Project: Explore Weather Trend
Reported by: **Binh Nguyen**
Date: **August 29, 2019**

1. Extract data:

I live in Hanoi, and the city is in the list of included city. The averaged temperature of Hanoi and globally were queried and downloaded to .csv files:

```
select year, avg_temp from city_data where city=='Hanoi';
select year,avg_temp from global_data;
```

2. Calculate moving average:

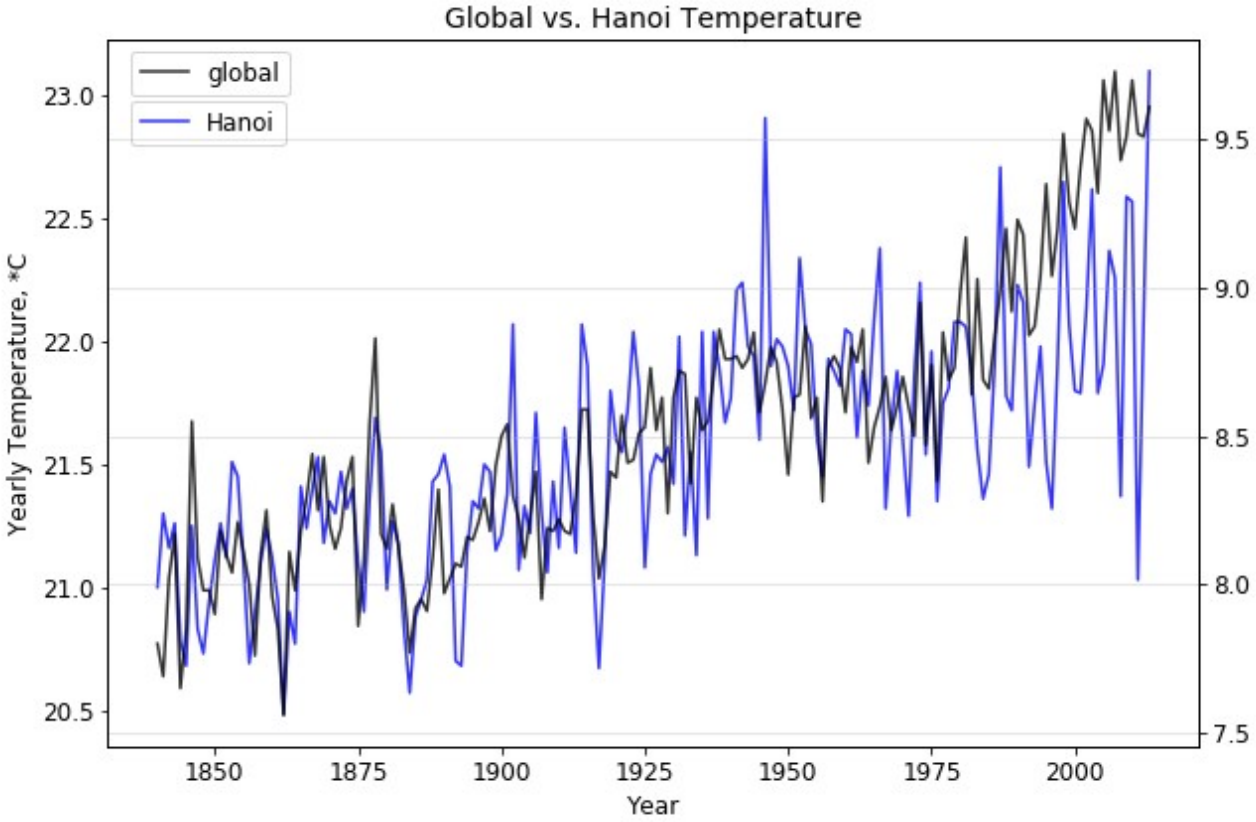
A moving average function was built by Python with a year as the index, a value list for the temperature and a third input as the number of years to be averaged.

```
def mov_avg(index, value, points):
  output = list()
  # Check if the lengh of the index and value lists are equal
  if len(index) != len(value):
    return print('Inputs are not in the same length, exit.')
  # enforce to number of year to be an odd number
  if points%2 ==0:
    return print('Choose an odd points should be considered.')
  start = round((points+1)/2)
  total = len(index)
  end = total - start+1
  delta = start-1
  for i in range(start,end):
    avg = 0
    for elem in value[i-delta:i+delta+1]:
      avg += elem
    avg /= points
    # return an list of array with the year as the middle of averaging slides
    output.append([index[i], avg])
  return output
```

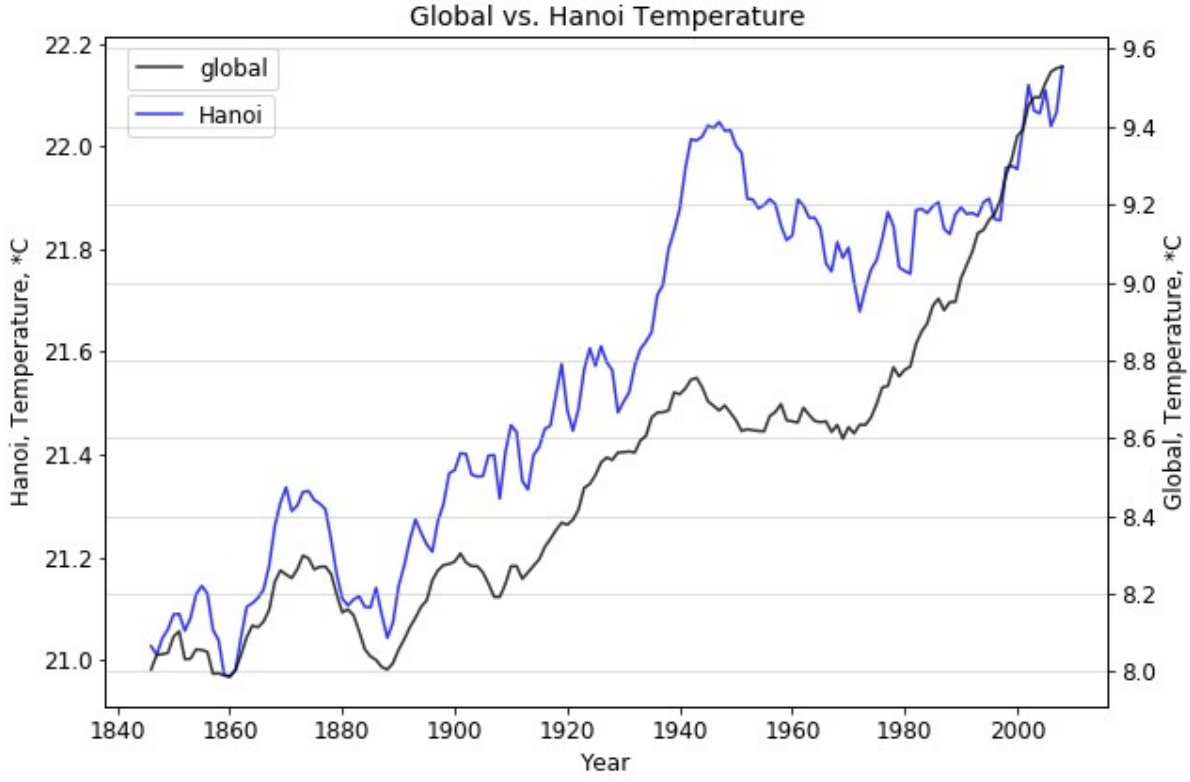
3. Line charts

The .csv files were read by pandas and the longer dataframe was cut to match to the same length using pandas merge with inner.

a) Line chart without data the moving average:



b) Line chart with an 11-year average:



4. Interpretation

It is worth mentioned that Hanoi's temperature is higher than the global average. This is expected because Hanoi is in sub-tropical region while the global average including polar regions.

a) *The average temperature of Hanoi and the globe is increasing over the observed period* (1840-2013). This is expected as well. The consensus on scientific community is that the increment of temperature as a result of accumulation man-made carbon dioxide emission.

b) *The global trend is more gradually and steady than one with Hanoi.* A local variation with one city was shown the second chart with more zig-zac line. The global trend taken into more data and more steady over time is logical.

c) *A strong correlation of the trend between Hanoi and the globe can be calculated using pandas corr function with coefficient = 0.89.* This mean a strong correlation between the increment of temperature in Hanoi with the globe.

d) *The increment of temperature seems to accelerating.* With the global trend, the temperature increased 0.4*C over 130 years (1840-1970) while 0.8*C was added over 43 year (1970-2013). The local trend is harder to justify the acceleration because the peak during 1940-1960 overshadowed the recent increment of the temperature. The acceleration of the global temperature is from worrisome to detrimental to the Earth's ecosystem.
