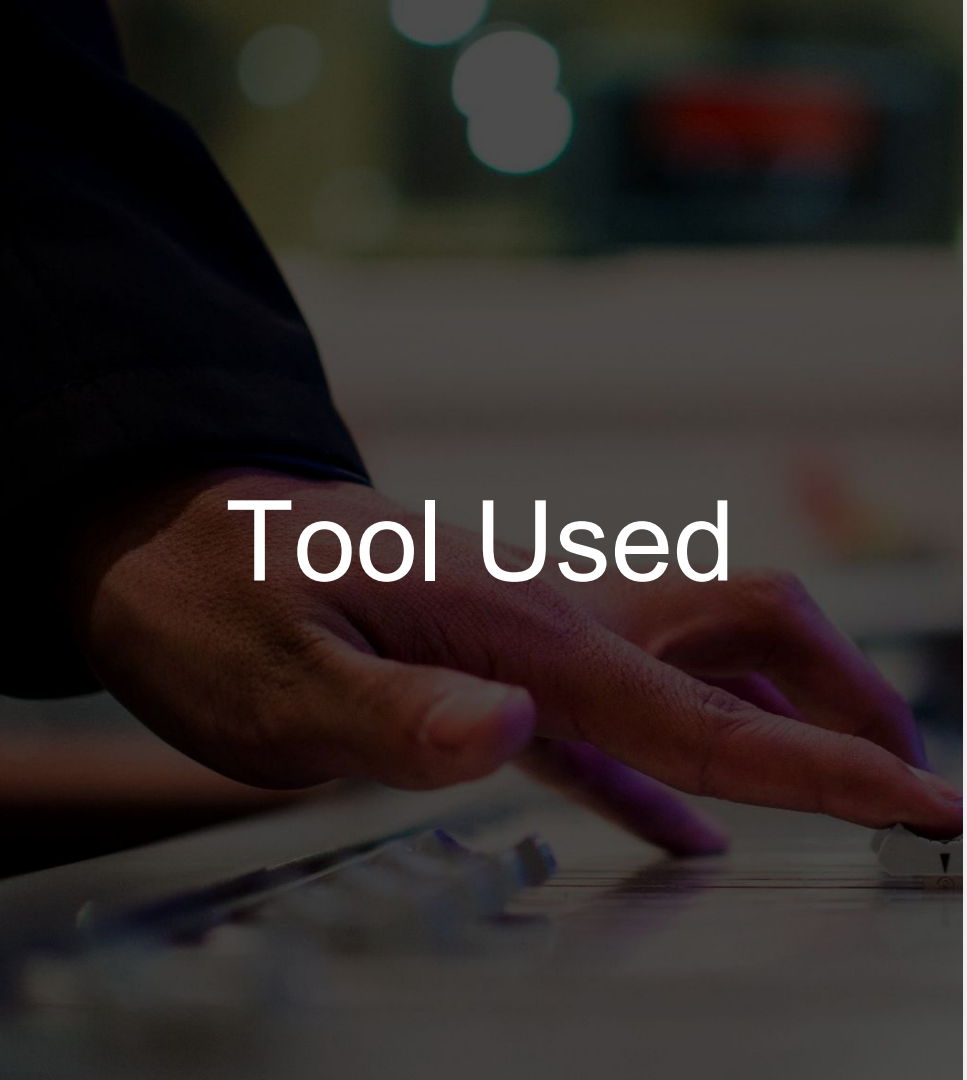
Climate Change
since 1750

Yonghao Zhang Xinyi Zhang Kaixin Chen

Data Preparation Work

- Data Cleaning
  - Missing values
  - Duplicate Datas
- Data Integration
  - Integration of Multiple files and databases
- Data transformation
  - import csv files into MySQL database
  - Attribute Construction and aggregation
- Data Reduction
  - Separate the whole database into small parts to Speed up Mining
  - Choose the attributes



Tool Used

- Matlab
- MySQL
- R
- Excel
- Latex
- Weka

- Is Global Warming a fact? Is it a global phenomenon or it only happens in the certain area?
- What is the relationship between the climate change and altitude?
- What is the relationship between the seasonality and climate trend?
- What is the relationship between the highs and lows trend and climate trend?

The Questions

Classification/Clustering

- Euclid Distances

Relationship between Climate Trend and altitude

Altitude	Average Temperature from 2000	Average Temperature from 1750
Low(0-30)	24.1	22.1
Medium(30-50)	13.6	12.0
Highs(50-90)	7.2	6.0

Palu(0.8S)

Season	Winter	Spring	Summer	Autumn
Average Temperature from 1750	20.5	20.7	20.5	20.8
Temperature from 2000	26.4	26.8	26.5	26.3

Kimberley(28.13S)

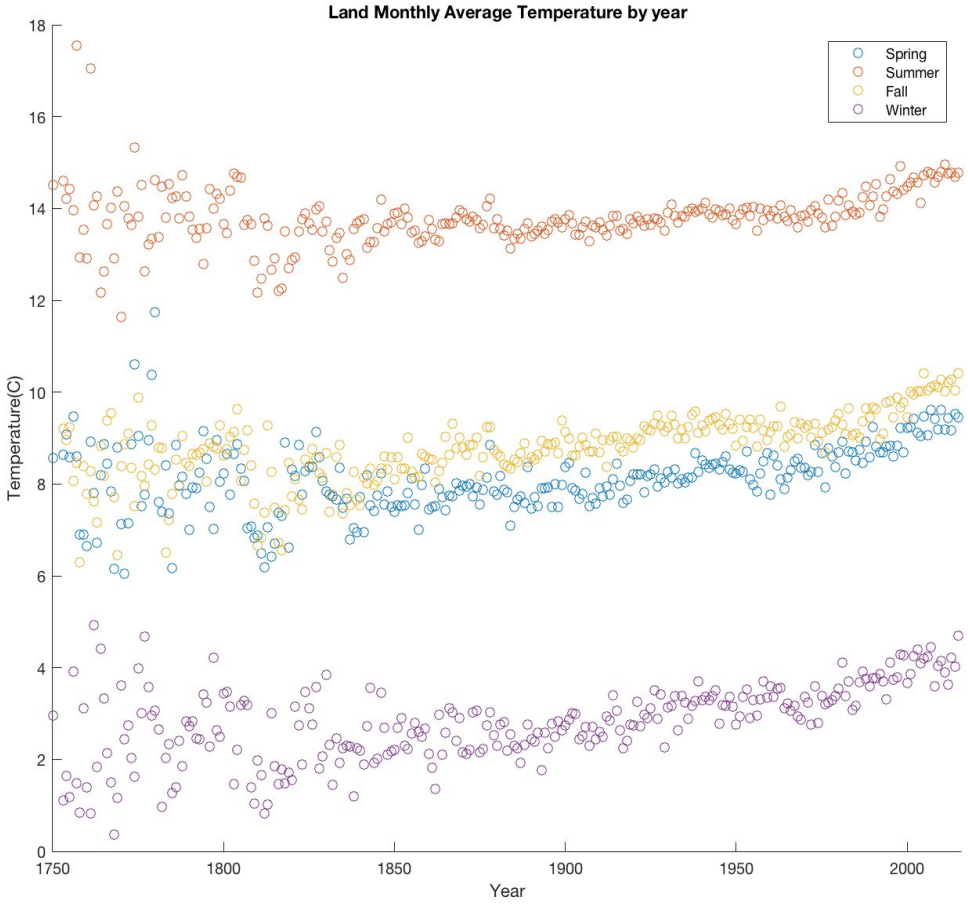
Season	Winter	Spring	Summer	Autumn
Average Temperature from 1750	23.6	17.1	10.6	19.0
Temperature from 2000	24.2	18.0	11.2	19.4

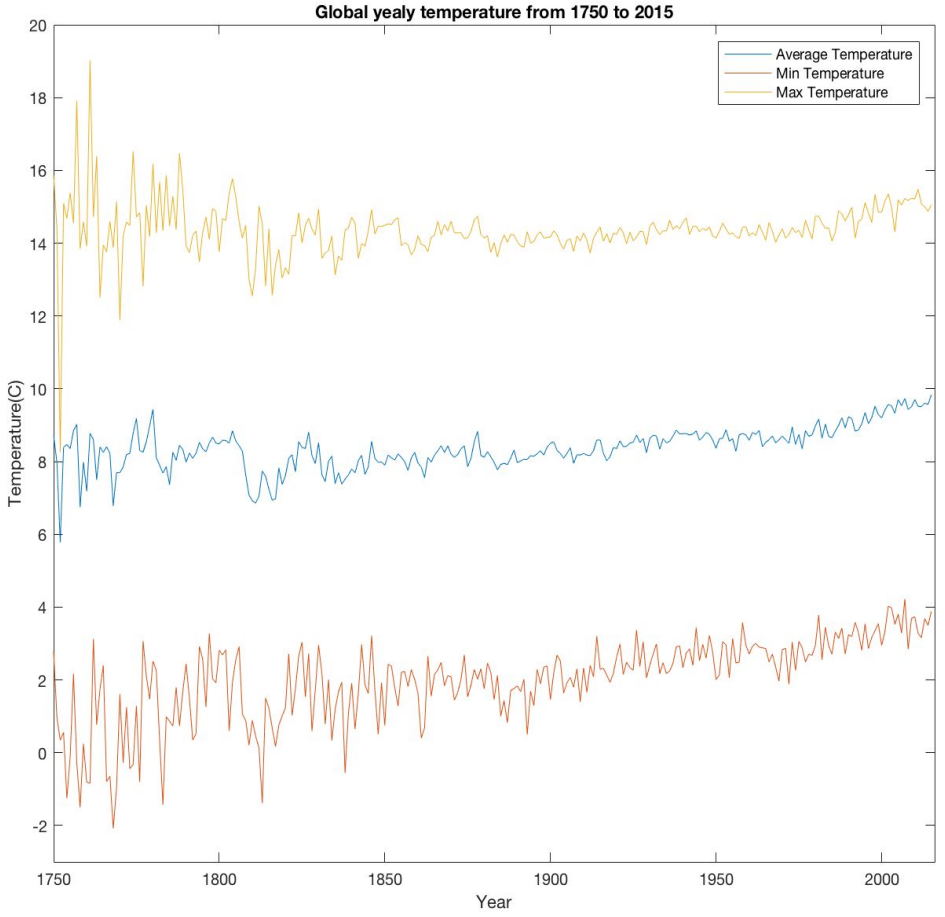
Changchun(44.2N)

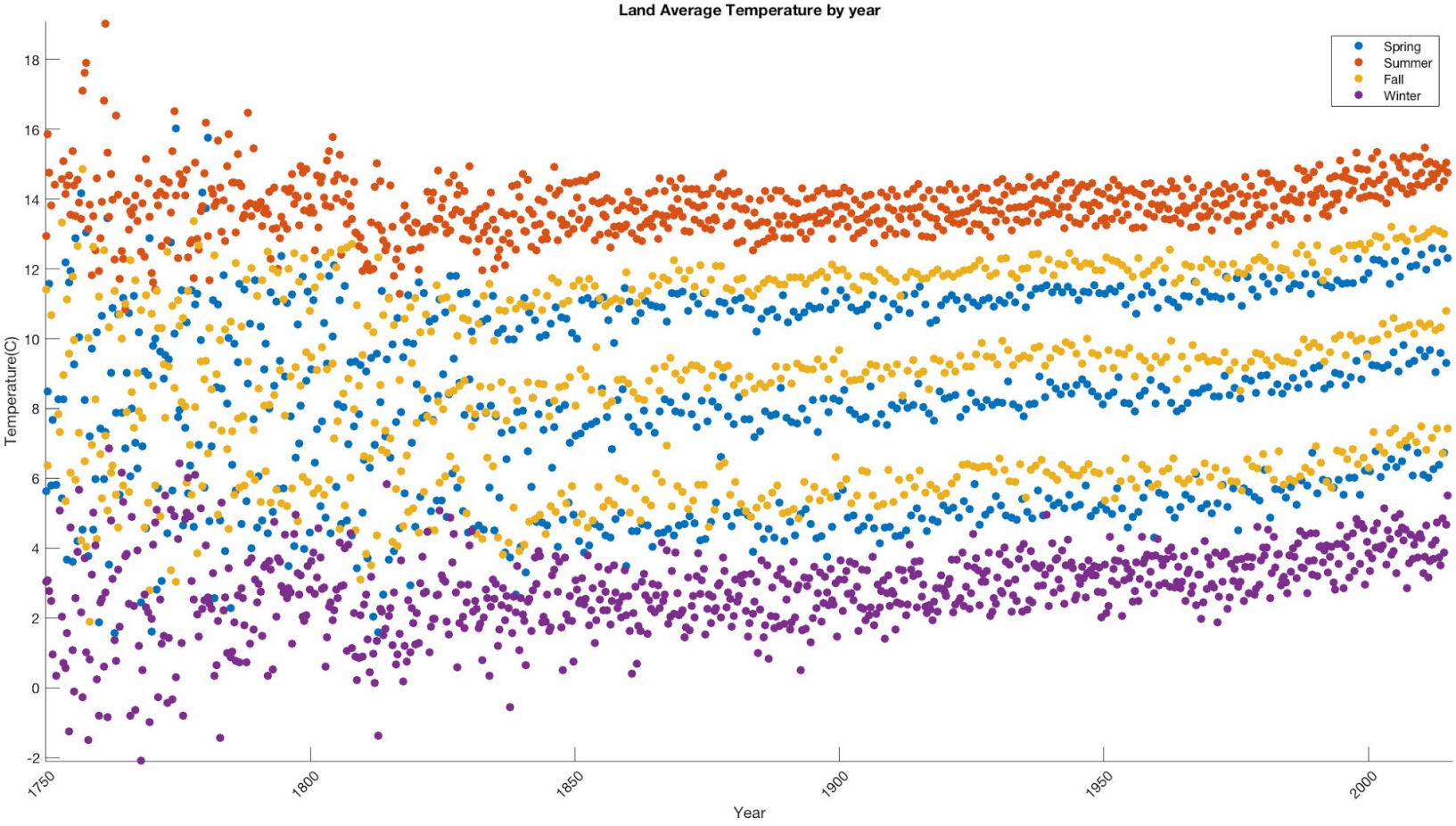
Season	Winter	Spring	Summer	Autumn
Average Temperature from 1750	-14.3	6.0	22.0	5.9
Temperature from 2000 t	-13.12	7.7	22.7	6.9

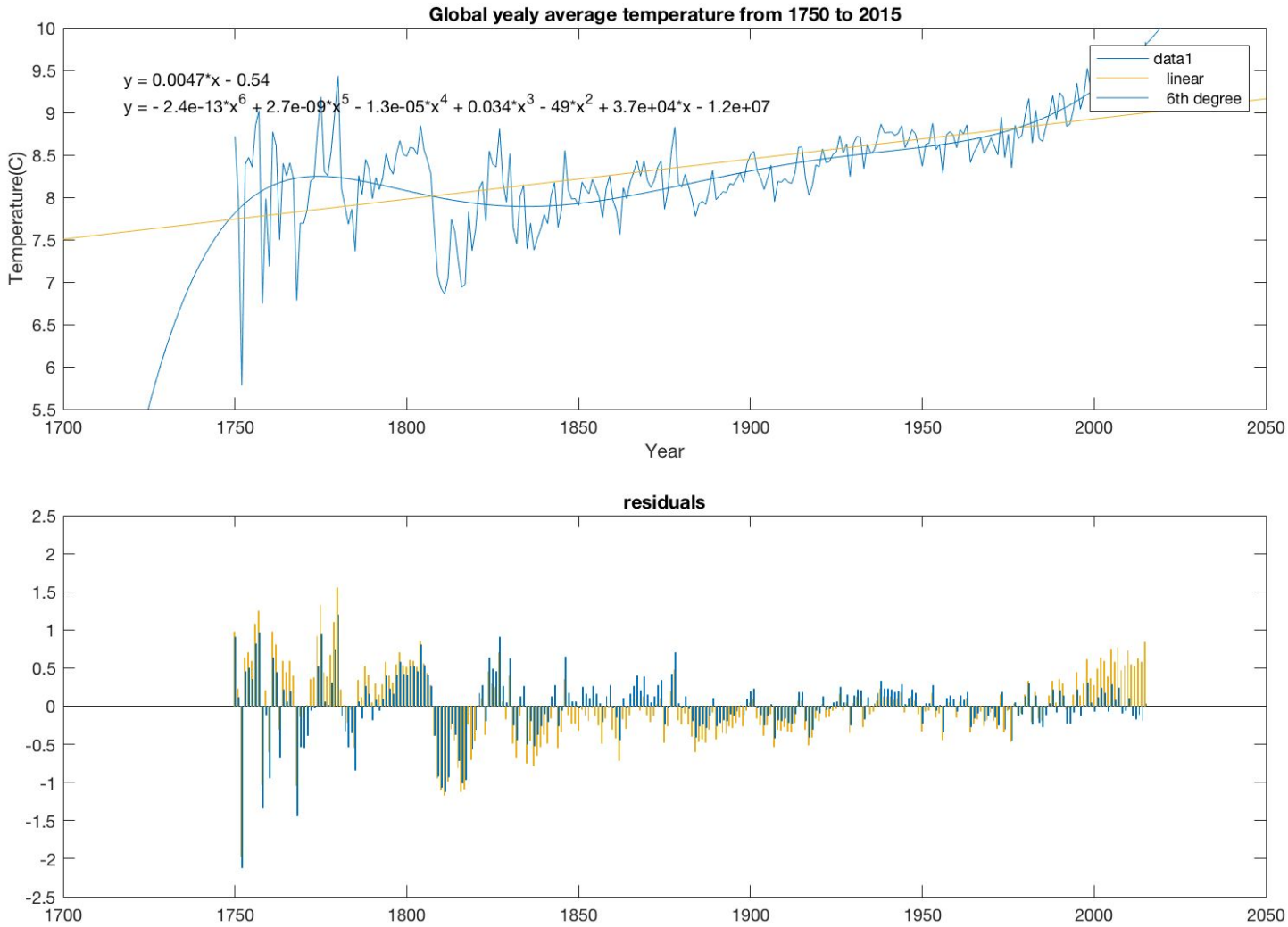
Norilsk(69.92N)

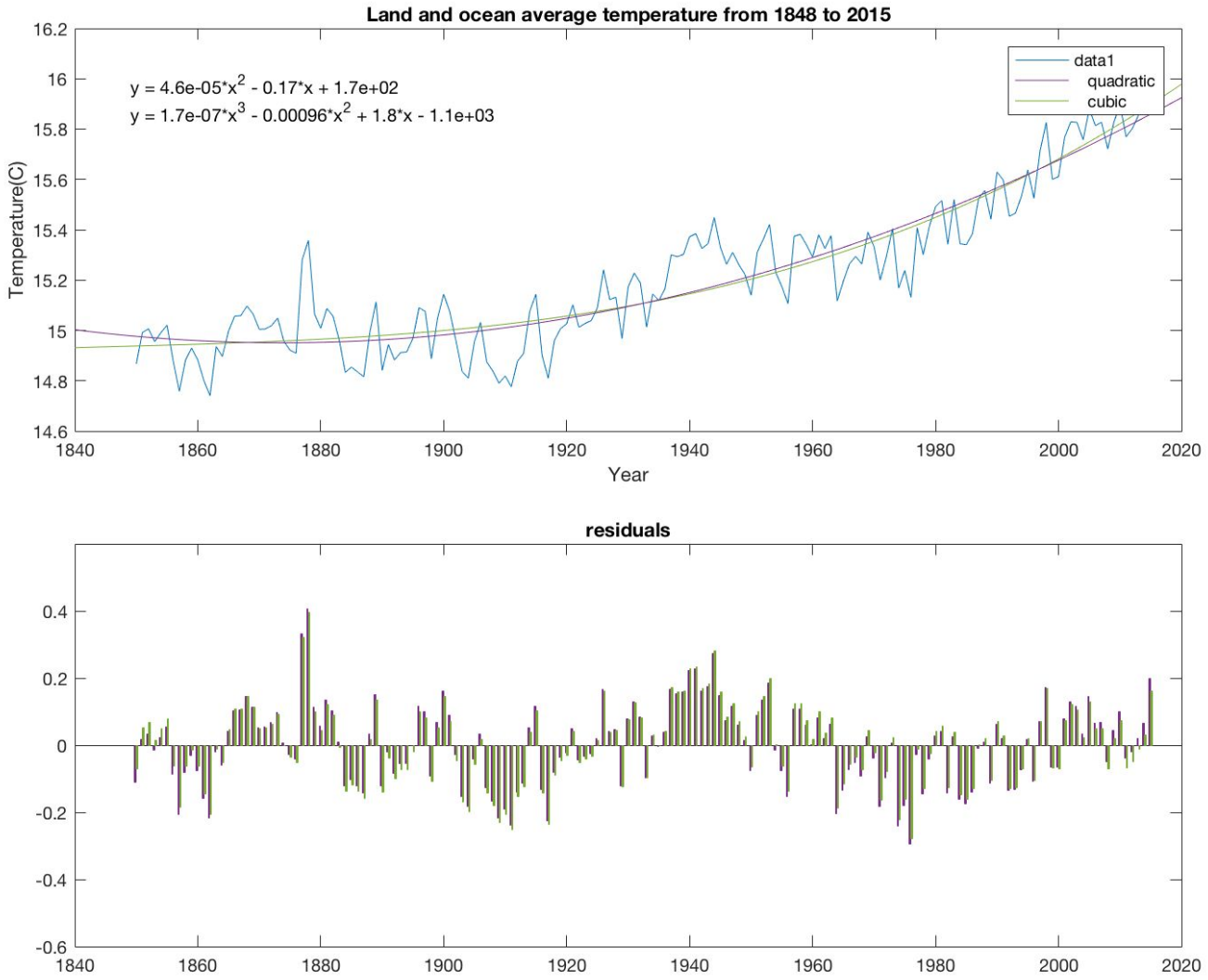
Season	Winter	Spring	Summer	Autumn
Average Temperature from 1750	-29.4	-16.2	8.9	-10.7
Temperature from 2000	-28.3	-14.5	10.4	-8.6

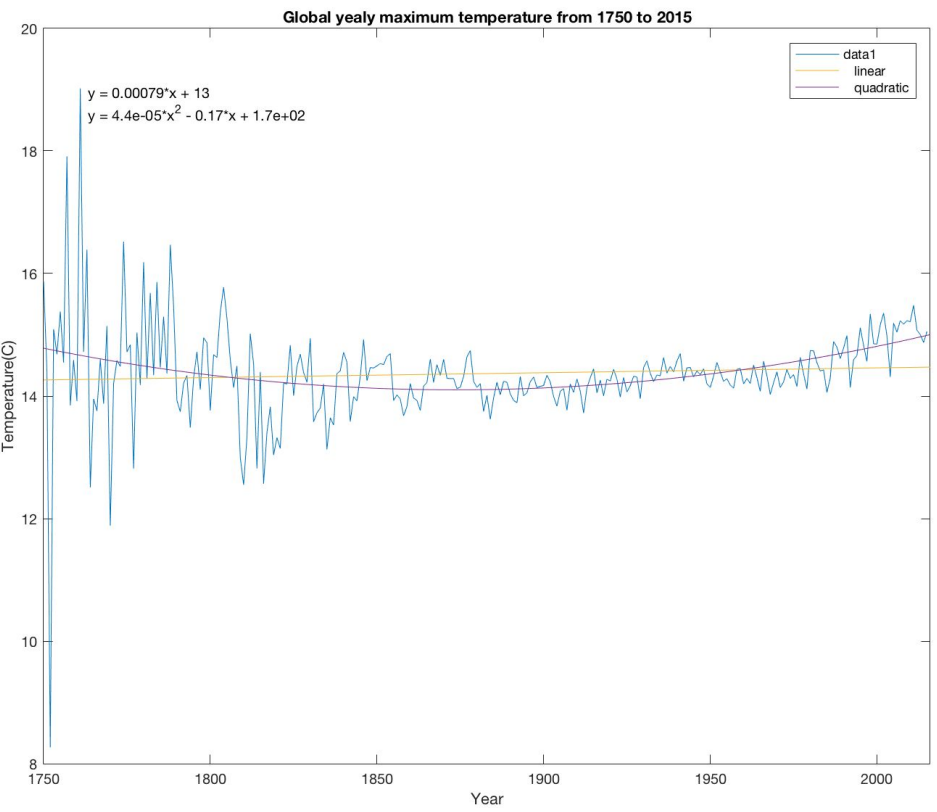

Land Monthly Average Temperature by year
Spring
Summer
Fall
Winter
Temperature(C)
Year
0
2
4
6
8
10
12
14
16
18
1750
1800
1850
1900
1950
2000

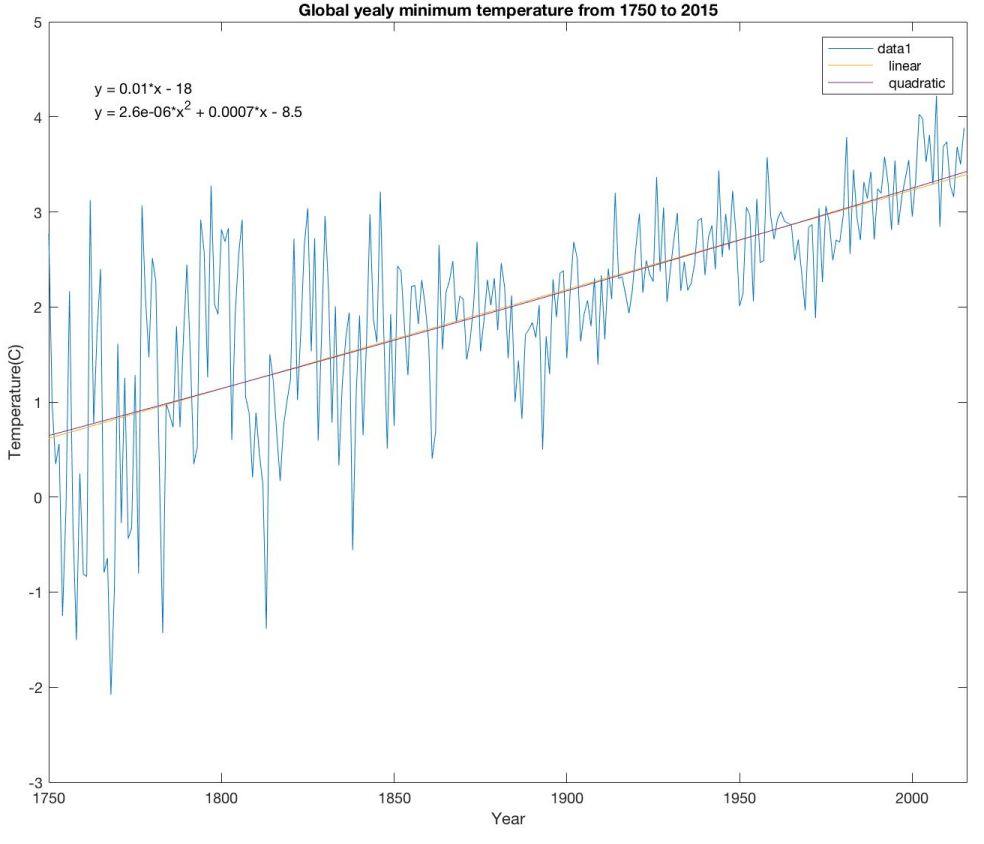

Global yealy temperature from 1750 to 2015
Average Temperature
Min Temperature
Max Temperature
Temperature(C)
Year
-2
0
2
4
6
8
10
12
14
16
18
20
1750
1800
1850
1900
1950
2000


Land Average Temperature by year
Spring
Summer
Fall
Winter
Temperature(C)
18
16
14
12
10
8
6
4
2
0
-2
1750
1800
1850
1900
1950
2000
Year

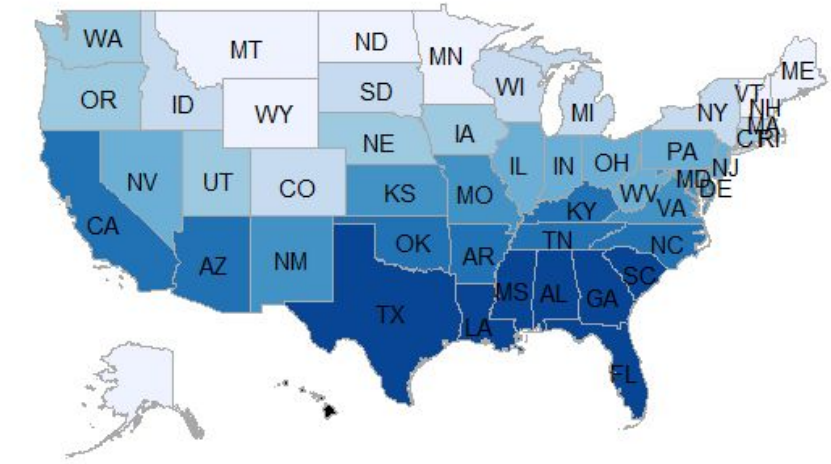

Global yealy average temperature from 1750 to 2015
y = 0.0047*x - 0.54
y = - 2.4e-13*x^6 + 2.7e-09*x^5 - 1.3e-05*x^4 + 0.034*x^3 - 49*x^2 + 3.7e+04*x - 1.2e+07
data1
linear
6th degree
Temperature(C)
Year
residuals


Land and ocean average temperature from 1848 to 2015
y = 4.6e-05*x^2 - 0.17*x + 1.7e+02
y = 1.7e-07*x^3 - 0.00096*x^2 + 1.8*x - 1.1e+03
data1
quadratic
cubic
Temperature(C)
Year
16.2
16
15.8
15.6
15.4
15.2
15
14.8
14.6
1840
1860
1880
1900
1920
1940
1960
1980
2000
2020
residuals
0.4
0.2
0
-0.2
-0.4
-0.6


Global yealy maximum temperature from 1750 to 2015
data1
linear
quadratic
y = 0.00079*x + 13
y = 4.4e-05*x^2 - 0.17*x + 1.7e+02
Temperature(C)
Year
20
18
16
14
12
10
8
1750
1800
1850
1900
1950
2000


Global yealy minimum temperature from 1750 to 2015
data1
linear
quadratic
y = 0.01*x - 18
y = 2.6e-06*x^2 + 0.0007*x - 8.5
Temperature(C)
Year
5
4
3
2
1
0
-1
-2
-3
1750
1800
1850
1900
1950
2000

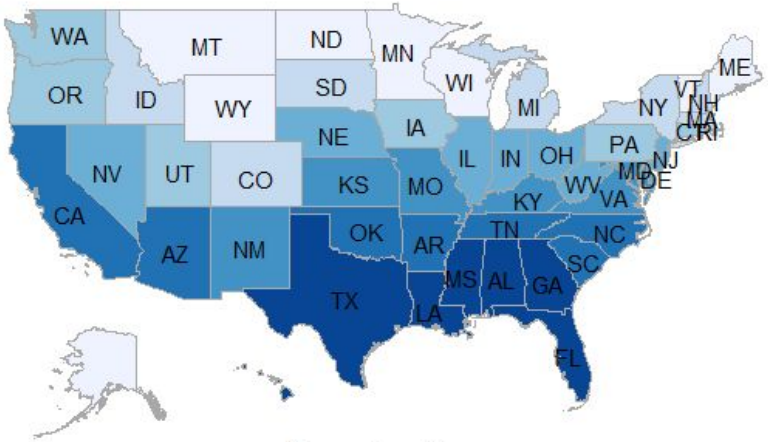
Average Temperatures of United States in 1850



Temperature Range

- [-5.79 to 4.98)
- [4.98 to 7.21)
- [7.21 to 8.88)
- [8.88 to 11.34)
- [11.34 to 13.02)
- [13.02 to 17.09)
- [17.09 to 21.83]

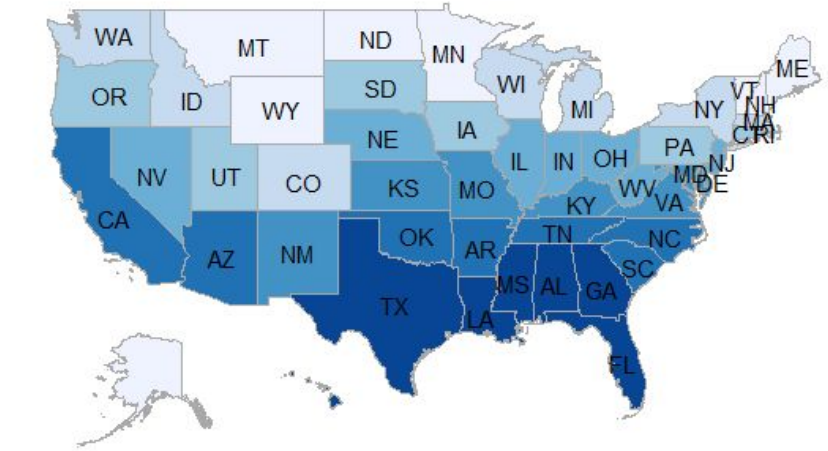
Average Temperatures of United States in 2013



Temperature Range

- [-2.06 to 8.54)
- [8.54 to 10.57)
- [10.57 to 11.81)
- [11.81 to 14.19)
- [14.19 to 15.91)
- [15.91 to 18.96)
- [18.96 to 23.03]

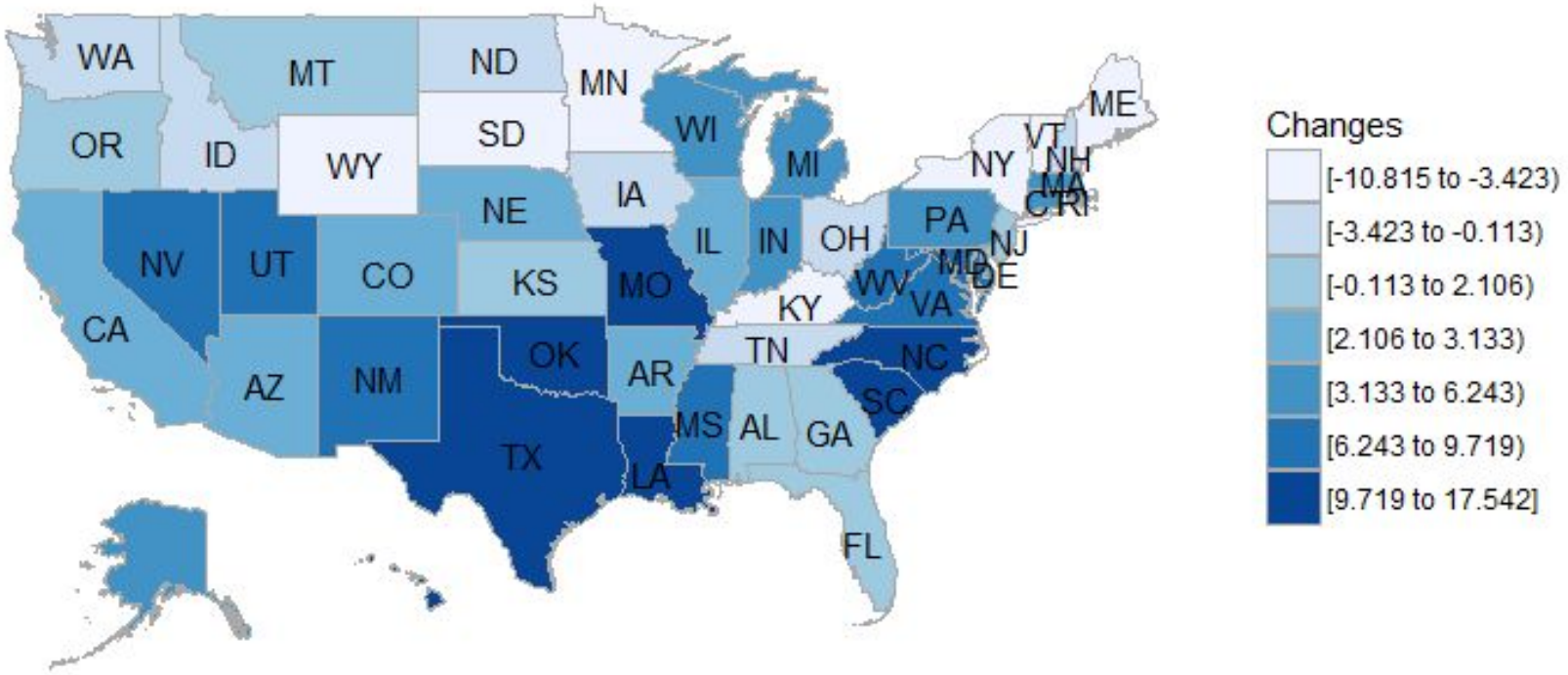
Average Temperatures of United States in 1980



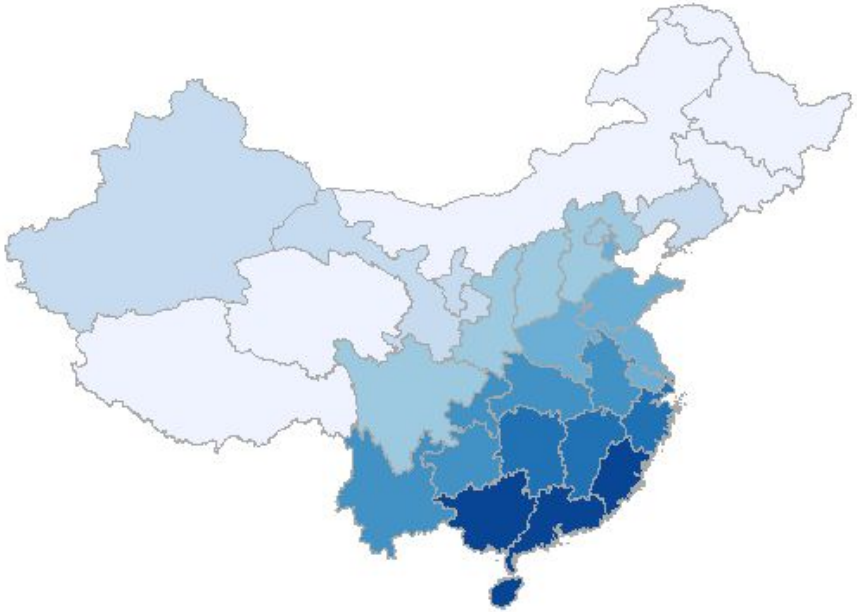
Temperature Range

- [-4.29 to 5.92)
- [5.92 to 8.22)
- [8.22 to 9.99)
- [9.99 to 12.22)
- [12.22 to 14.25)
- [14.25 to 17.29)
- [17.29 to 23.03]

Average Temperature Change of United States from 1949 to 2013

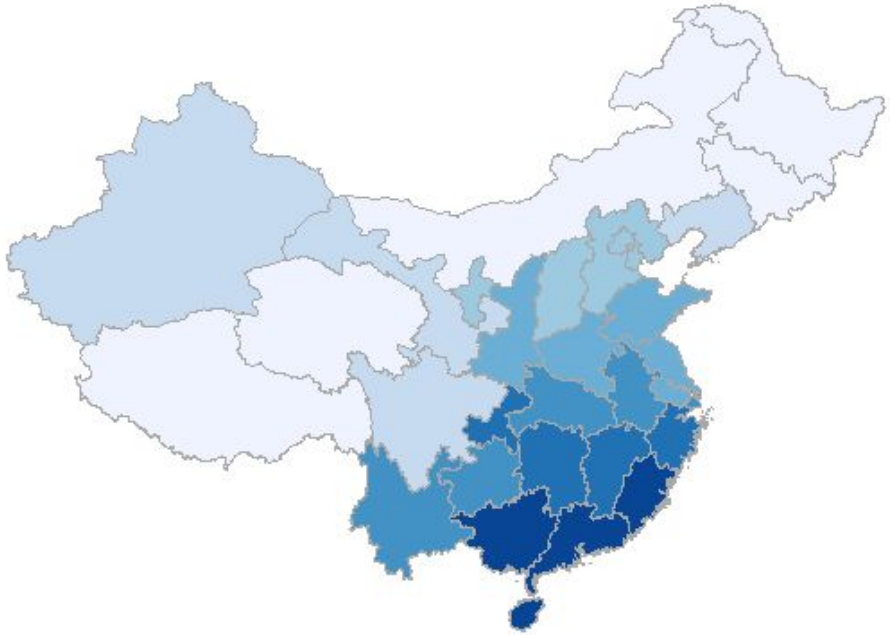


Average Temperatures of China in 1949



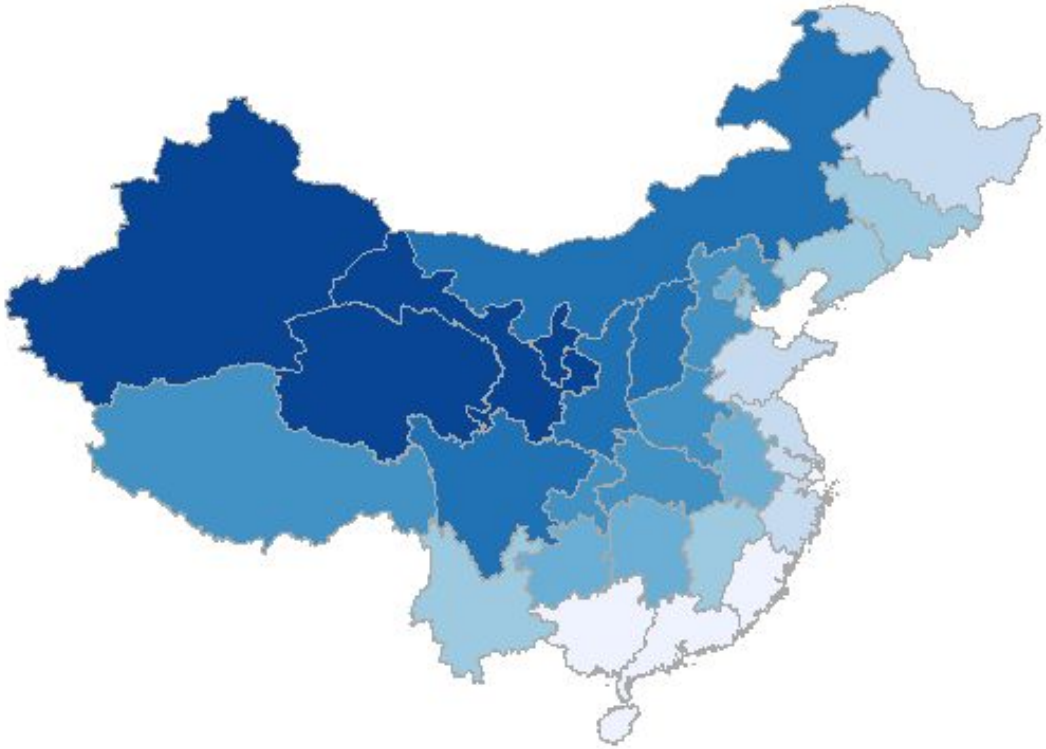
Temperature Range
- [-2.62 to 5.12)
- [5.12 to 8.33)
- [8.33 to 11.96)
- [11.96 to 15.85)
- [15.85 to 16.39)
- [16.39 to 19.18)
- [19.18 to 25.03]

Average Temperatures of China in 2013

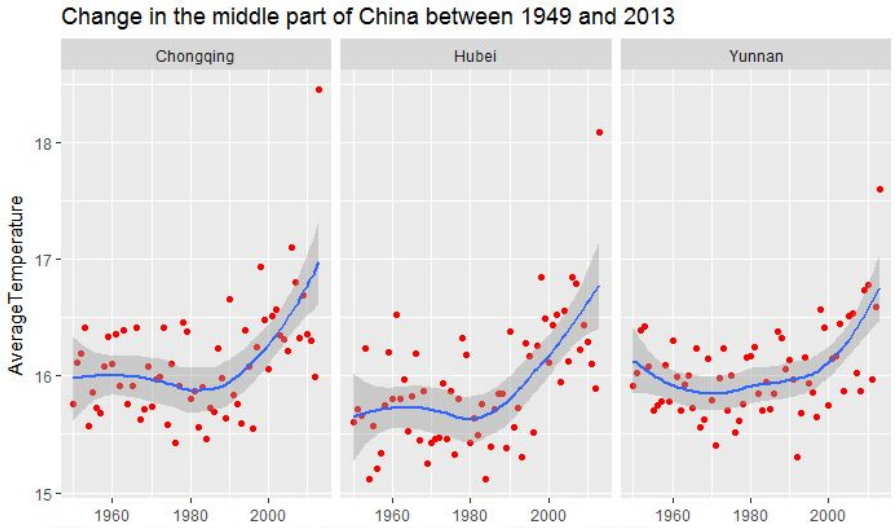


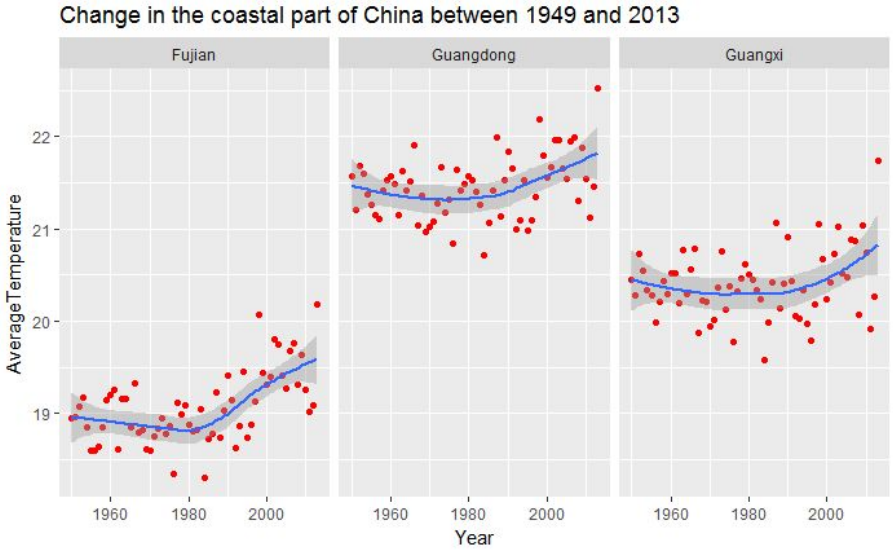
Temperature Range
- [-0.723 to 8.790)
- [8.787 to 11.310)
- [11.31 to 13.66)
- [13.658 to 17.440)
- [17.436 to 18.200)
- [18.20 to 20.18)
- [20.181 to 25.560]

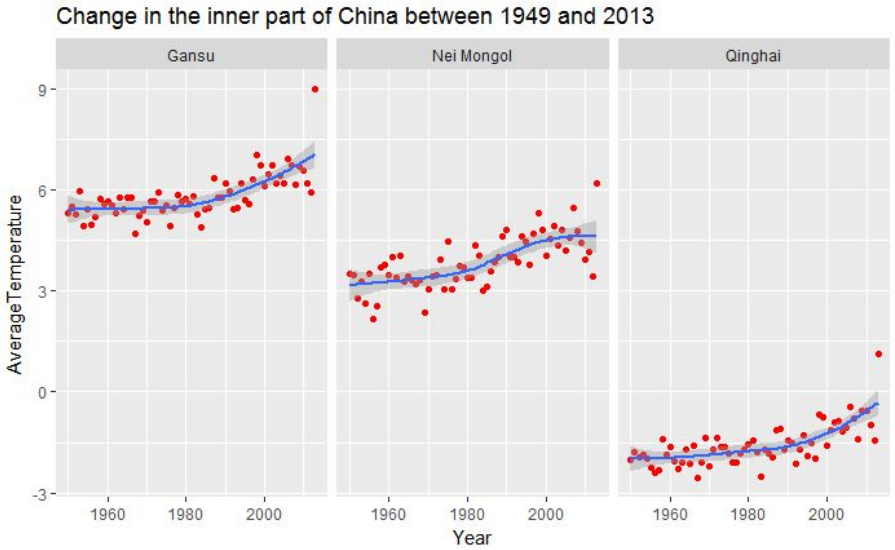
Average Temperature Change of China from 1949 to 2013



The average temperature increase in interior provinces is perceptibly higher than that of the coastal ones



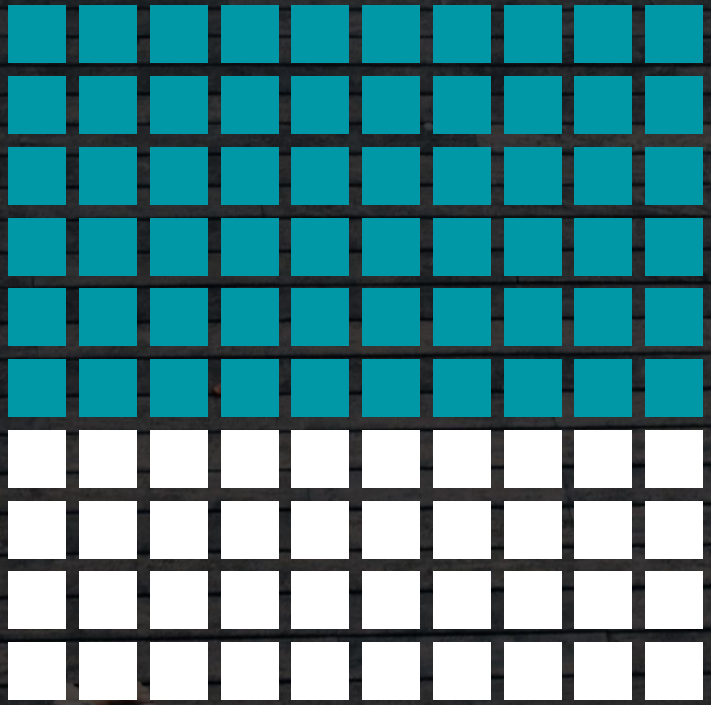




- Continental parts are getting heated at a much higher rate compared to coastal parts.
- The coastal areas have more moderate temperatures than the interiors area around the world because of the heat capacity of water.

Applications

- Countries’ macro control
- Distribution of national resources
- For advertising




Thank You