

Assignment 5 Part 1

Tianying Zhang Shenhao Li Anthea Yichen Li

MA 415

March 18, 2018

- 1 Project Description
- 2 Data Visualization
 - Time Series
 - by Air Temperature
 - by Water Temperature
 - Annual Temperature
- 3 1. Test the Difference Based on Time of the day
 - T-test by Air Temperature
 - T-test by Water Temperature
 - Conclusion
- 4 2. Test the difference from 1988 to 2017
 - T-test by Air Temperature
 - T-test by Water Temperature
 - Conclusion

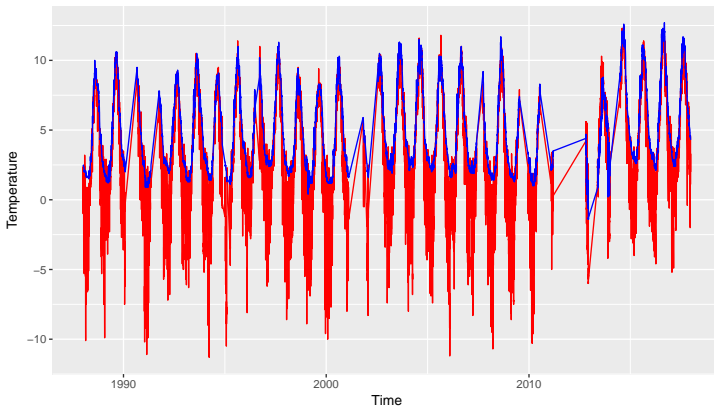
Project Description

In this project, we explore and visualize the using the Sea Temperature and Air Temperature data sourced from NOAA. Through Tidyverse were able to to read, clean, organize, and come up with a conclusion about the temperature change on a daily basis and on a 30 year scope with statistics tests.

Data Visualization

Time Series

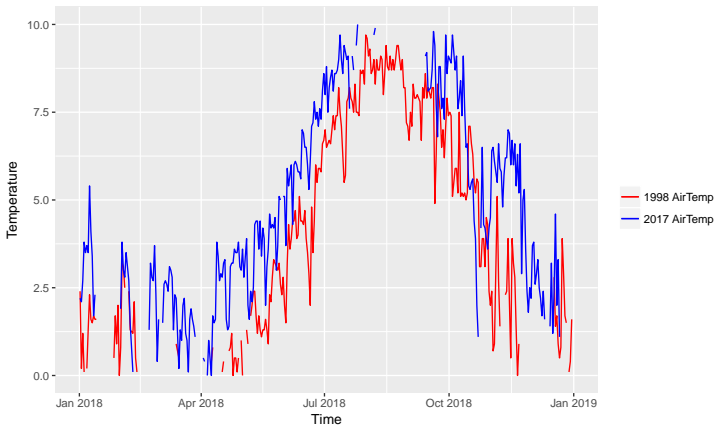
A time series composed of 30 years of daily Air Temperature and Sea Temperature readings recorded at noon



Data Visualization

Air Temperature

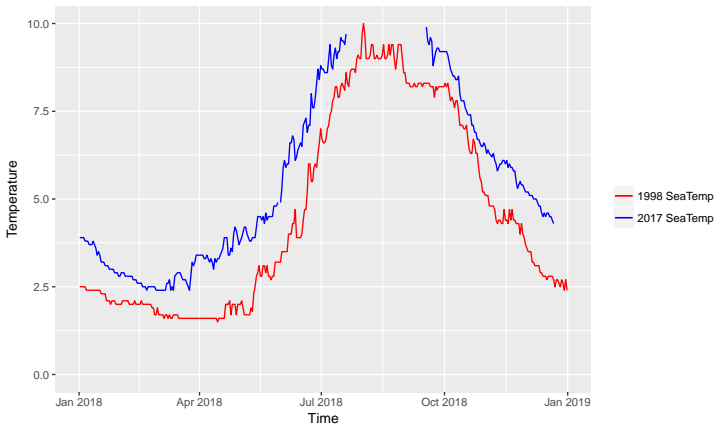
A time series composed of 1998 and 2017 of daily Air Temperature recorded at noon



Data Visualization

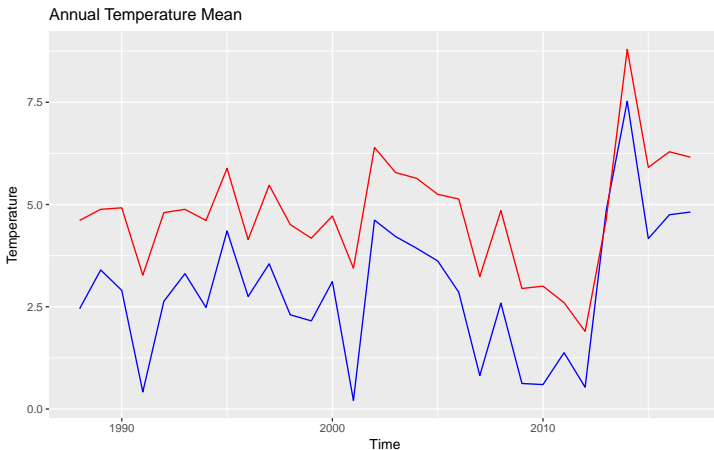
Sea Temperature

A time series composed of 1998 and 2017 of daily Sea Temperature readings recorded at no



Data Visualization

Annual Temperature



Project Part 1

1. Test the Difference Based on Time of the day

1. Test the Difference Based on Time of the day

by Air Temperature

Welch Two Sample t-test

```
data: Total_Daily00$ATMP00 and Total_Daily02$ATMP02
t = 0.18225, df = 20812, p-value = 0.8554
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.1051899  0.1267560
sample estimates:
mean of x mean of y
 3.531226  3.520442
```

- $p > 0.05$, we fail to reject the null hypothesis that air temperature difference is not significant based on time of the day.

1. Test the Difference Based on Time of the day

by Water Temperature

Welch Two Sample t-test

```
data: Total_Daily04$WTMP04 and Total_Daily06$WTMP06
t = 0.6446, df = 20813, p-value = 0.5192
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.05238191  0.10371754
sample estimates:
mean of x mean of y
 4.843020  4.817352
```

- $p > 0.05$, we fail to reject the null hypothesis that sea temperature difference is not significant based on time of the day.

1. Test the Difference Based on Time of the day

Conclusion

- Both the above two t tests have shown that there is no statistical significance in temperature difference based on time of the day.

Project Part 2

2. Test the difference from 1988 to 2017

2. Test the difference from 1988 to 2017

by Air Temperature

Welch Two Sample t-test

```
data: Total_1988VS2017["ATMP1988"] and Total_1988VS2017["ATMP2017"]
t = -7.4843, df = 701.29, p-value = 2.162e-13
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -3.012741 -1.760561
sample estimates:
mean of x mean of y
 2.338997  4.725648
```

- $p\text{-value} = 2.162e-13 < 0.05$, we conclude by rejecting the null hypothesis that in 1988 and 2017 air tmp have the same mean

2. Test the difference from 1988 to 2017

by Water Temperature

Welch Two Sample t-test

```
data: Total_1988VS2017["WTMP1988"] and Total_1988VS2017["WTMP2017"]
t = -7.2687, df = 695.59, p-value = 9.78e-13
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -1.999515 -1.149048
sample estimates:
mean of x mean of y
 4.572981  6.147262
```

- $p\text{-value} = 9.78e-13 > 0.05$, we can reject the null hypothesis that in 1988 and 2017 water tmp have the same mean

2. Test the difference from 1988 to 2017

Final Conclusion

- Both the above t tests using air temperature data and sea temperature data have showed statistical meaningful differences in temperature from 1988 to 2017