

# Outline

I performed following steps:

- Query annual values from the DB for global temperature and for local temperature in Munich/Germany.
- Export the results as CSV files and import them in Excel
- Calculate 5-year moving average for both value series.
- Plot the 5-year moving average over the years.

## Queries

I retrieved annual temperature values using SQL queries and saved the results in CSV files.

- Query global temperature values:

```
select *
from global_data
order by year;
```

- Query temperature for Munich/Germany:

```
select *
from city_data
where city = 'Munich' and country = 'Germany'
order by year;
```

Note: there are no other cities with same name from a different country in this DB, so we could omit the condition `country = 'Germany'` in this specific case. But it's generally needed because there can be cities with same name in different countries. With the following query we can count the number of countries that have a city with a given name:

```
select s.city, count(s.country)
from (
    select distinct city, country
    from city_data) s
group by s.city
order by 2 desc;
```

There are several city names that appear in different countries. For example, London appears in 2 countries, and with the query

```
select distinct city, country
from city_data
where city = 'London';
```

we can find out that those countries are United Kingdom and Canada.

# Calculation

I imported the CSV files in Excel and calculated the 5-year moving average for both data sets (for global and local temperatures). An example of the calculation can be seen in this screenshot:

24	1772	8,19	7,64
25	1773	8,22	7,93
26	1774	8,77	8,14
27	1775	9,18	8,44
28	1776	8,31	=AVERAGE(B24:B28)

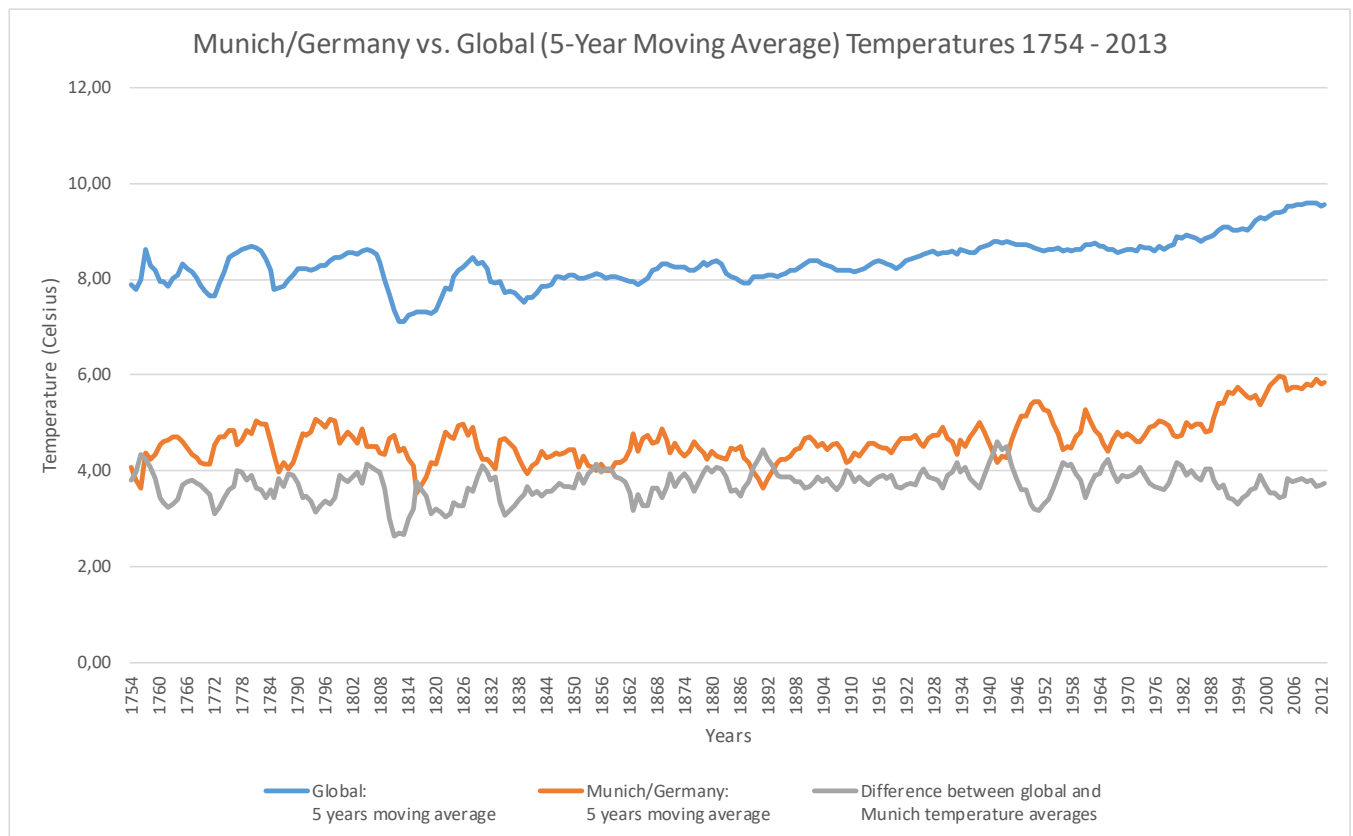
I also calculated the difference between the global and local temperature value for each year.

# Charts

I created a line chart plotting the 5-year moving average over the years for 3 value series:

- Global temperature
- Local temperature for Munich/Germany
- Difference between global and local temperature

Here is the resulting chart:



# Observations

1. Both the global temperature and the local temperature in Munich were rising since the beginning of the 20<sup>th</sup> century, with recent values being around 1.2° higher than in the early 20<sup>th</sup> century.
2. The local temperature values in Munich have more variation than global temperature values, probably the variations between different regions of the world average out so that the global values line is smoother.
3. We can see that the local temperature in Munich is lower than the global temperature. The difference is mostly between 3 and 4 degrees Celsius.
4. We see the dip of approx. 0.5 degrees Celsius in both global and local temperature values between the years 1810 and 1820. This could be because of the climate anomaly caused by the eruption of Mount Tambora in 1816, see [https://en.wikipedia.org/wiki/Year\\_Without\\_a\\_Summer](https://en.wikipedia.org/wiki/Year_Without_a_Summer).