

# Project 1: “Exploring Weather Trends”

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This project will analyze local and global temperature data and compare the trends of both. The local city selected for this assignment is Santiago of Chile.

## Data

The data employed corresponds to the following tables:

- city\_list: contains a list of cities and countries in the database.
- city\_data: contains the average temperatures for each city by year (°C).
- global\_data: contains the average global temperatures by year (°C).

To extract each table, the following codes were executed using the SQL Workspace provided by the Udacity's Classroom:

a. city\_list:

```
SELECT *  
  
FROM city_list
```

b. city\_data

```
SELECT *  
  
FROM city_data
```

c. global\_data

```
SELECT *  
  
FROM global_data
```

Similarly, to extract the local information from Santiago (Chile) the following code was executed:

a. Santiago's Average Temperature

```
SELECT year, avg_temp  
  
FROM city_data  
  
WHERE country = 'Chile' AND city = 'Santiago'
```

After obtaining the required data, all the tables were downloaded in CSV format.

## Data Analysis

It is important to consider that from this point ahead, Microsoft Excel was used to perform the analysis of the extracted data, including the corresponding filters, moving averages, charts and Pearson correlation.

### Data filter

Preliminarily, we can observe that the global data starts in 1855, whereas Santiago's useful information begins in 1859, therefore, the total data was sliced between 1859 to 2013.

### Moving Average Filtering

Moving averages were calculated with windows of 10 years, obtaining a curve that it is smoother and therefore, easier to analyze. To calculate the corresponding moving average, we use the formulas hereunder:

- Global 10 moving averages

Year	avg_temp_global	avg_temp_santiago	global_10ma	stgo_10ma
1855	8,11	2,57		
1856	8	5		
1857	7,76	5,1		
1858	8,1	5,1		
1859	8,25	5,6		
1860	7,96	5,25		
1861	7,85	4,84		
1862	7,56	4,79		
1863	8,11	4,51		
1864	7,98	4,99	=+AVERAGE(B2:B11)	
1865	8,18	5,45	7,975	5,063

- Santiago 10 moving averages

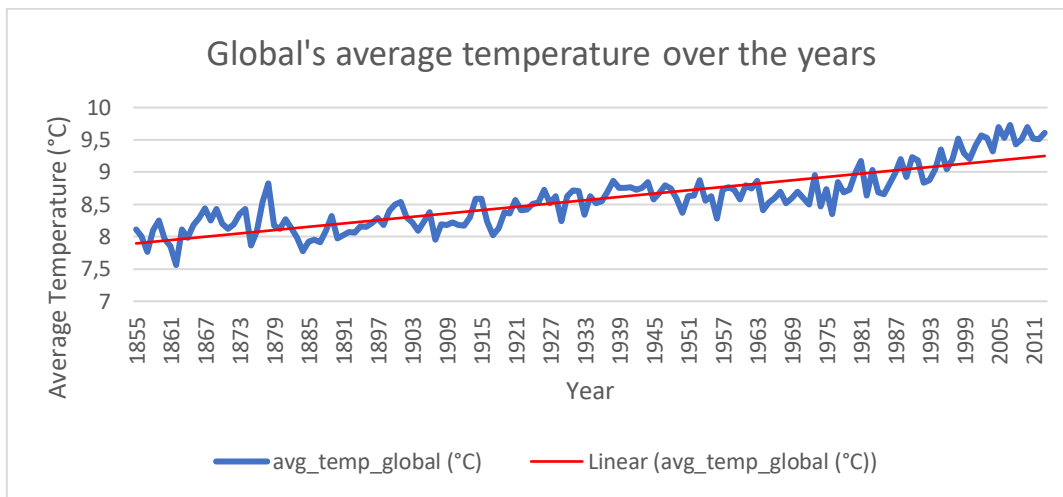
Year	avg_temp_global	avg_temp_santiago	global_10ma	stgo_10ma
1855	8,11	2,57		
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1861	7,85	4,84		
1862	7,56	4,79		
1863	8,11	4,51		
1864	7,98	4,99	7,968	=+AVERAGE(C2:C11)
1865	8,18	5,45	7,975	5,063

## Charts

The global and Santiago's information is visualized in the following charts:

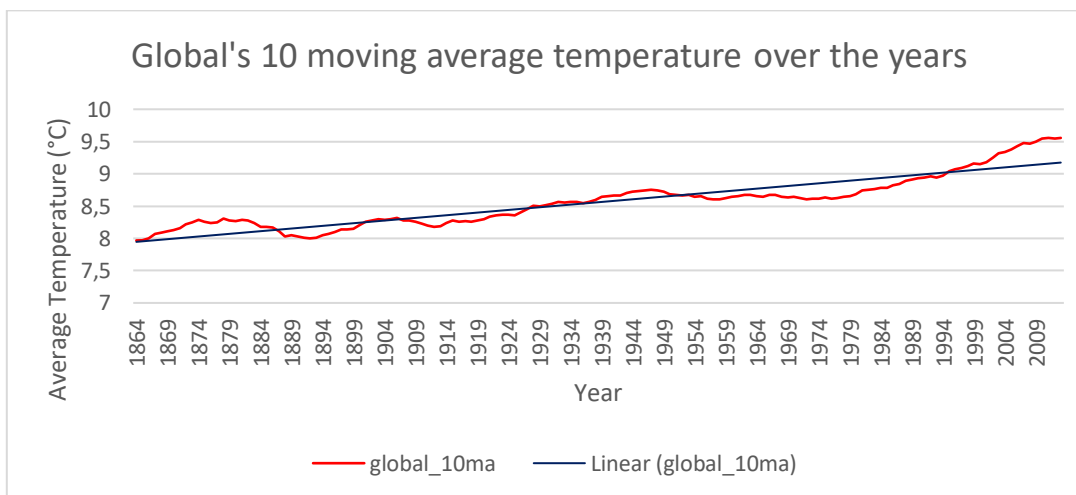
- Global data: As shown below from 1855 to 2013, the average global temperature increased gradually by an order of approximately 1.5 ° C. The trend line (Linear (avg\_temp\_global)) is added on top to highlight this statement.

Chart 1. Global's average temperature over the years



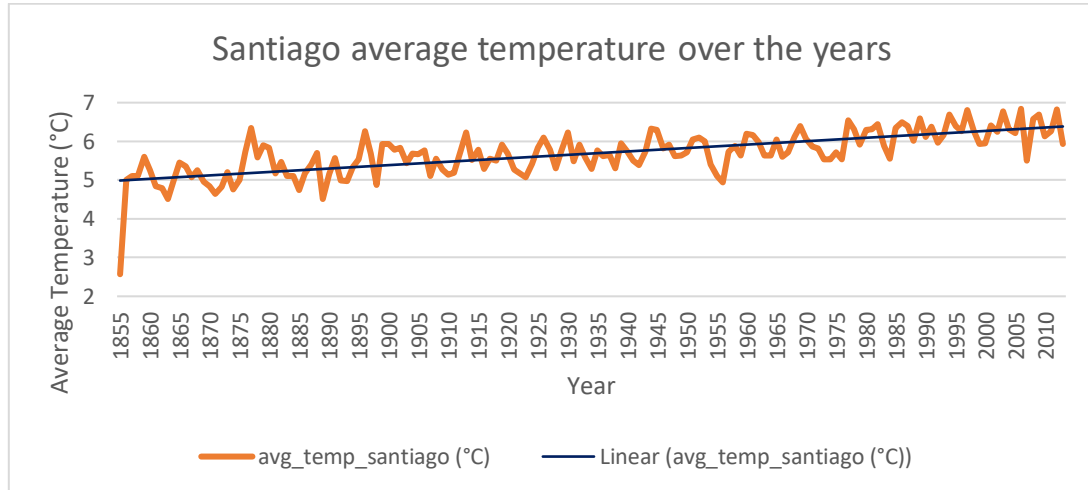
With the idea of smoothing the curve, the 10-year moving average was calculated. With the new data, the time axis was stretched down to a new window from 1864 to 2009. The trend line is maintained on top to support the thesis of a sustained increase over time.

Chart 2. Global's 10 moving average temperature over the years



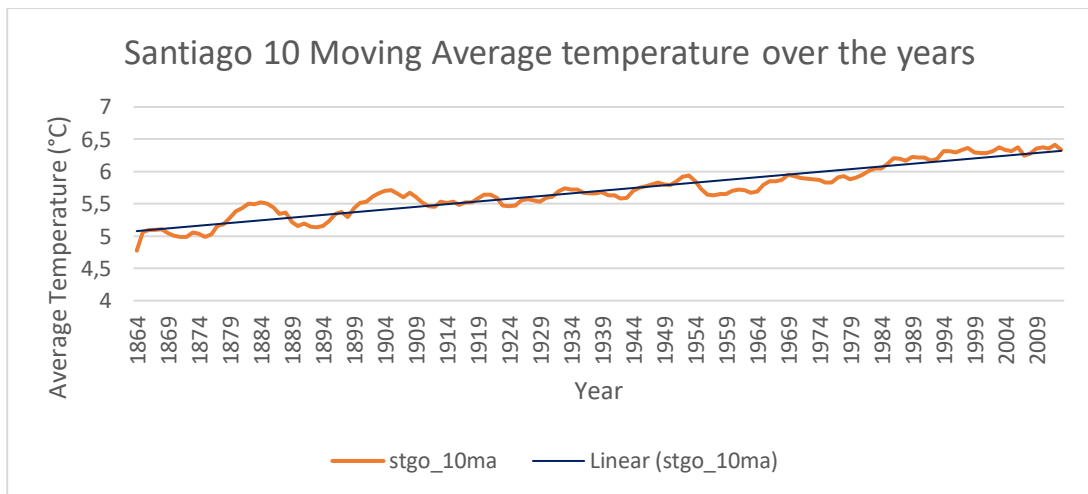
- Santiago data: Similar to what is seen above with the raw data, the average temperature of Santiago has been on a steady increase, although that is also highlighted in the chart set.

Chart 3. Santiago average temperature over the years



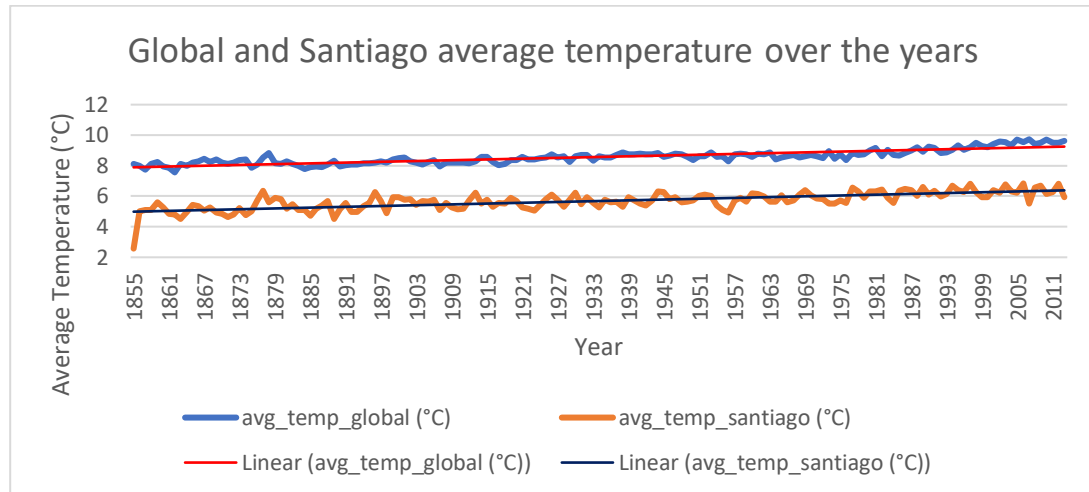
The moving average filter was repeated in the local dataset, using the same 10-year window, since it has the same effect, resulting in a streamlined output. In the graph, you could also see the trend of rising temperature.

Chart 4. Santiago 10 moving average temperature over the years



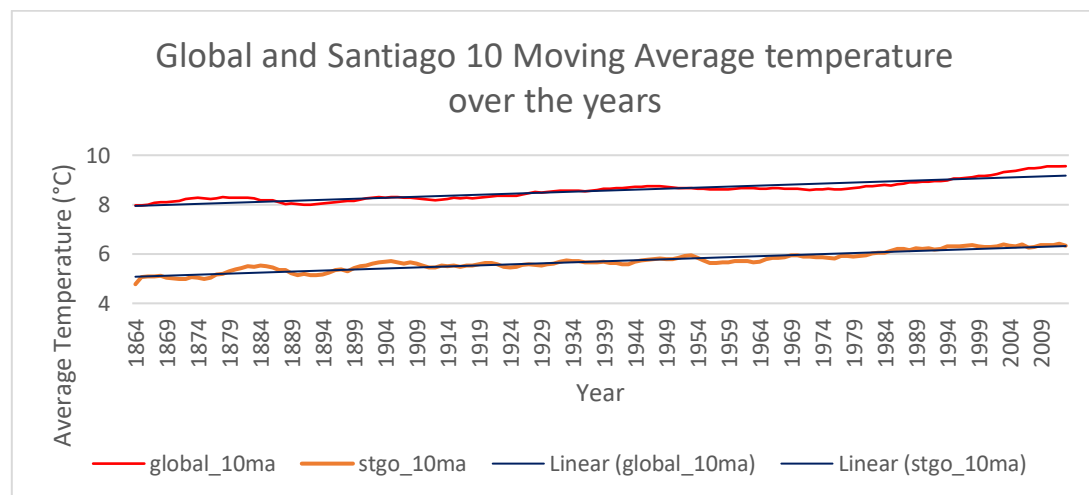
- Global and Santiago data comparatives
1. Global and Santiago average temperature over the years: this chart has been constructed with the real data.

Chart 5. Global and Santiago average temperature over the years



2. Global and Santiago 10 Moving Averages temperatures over the years: This chart has been constructed with both 10 moving averages calculated above.

Chart 6. Global and Santiago 10 moving average temperature over the years



## Observations

- Comparatively, the global temperature concerning Santiago is approximately 3 °C higher throughout the evolution of the analyzed time (Chart 5, Chart 6)
- In the graphs, it can be seen for both cases a gradual increase in temperature over the years, which is greater than 1 ° C. (Chart 5, Chart 6)
- Looking at the trend of both, it seems that in the future this will continue to increase. (Chart 5, Chart 6)
- Another observation is that if you look at the global data graph with 10 moving averages, since the year 2000 the increase represented is more powerful, which reinforces the hypothesis of a strong increase in global temperature since the 1990s. (Chart 2)
- Comparing the Pearson correlation for both datasets, we got 0.66 for the raw data chart, on the other hand we got 0.91 for the moving average case. This indicates that when working with moving averages the data tends to be more related to each other, which can be used for an eventual forecast.