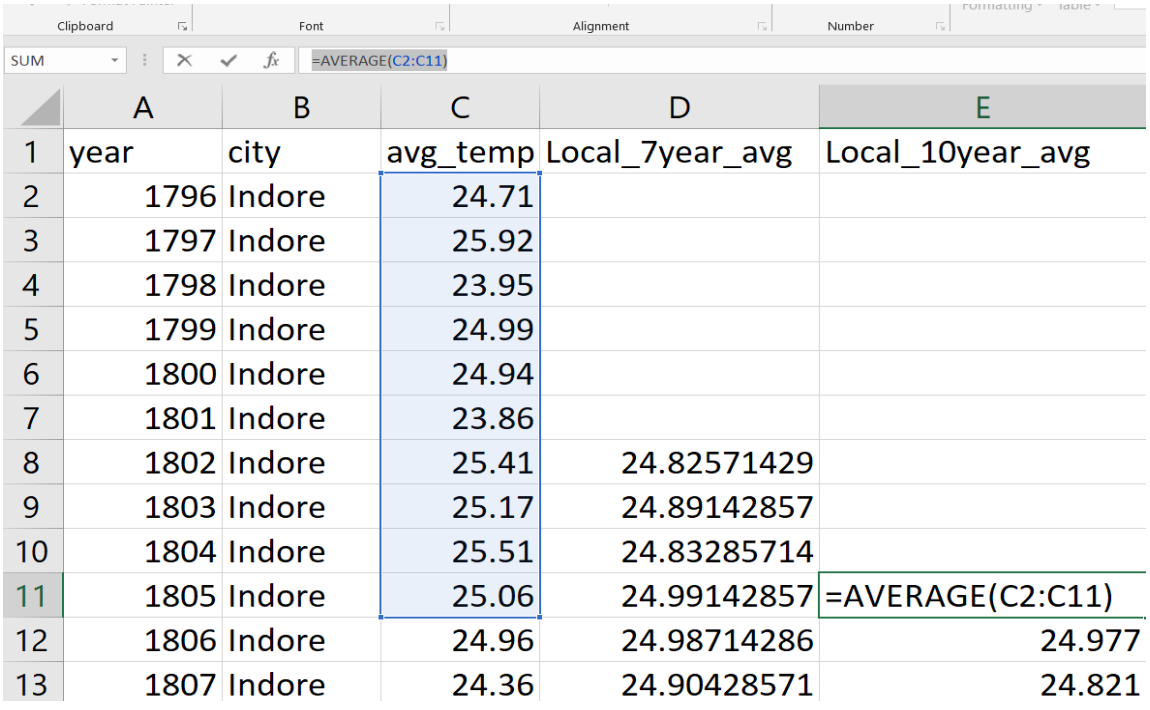
Q2. How did you calculate the moving average?

To calculate the moving average in MS Excel, I have used AVERAGE function (as shown in the lesson). And I have tried 7, 10, 20 year moving average to see which average is better to smooth out data. (as shown below)



	A	B	C	D	
1	year	city	avg_temp	Local_7year_avg	Local_1
2	1796	Indore	24.71		
3	1797	Indore	25.92		
4	1798	Indore	23.95		
5	1799	Indore	24.99		
6	1800	Indore	24.94		
7	1801	Indore	23.86		
8	1802	Indore	25.41	=AVERAGE(C2:C8)	
9	1803	Indore	25.17	24.89142857	
10	1804	Indore	25.51	24.83285714	
11	1805	Indore	25.06	24.99142857	

Fig: Local Average of 7 year



	A	B	C	D	E
1	year	city	avg_temp	Local_7year_avg	Local_10year_avg
2	1796	Indore	24.71		
3	1797	Indore	25.92		
4	1798	Indore	23.95		
5	1799	Indore	24.99		
6	1800	Indore	24.94		
7	1801	Indore	23.86		
8	1802	Indore	25.41	24.82571429	
9	1803	Indore	25.17	24.89142857	
10	1804	Indore	25.51	24.83285714	
11	1805	Indore	25.06	24.99142857	=AVERAGE(C2:C11)
12	1806	Indore	24.96	24.98714286	24.977
13	1807	Indore	24.36	24.90428571	24.821

Fig: Local Average of 10 year

SUM =AVERAGE(C2:C21)

AVERAGE(**number1**, [number2], ...)

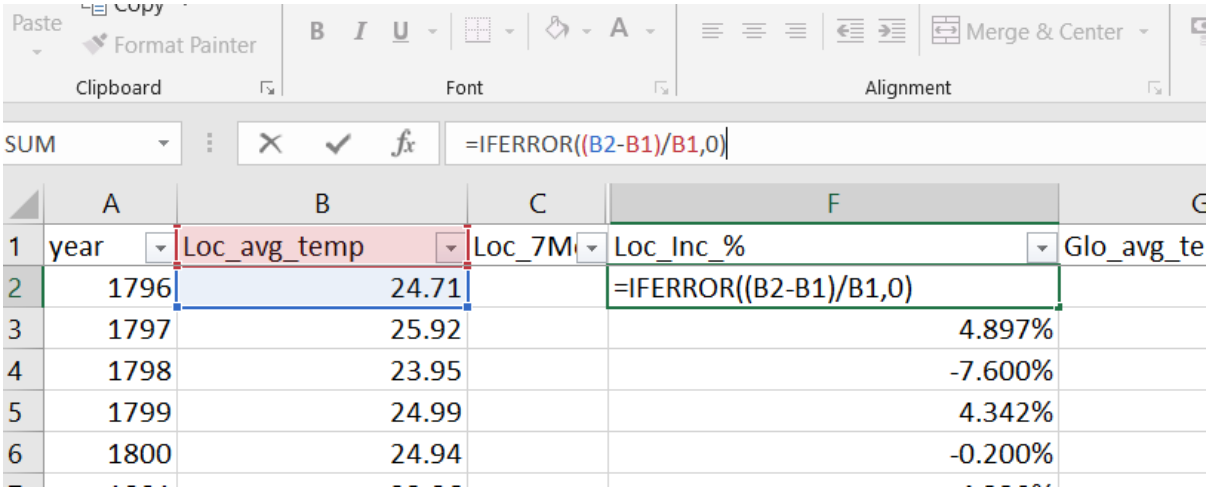
	A	B	C	D	E	F
1	year	city	avg_temp	Local_7year_avg	Local_10year_avg	Local_20year_avg
2	1796	Indore	24.71			
3	1797	Indore	25.92			
4	1798	Indore	23.95			
5	1799	Indore	24.99			
6	1800	Indore	24.94			
7	1801	Indore	23.86			
8	1802	Indore	25.41	24.82571429		
9	1803	Indore	25.17	24.89142857		
10	1804	Indore	25.51	24.83285714		
11	1805	Indore	25.06	24.99142857	24.952	
12	1806	Indore	24.96	24.98714286	24.977	
13	1807	Indore	24.36	24.90428571	24.821	
14	1808	Indore		25.07833333	24.91777778	
15	1809	Indore		25.012	24.90875	
16	1810	Indore		24.9725	24.90428571	
17	1811	Indore		24.79333333	25.07833333	
18	1812	Indore		24.66	25.012	
19	1813	Indore	24.3	24.33	24.838	
20	1814	Indore	23.5	23.9	24.436	
21	1815	Indore	23.84	23.88	24.192	=AVERAGE(C2:C21)
22	1816	Indore	23.44	23.77	23.888	24.614

Fig: Local Average of 20 year

Q3. What were your key considerations when deciding how to visualize the trends?

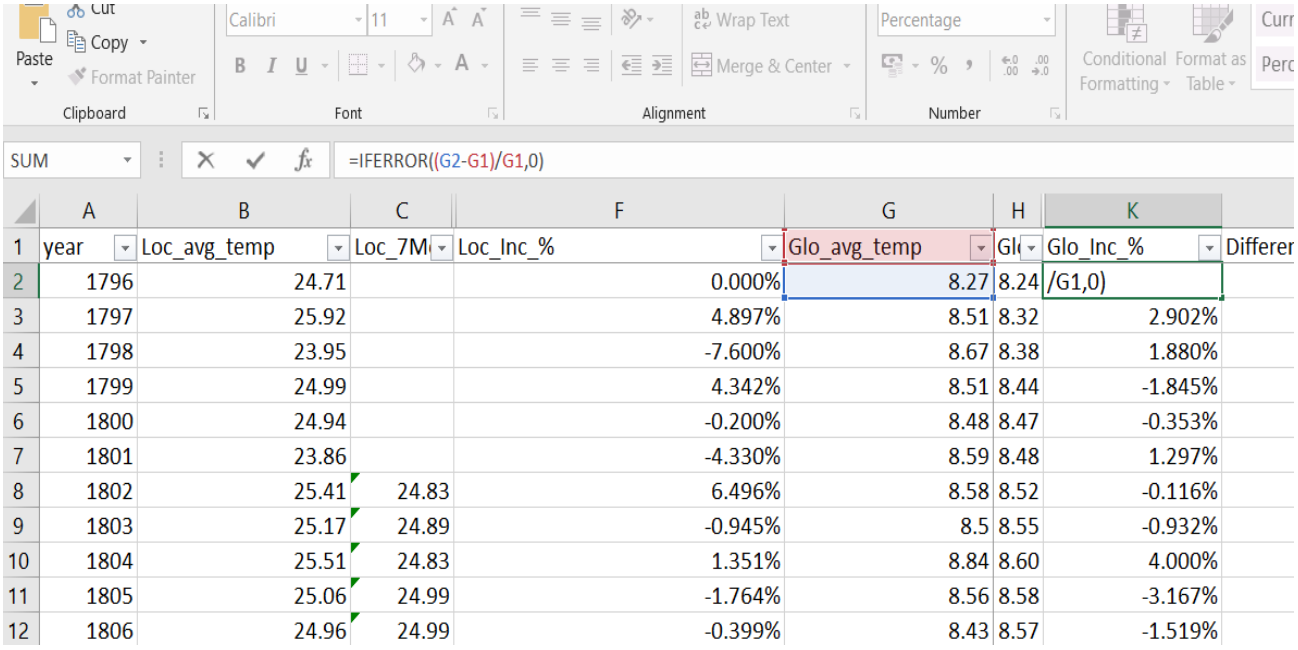
The key consideration was to determine the timeframe for data visualization. Looking at the local temperature data for Indore, the data covers the period between 1796 to 2013, where in the global temperature data covers the period between 1750 to 2015. Therefore, the analysis was performed for the range between 1796 to 2013. To make sure local and global temperature data is mapped correctly, we have to use VLOOKUP to retrieve the global temperature data worksheet into the local data worksheet. To help assess the data variance and frequency of change between local and global temperature levels, we have to calculate the following:

- The Local and Global annual change percentage.
- The difference between Local and Global average temperature.



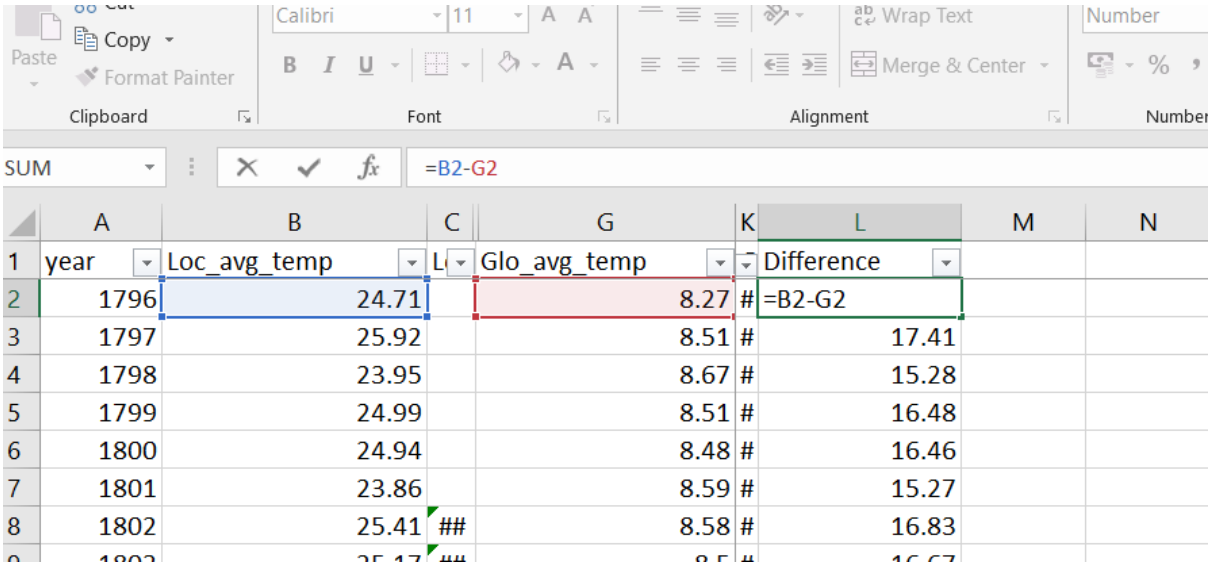
	A	B	C	F	G
1	year	Loc_avg_temp	Loc_7M	Loc_Inc_%	Glo_avg_te
2	1796	24.71		=IFERROR((B2-B1)/B1,0)	
3	1797	25.92		4.897%	
4	1798	23.95		-7.600%	
5	1799	24.99		4.342%	
6	1800	24.94		-0.200%	

Fig: Local Annual Change Percentage



	A	B	C	F	G	H	K
1	year	Loc_avg_temp	Loc_7M	Loc_Inc_%	Glo_avg_temp	Gl	Glo_Inc_%
2	1796	24.71		0.000%	8.27	8.24	/G1,0)
3	1797	25.92		4.897%	8.51	8.32	2.902%
4	1798	23.95		-7.600%	8.67	8.38	1.880%
5	1799	24.99		4.342%	8.51	8.44	-1.845%
6	1800	24.94		-0.200%	8.48	8.47	-0.353%
7	1801	23.86		-4.330%	8.59	8.48	1.297%
8	1802	25.41	24.83	6.496%	8.58	8.52	-0.116%
9	1803	25.17	24.89	-0.945%	8.5	8.55	-0.932%
10	1804	25.51	24.83	1.351%	8.84	8.60	4.000%
11	1805	25.06	24.99	-1.764%	8.56	8.58	-3.167%
12	1806	24.96	24.99	-0.399%	8.43	8.57	-1.519%

Fig: Global Annual Change Percentage



	A	B	C	G	K	L	M	N
1	year	Loc_avg_temp	L	Glo_avg_temp		Difference		
2	1796	24.71		8.27	#	=B2-G2		
3	1797	25.92		8.51	#	17.41		
4	1798	23.95		8.67	#	15.28		
5	1799	24.99		8.51	#	16.48		
6	1800	24.94		8.48	#	16.46		
7	1801	23.86		8.59	#	15.27		
8	1802	25.41	##	8.58	#	16.83		

Fig: Difference Between Local and Global average temperature

To calculate the Max, Min, Average, Standard Deviation, High/Low (%) change, we have to use Pivot Table as shown below:

2		
3	**Average of Loc_avg_temp**	**Average of Glo_avg_temp**
4	24.88	8.40
5		
6	**Max of Loc_avg_temp**	**Max of Glo_avg_temp**
7	26.41	9.73
8		
9	**Min of Loc_avg_temp**	**Min of Glo_avg_temp**
10	19.6	6.86
11		
12	**StdDev of Loc_avg_temp**	**StdDev of Glo_avg_temp**
13	0.66	0.55
14		
15	**Average of Loc_Inc_%**	**Average of Glo_Inc_%**
16	-0.01	0.00
17		
18	**Max of Loc_Inc_%**	**Max of Glo_Inc_%**
19	0.06	0.12
20		
21	**Min of Loc_Inc_%**	**Min of Glo_Inc_%**
22	-1	-0.10
23		
24	**Max of Difference**	**Min of Difference**
25	17.43	-8.11

Observation: -

	Min	Max	Average	SD	Highest Inc. (%)	Lowest Dec (%)	Avg Change
Indore	**19.6**	**26.41**	**24.88**	**0.66**	**0.06**	**-1**	**-0.01**
Global	**6.86**	**9.73**	**8.40**	**0.55**	**0.12**	**-0.10**	**0.00**

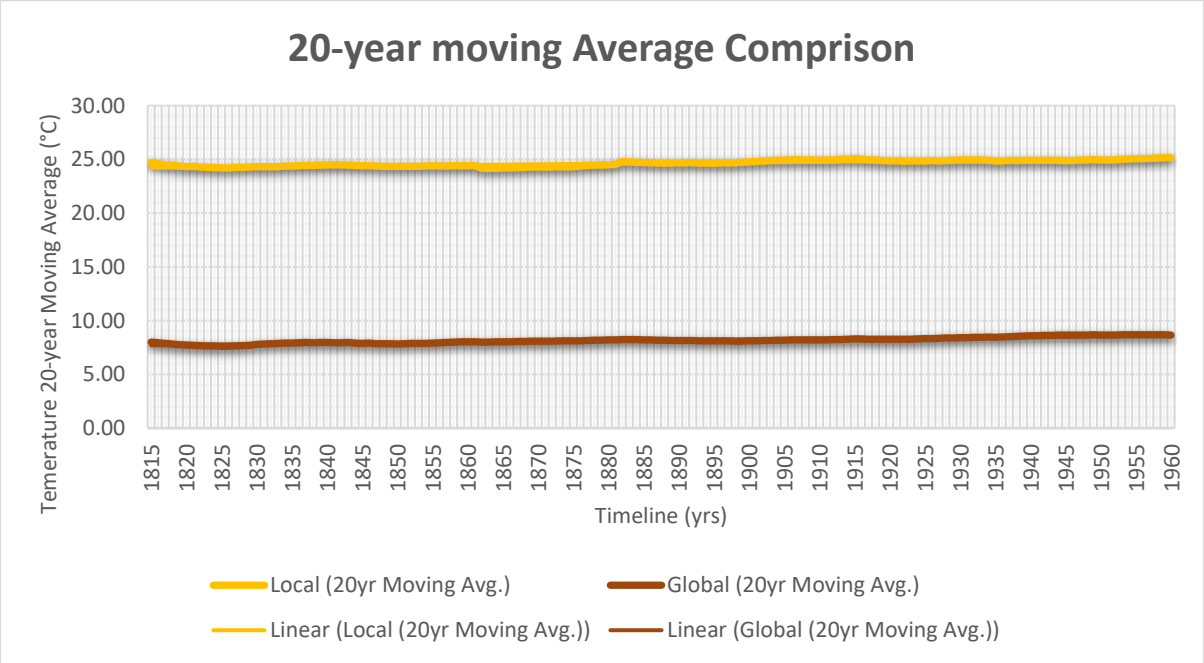
Table: Local VS Global

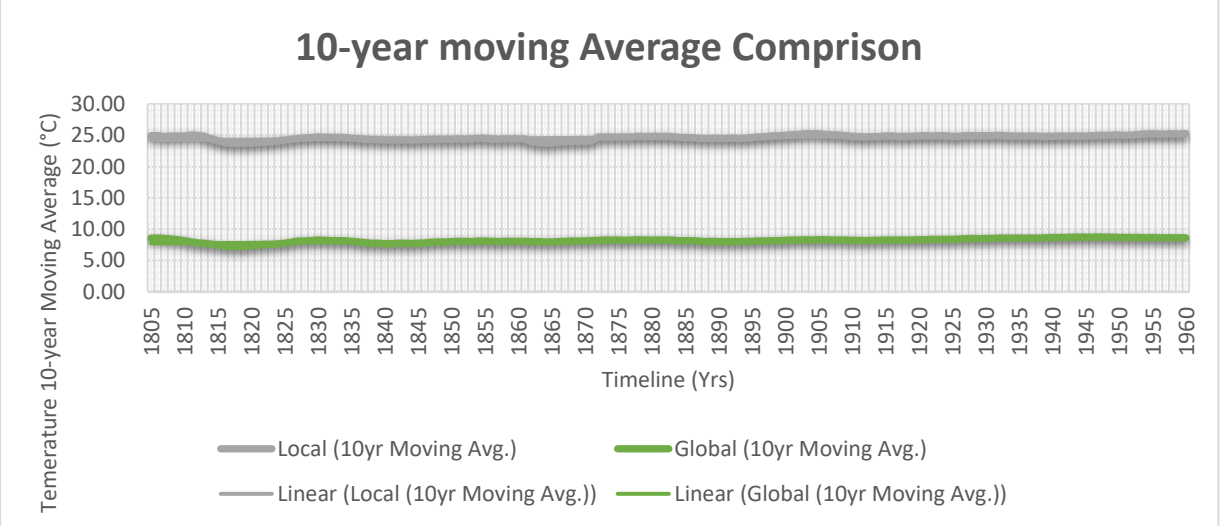
Highest Difference	Lowest Difference
17.43	-8.11

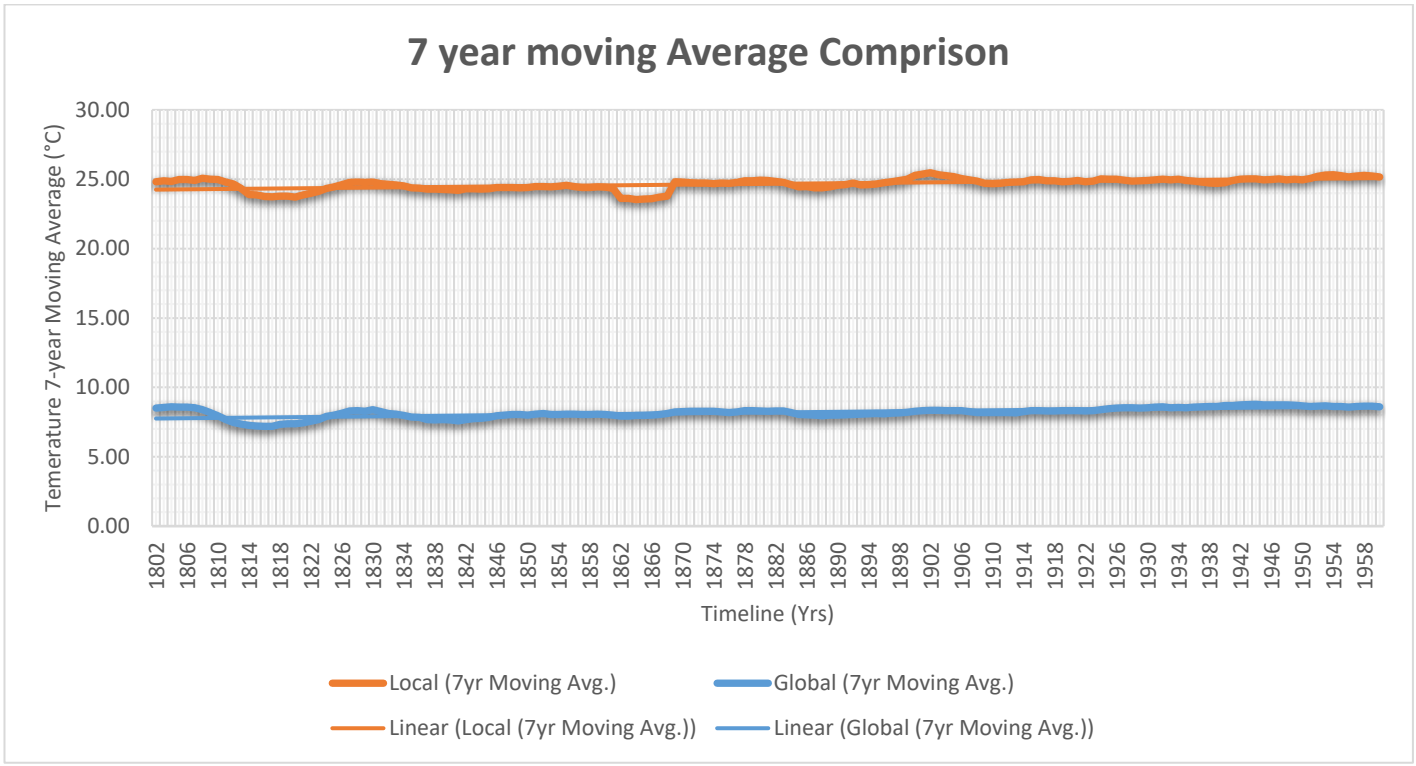
Table: Highest and Lowest Average Difference

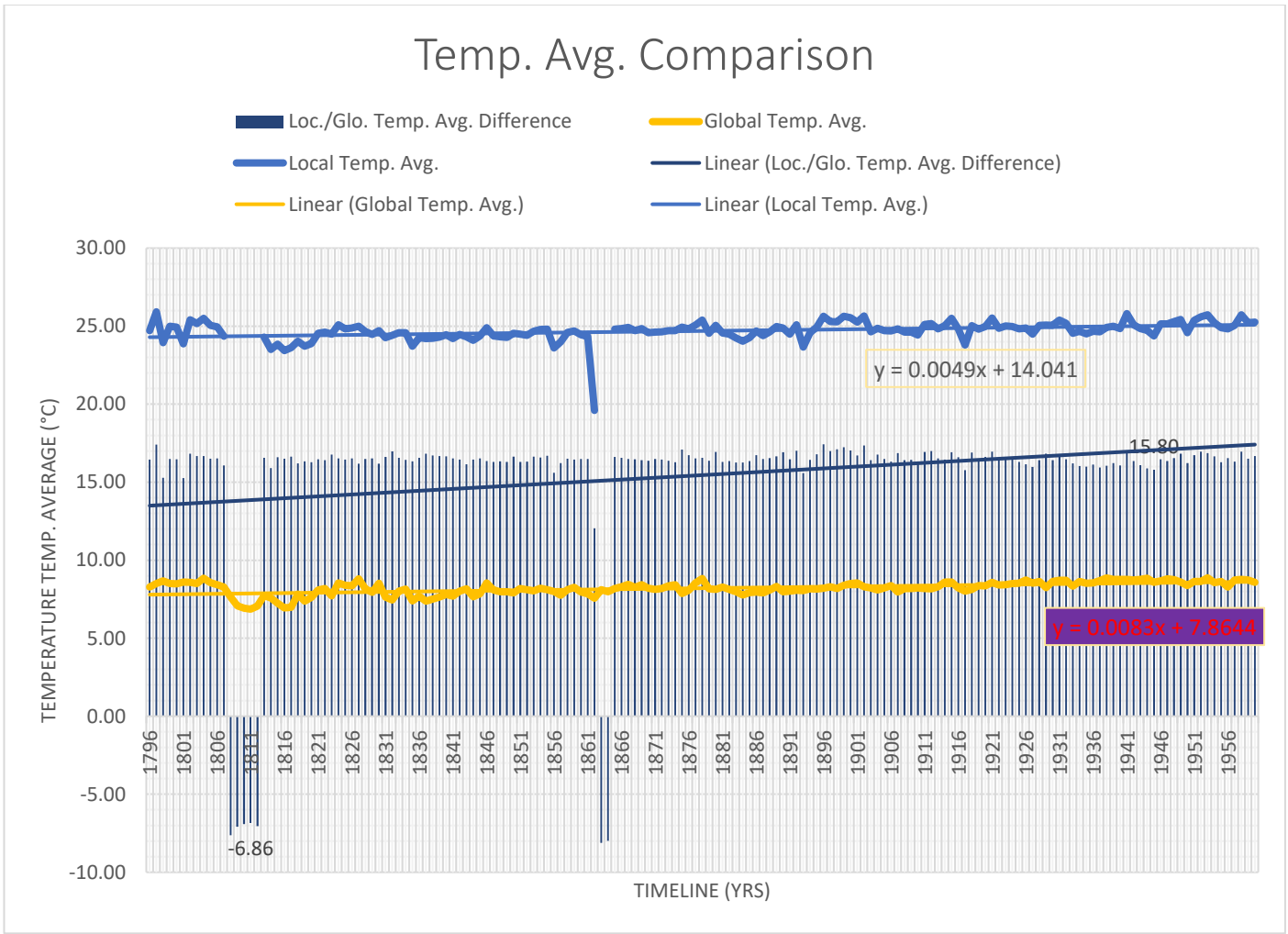
- The Local (Indore) is hotter than global temperature (refer min, max and average in the table above).
- The Local (Indore) is increasing whereas the Global temperature is also increasing.
- The Global Temperature levels have a smaller variance than Local (Indore) temperature changes.
- The Highest difference between Local and Global Temperature is 17.43 and the lowest difference between Local and Global Temperature is -8.11.
- To determine the slope, we have used the TREND function for the local and global temperature data, so the following equations are:
    1. Local Temperature: y = 0.0049x + 14.041
    2. Global Temperature: y = 0.0083x + 7.8644

By comparing above two equation we get the slope (Slope 1: 0.0049) and second one is (Slope 2: 0.0083). We can observe that the Global Temperature is increasing more rapidly than Local Temperature.






7 year moving Average Comprison
Temerature 7-year Moving Average (°C)
30.00
25.00
20.00
15.00
10.00
5.00
0.00
1802 1806 1810 1814 1818 1822 1826 1830 1834 1838 1842 1846 1850 1854 1858 1862 1866 1870 1874 1878 1882 1886 1890 1894 1898 1902 1906 1910 1914 1918 1922 1926 1930 1934 1938 1942 1946 1950 1954 1958
Timeline (Yrs)
Local (7yr Moving Avg.)
Global (7yr Moving Avg.)
Linear (Local (7yr Moving Avg.))
Linear (Global (7yr Moving Avg.))


Temp. Avg. Comparison
Loc./Glo. Temp. Avg. Difference
Global Temp. Avg.
Local Temp. Avg.
Linear (Loc./Glo. Temp. Avg. Difference)
Linear (Global Temp. Avg.)
Linear (Local Temp. Avg.)
TEMPERATURE TEMP. AVERAGE (°C)
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-5.00
-10.00
y = 0.0049x + 14.041
15.80
y = 0.0083x + 7.8644
-6.86
1796 1801 1806 1811 1816 1821 1826 1831 1836 1841 1846 1851 1856 1861 1866 1871 1876 1881 1886 1891 1896 1901 1906 1911 1916 1921 1926 1931 1936 1941 1946 1951 1956
TIMELINE (YRS)