

Climate Study for the United States

Team 10

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GitHub: <https://github.com/WFighter909/ECE-143-Group-10>

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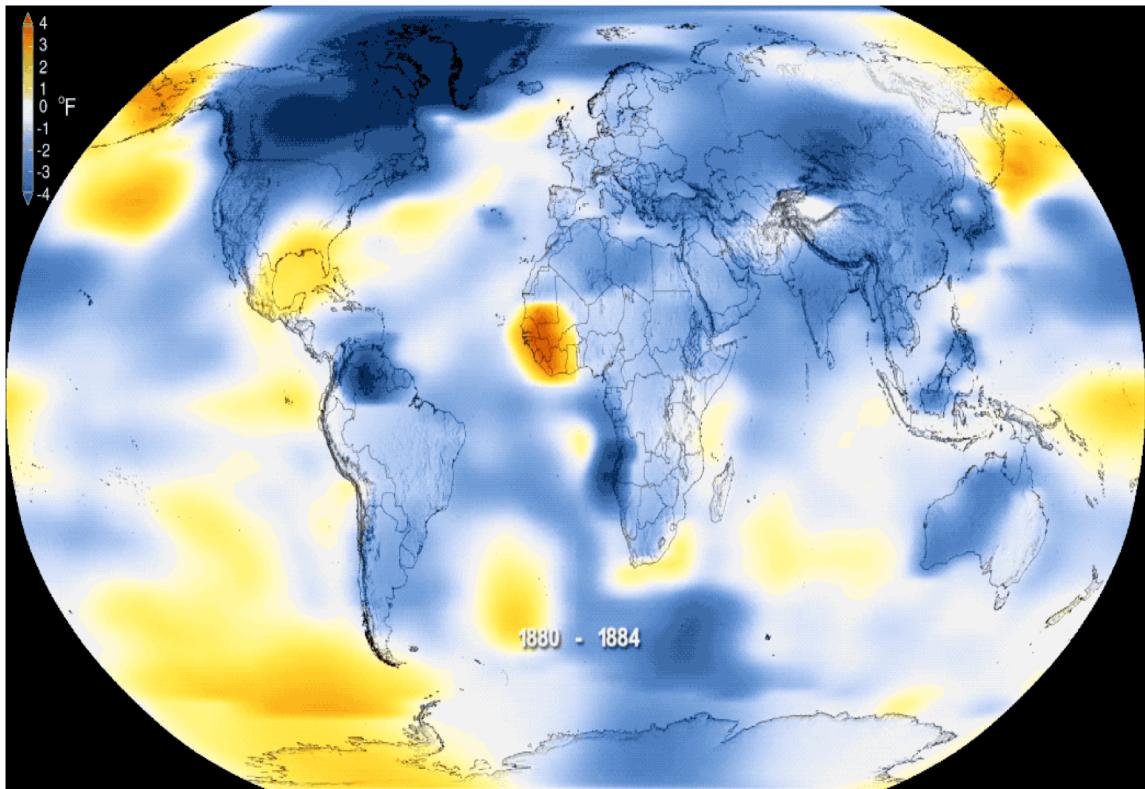
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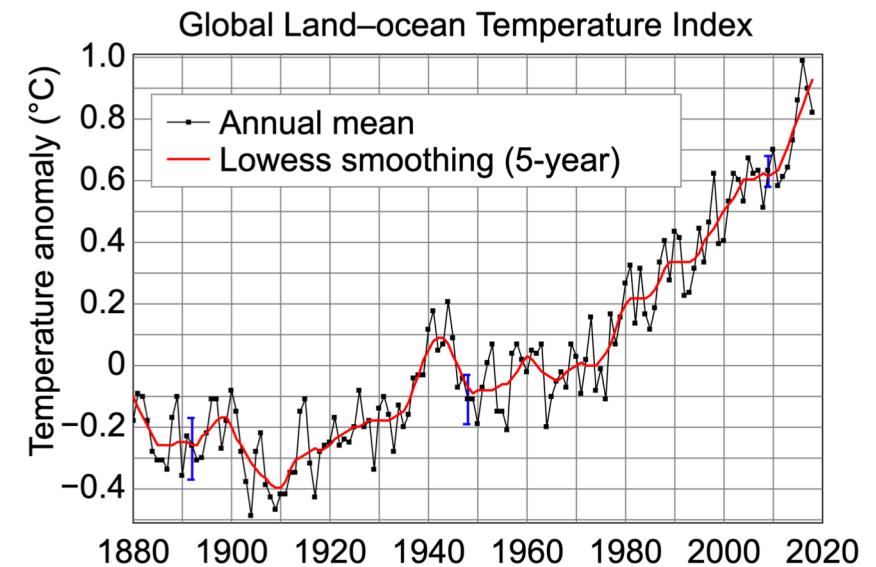
Introduction



Climate Change in Recent Years



<https://climate.nasa.gov/news/2876/new-studies-increase-confidence-in-nasas-measure-ofearths-temperature/>



The Phenomenon of Climate Change:

- **global warming**
- **forest degradation**
- **desertification**

Proposals & Goals

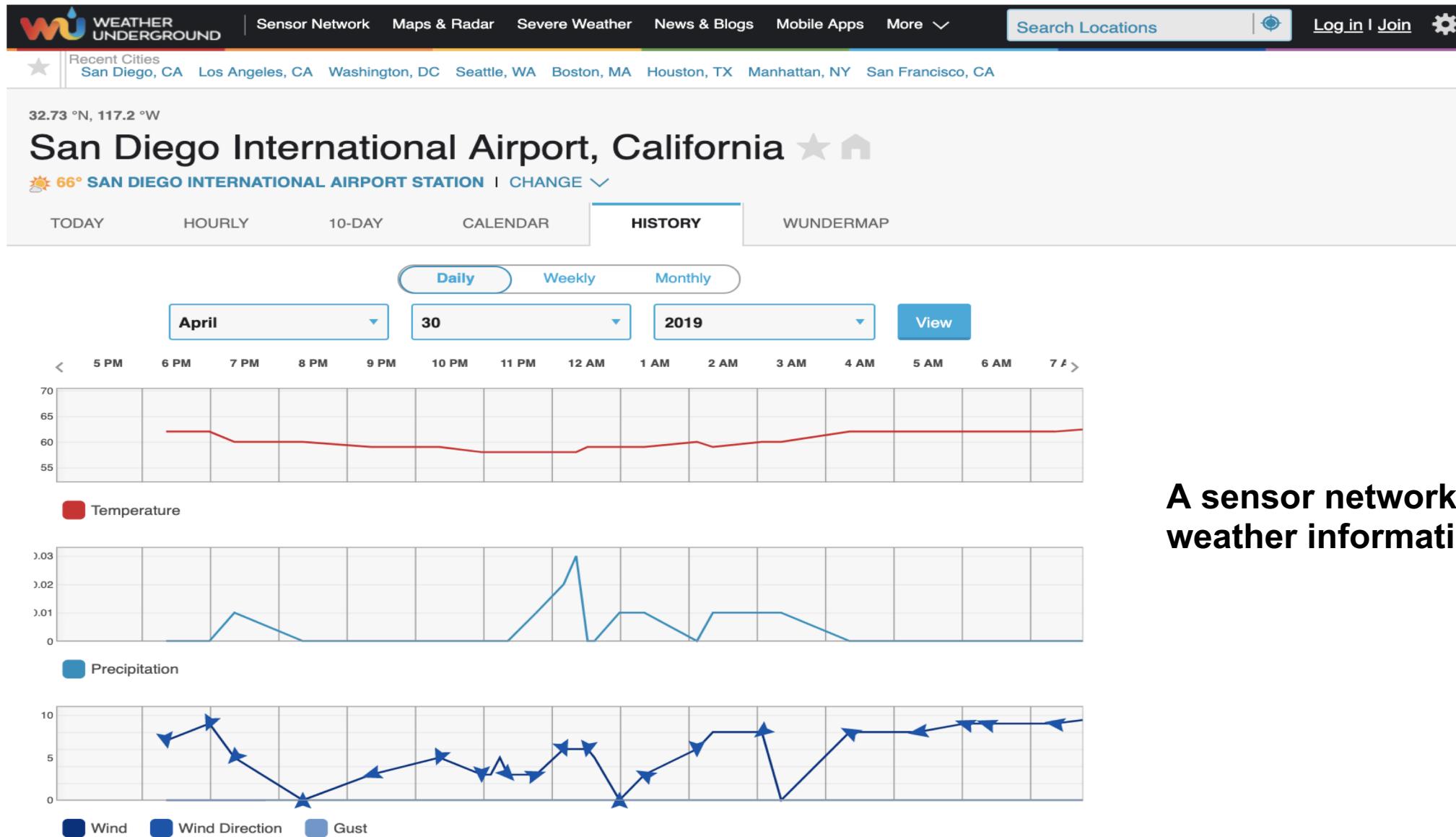
- To explore the trends of climate change in some cities in the United States by visualizing weather data over the past few decades.
- To study the relationship between the geographical position and climatic correlation.



Data Collection and Preprocess

Weather Underground

[link](#)



A sensor network for weather information

Data Summary

Temperature (° F)	Actual	Historic Avg.	Record	▲	Dew Point (° F)	Actual	Historic Avg.	Record	▲
High Temp	65	68	94		Dew Point	54	-	-	
Low Temp	58	58	46		High	57	-	-	
Day Average Temp	62	63	-		Low	50	-	-	
Precipitation (Inches)	Actual	Historic Avg.	Record	▲	Average	54	-	-	
Precipitation	0.07	0.01	0.88		Wind (MPH)	Actual	Historic Avg.	Record	▲
Month to Date	0.16	0.78	-		Max Wind Speed	15	-	-	
Year to Date	7.61	6.84	-		Visibility	10	-	-	
Degree Days (° F)	Actual	Historic Avg.	Record	▲	Sea Level Pressure (Hg)	Actual	Historic Avg.	Record	▲
Heating Degree Days	3	3	-		Sea Level Pressure	30.05	-	-	
HDD Month to Date	33	113	-		Astronomy	Day Length	Rise	Set	▲
HDD Since July 1	781	1149	-		Actual Time	13h 26m	6:04 AM	7:30 PM	
Cooling Degree Days	0	1	-		Civil Twilight		5:37 AM	7:56 PM	
CDD Month to Date	18	14	-		Nautical Twilight		5:06 AM	8:27 PM	
CDD Year to Date	22	24	-		Astronomical Twilight		4:33 AM	9:00 PM	
Growing Degree Days	10	-	-		Moon: waning crescent		4:03 AM	3:43 PM	

Data Selected

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weather icon

Data Cleaning and Missing Data Filling

- missing_values = ["n/a", "na", "--", **None**, 'None']
- use forward-fill to fill the missing values:
`pandas.DataFrame.fillna(method="ffill", inplace=True)`

date	temperature	precip
19900101	54	0
19900102	55	0.42
19900103	53	0
19900104	None	0
19900105	None	None
19900106	None	0
19900107	54	0
19900108	56	0
19900109	60	None
19900110	58	0
19900111	60	0



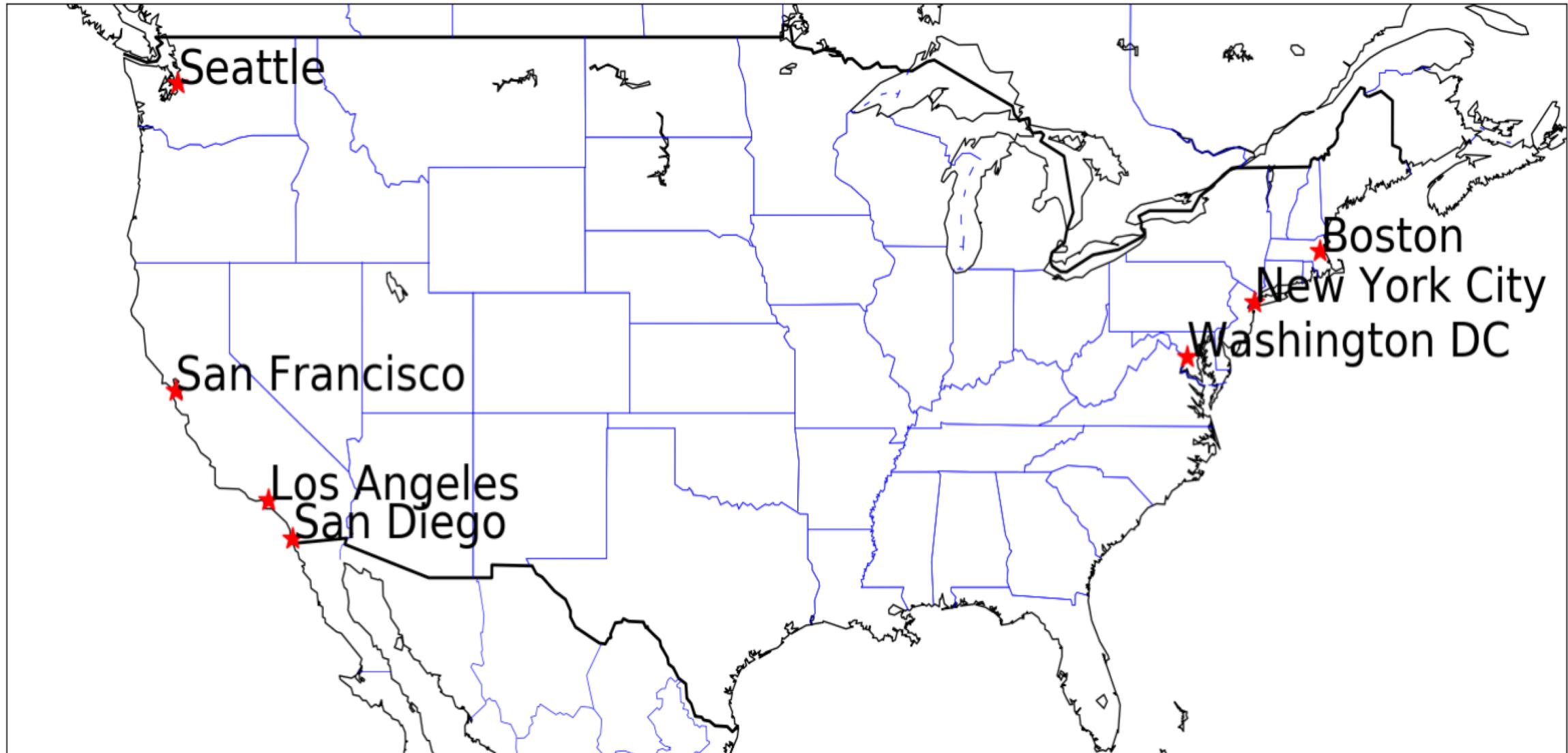
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19900105	53	0
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19900107	54	0
19900108	56	0
19900109	60	0
19900110	58	0
19900111	60	0



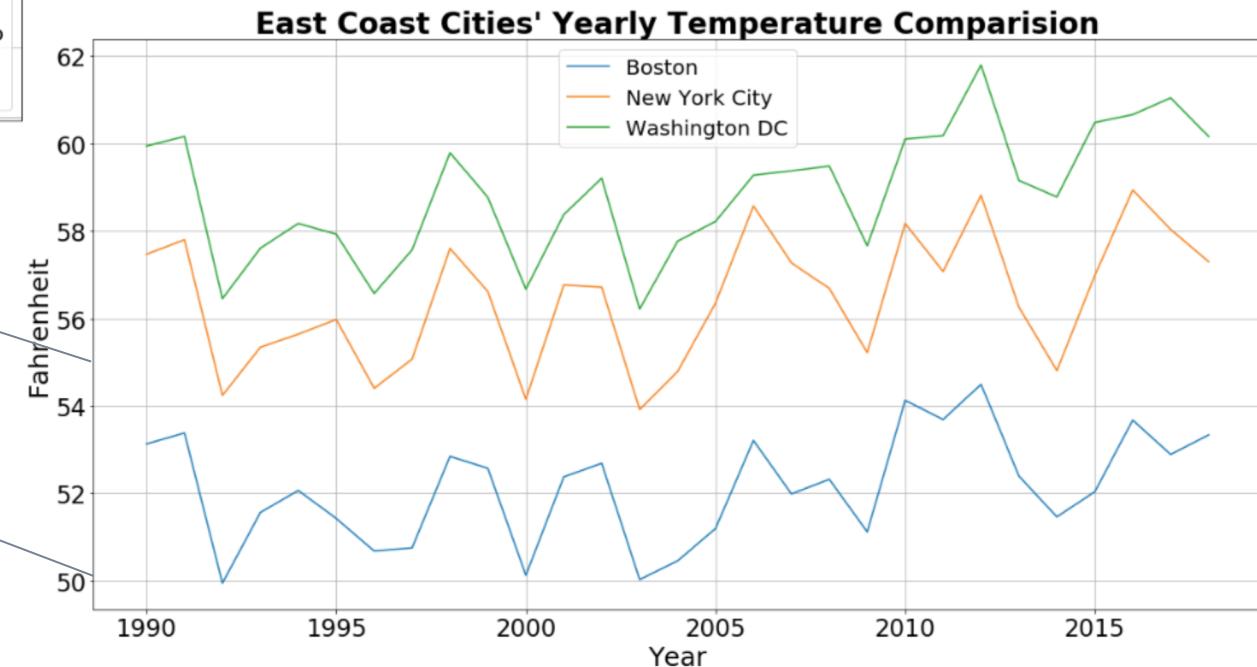
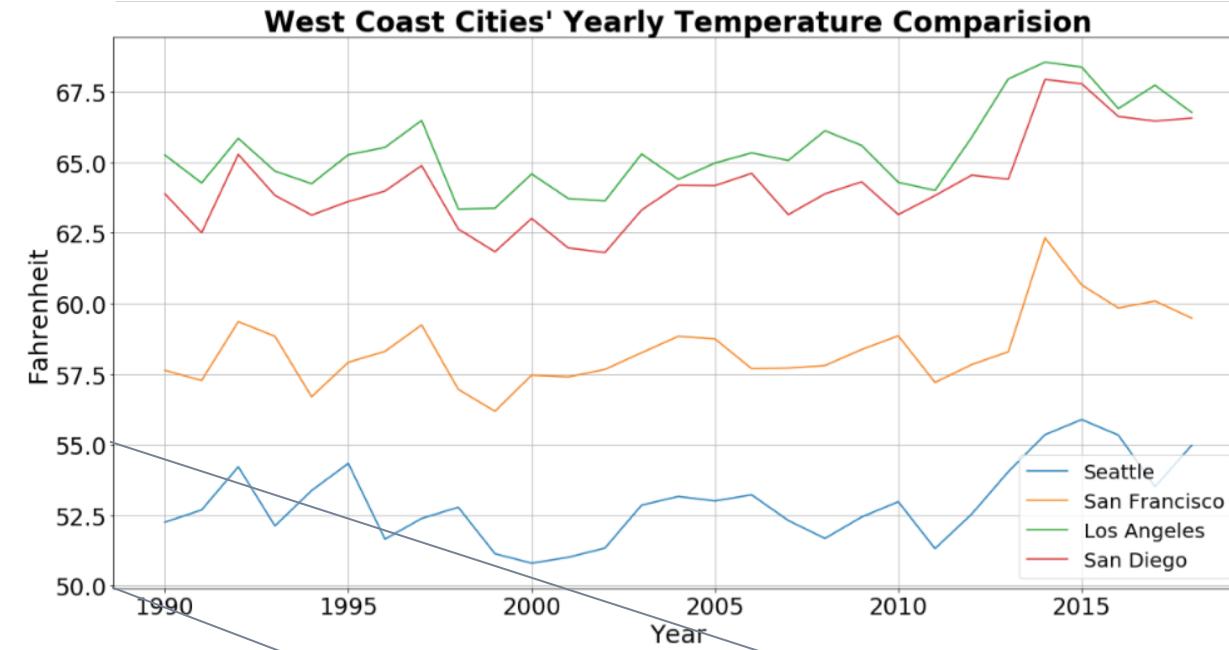
Comparison between West and East Coast

The Distribution of Selected Cities

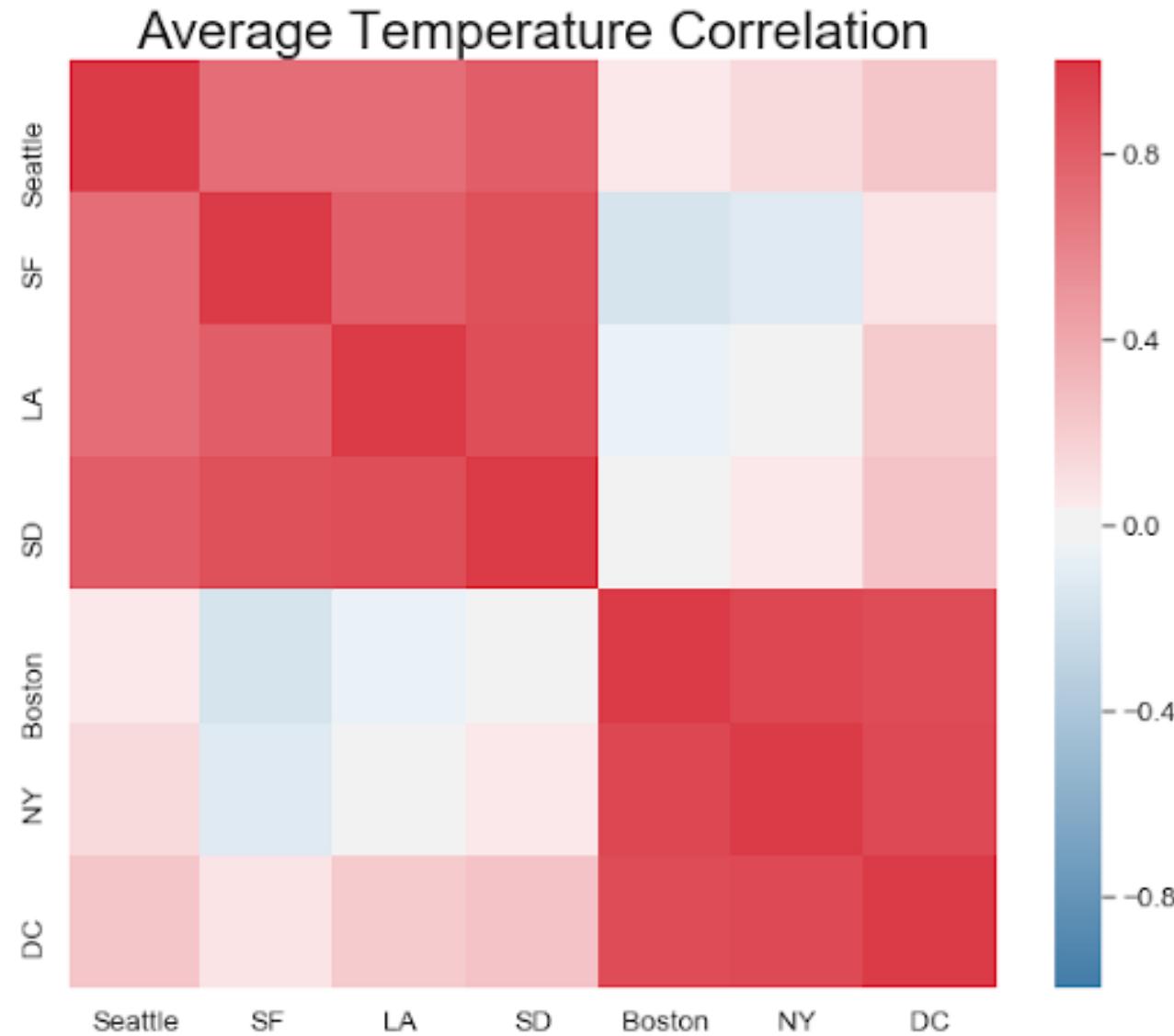
[city code reference](#)



Average Temperature Comparison -- Year wise



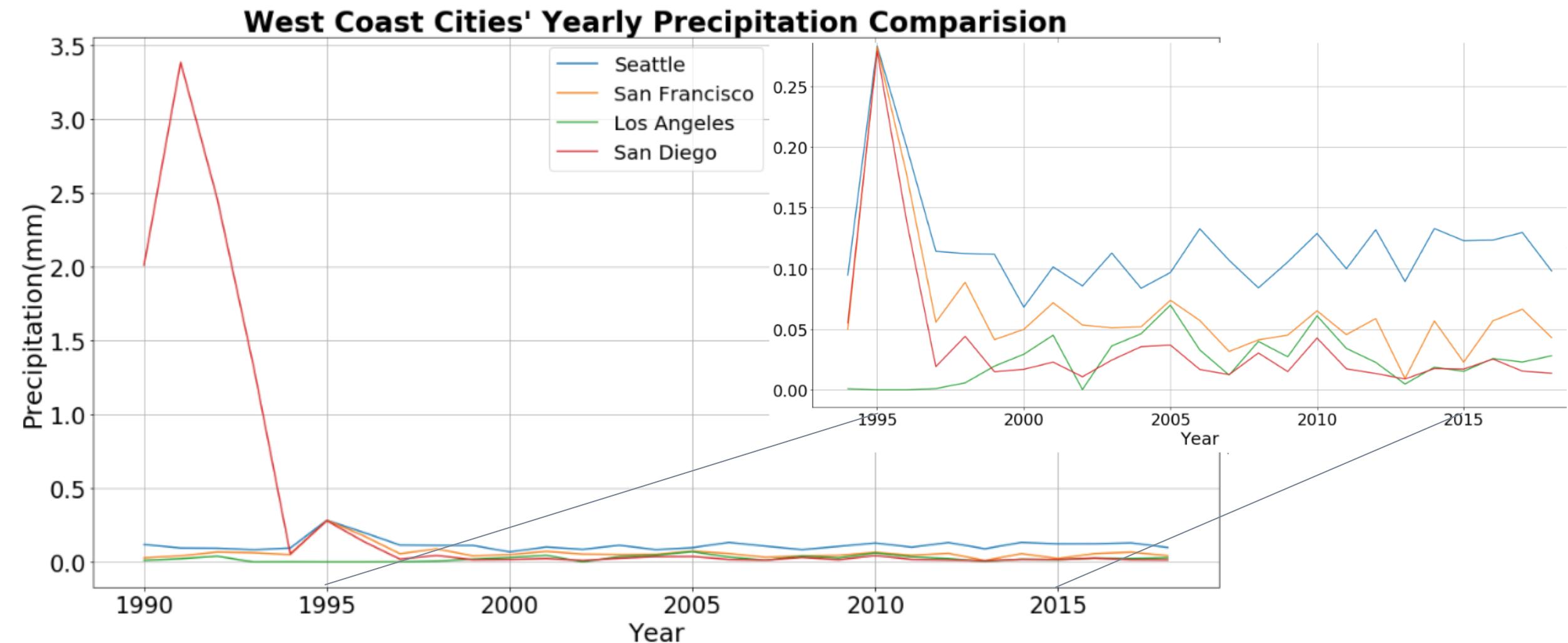
Average Temperature Correlation



Summary

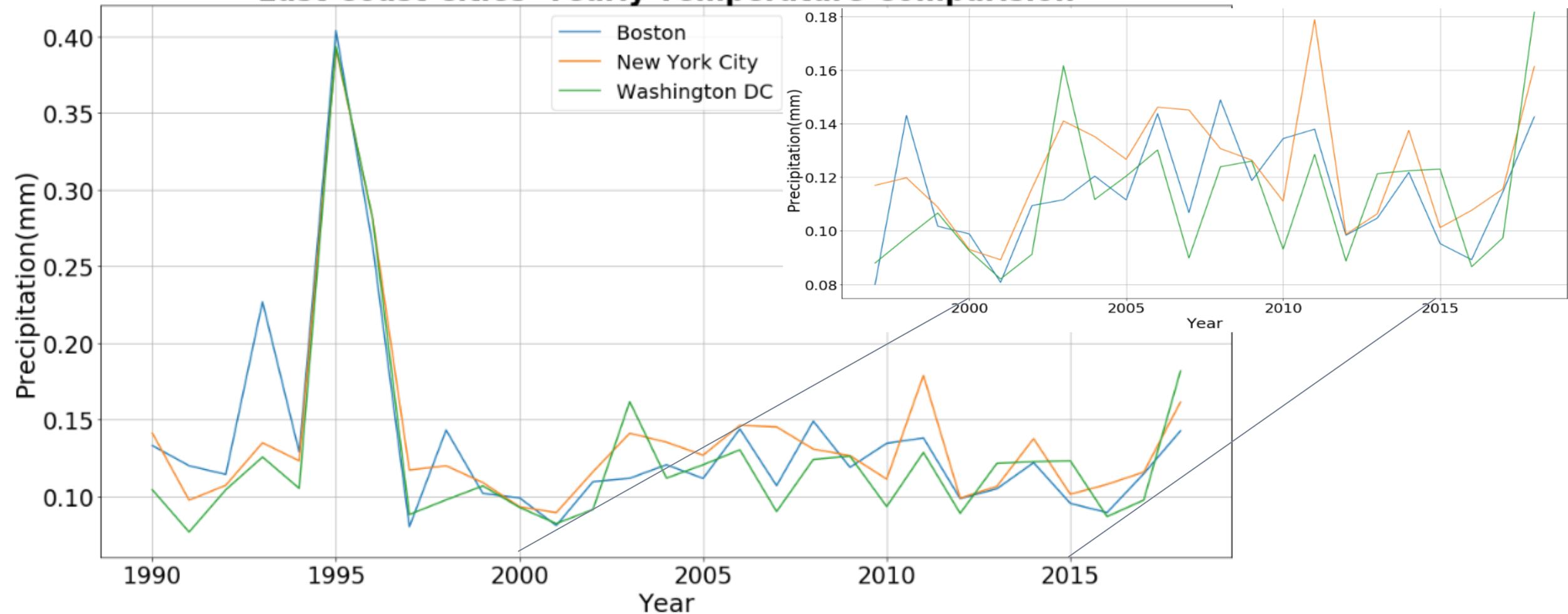
- The average temperature of the cities shows good correlation w.r.t their longitude.
- As we move North, the average temperature decreases
- Temperatures in all cities show an overall slightly upward trend.

Average Precipitation Comparison -- Year wise (West Coast)



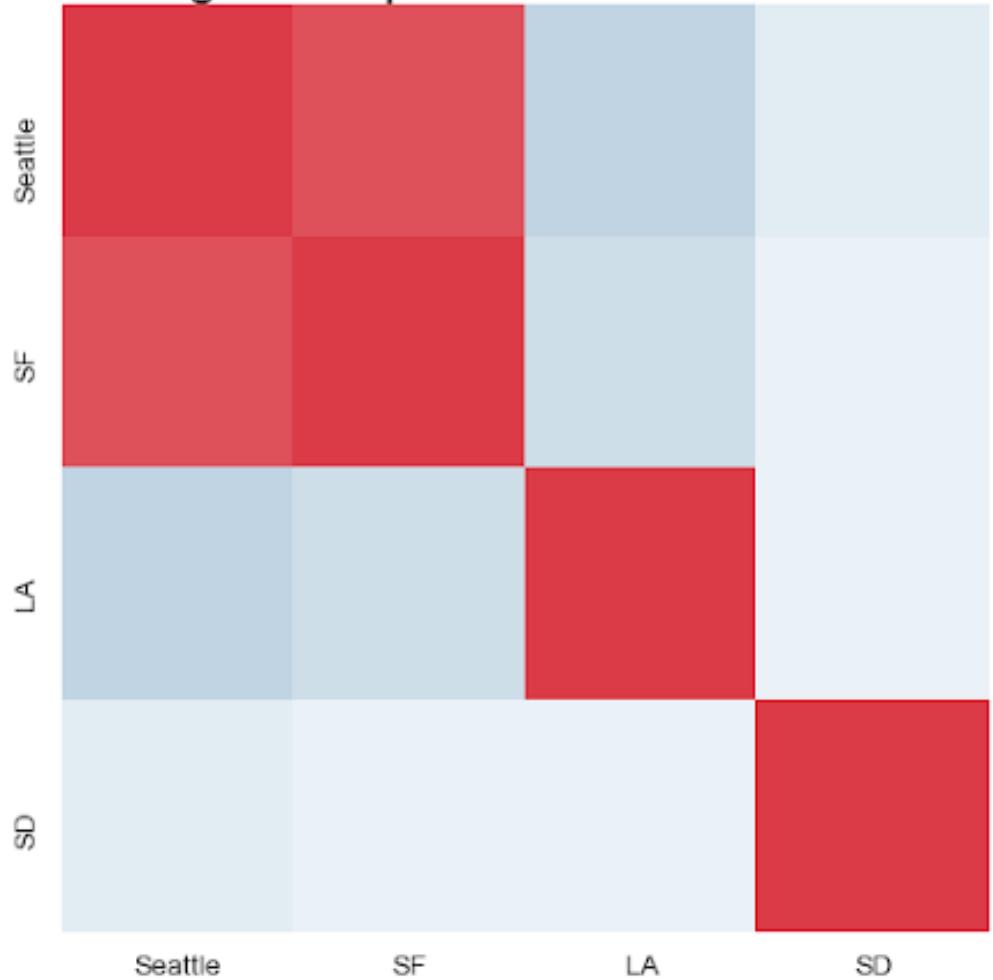
Average Precipitation Comparison -- Year wise (East Coast)

East Coast Cities' Yearly Temperature Comparision

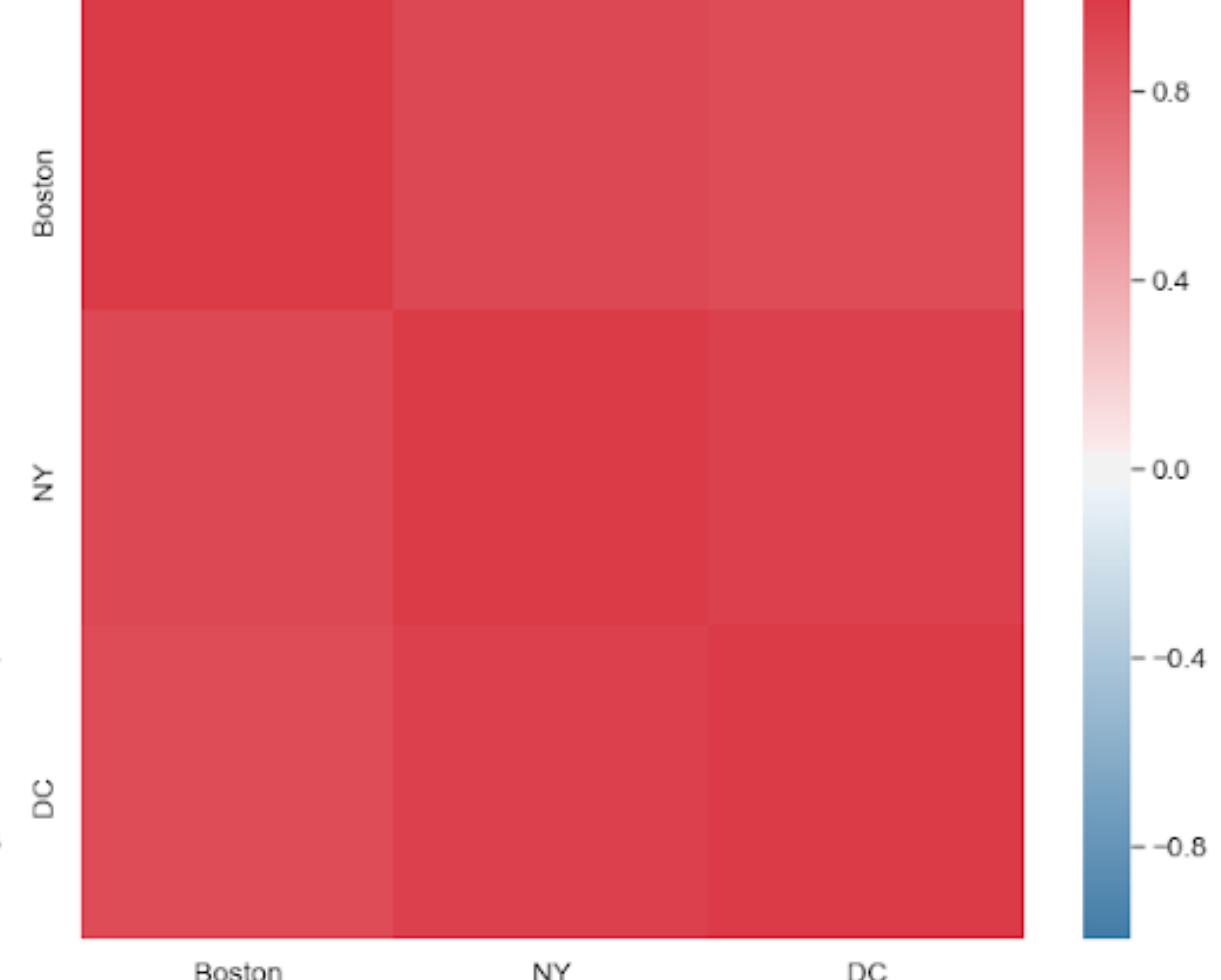


Average Precipitation Correlation

Average Precipitation Correlation - West



Average Precipitation Correlation - East



Summary

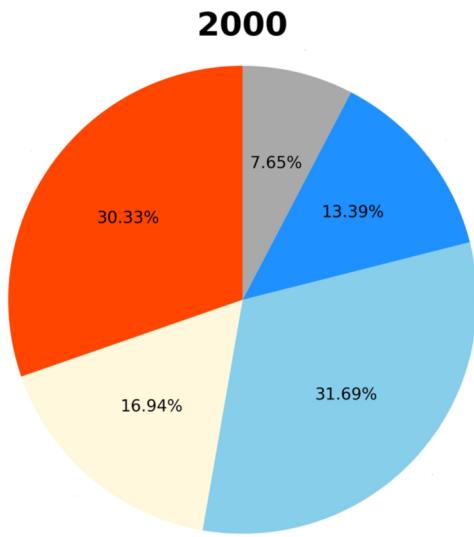
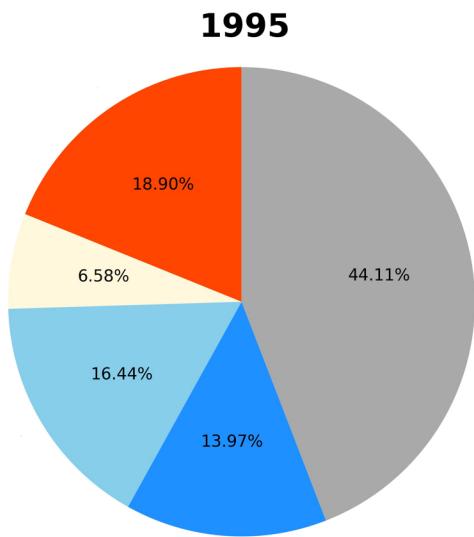
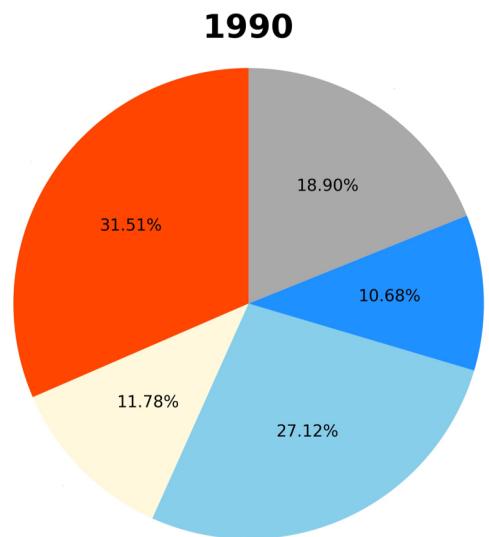
- Urban precipitation on the West Coast is relatively small and stable, except for San Diego's data in 1991.
- East coastal cities have more precipitation than west coastal cities. But latitude changes have little effect on changes in precipitation.



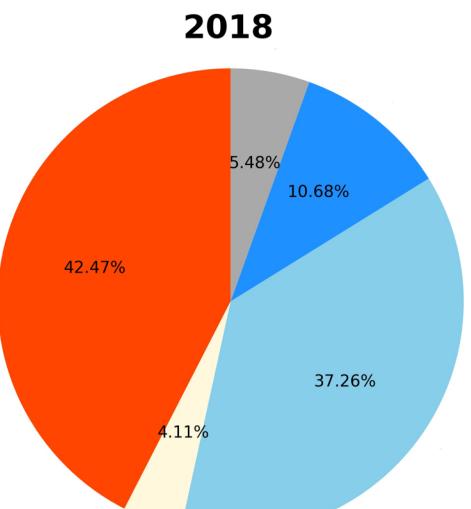
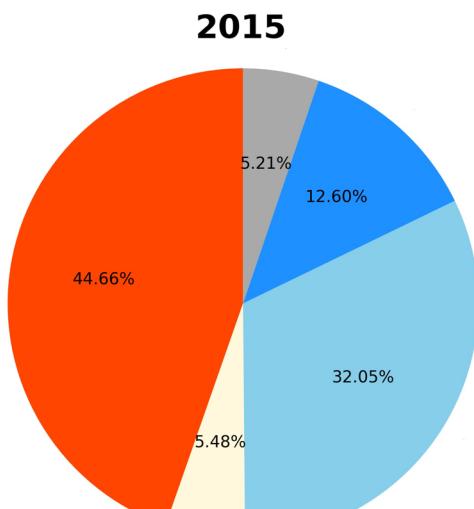
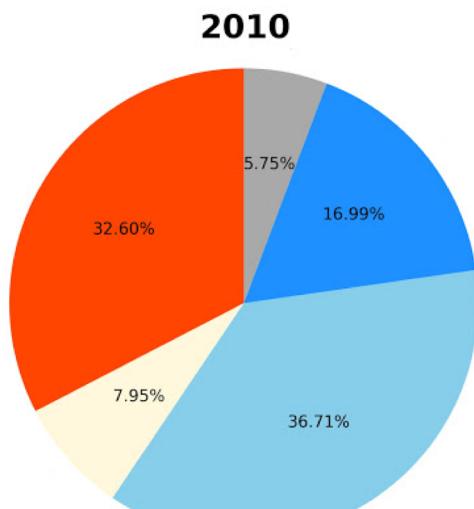
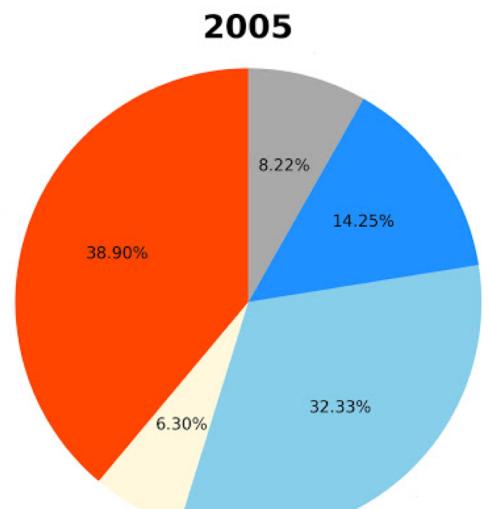
Data Visualization for San Diego



Weather of San Diego (1990 - 2018)



Weather Type	Color
sunny	Orange
clear	Yellow
cloudy	Light Blue
rain	Blue
disaster	Grey



Weather of San Diego (1990 - 2018)

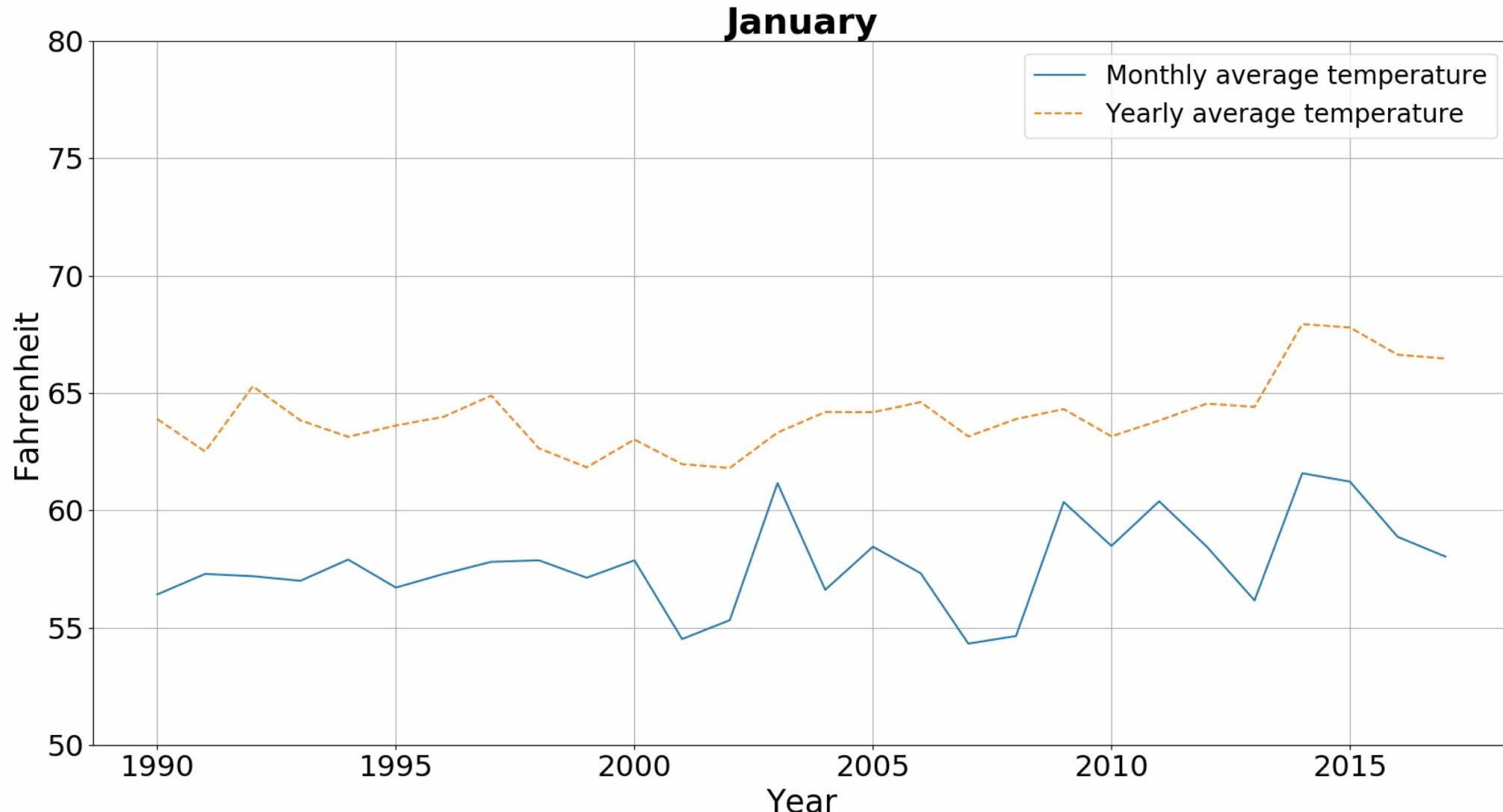
1990



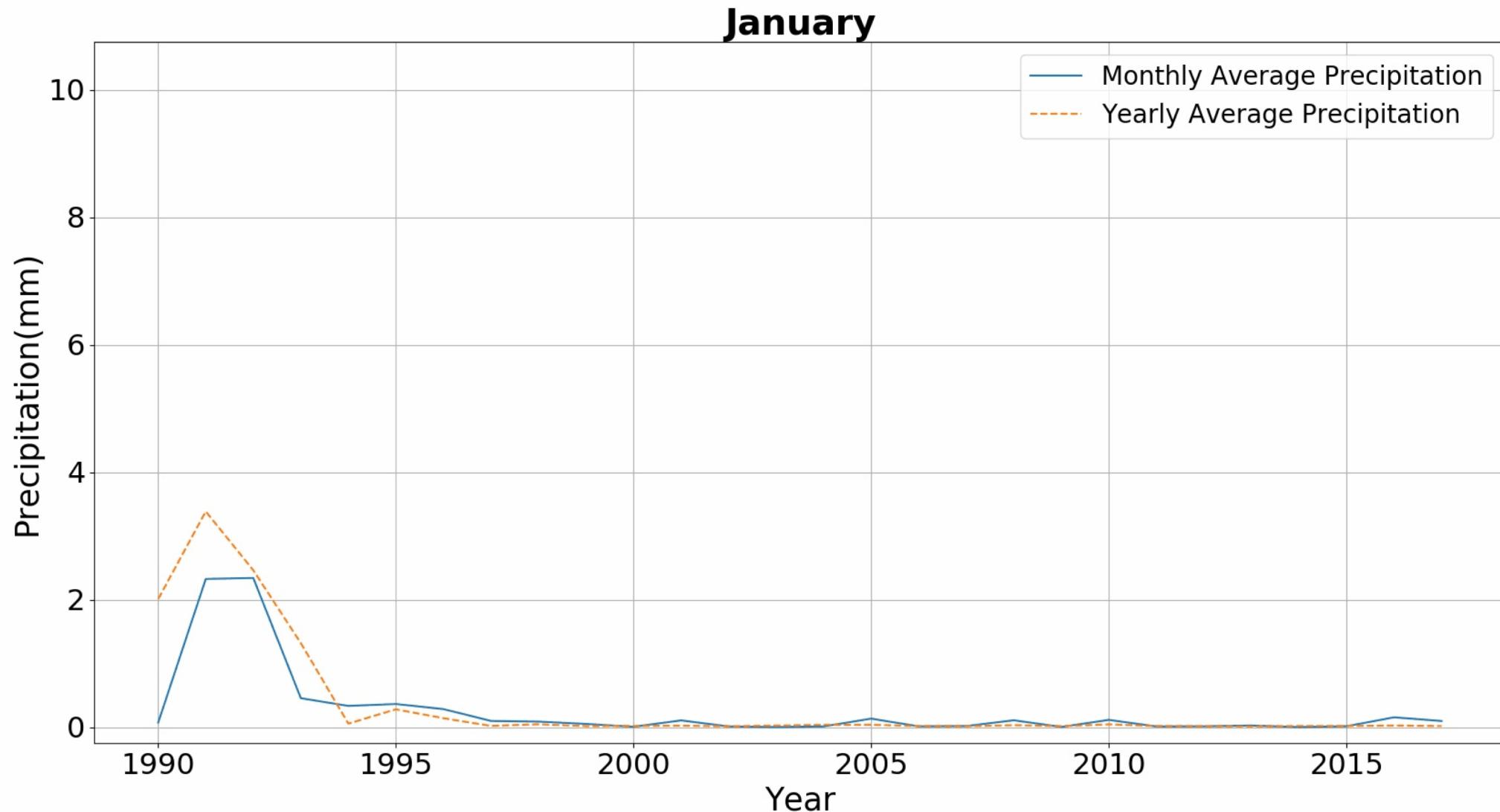
- The proportion of rainy days in San Diego is basically the same.
- San Diego experienced severe disaster weather around 1995, but it has improved through the years.



Average Temperature of San Diego (1990 - 2018)



Average Precipitation in San Diego (1990 - 2018)



Summary

- The average temperature per month in San Diego has fluctuated over the years but has shown a slight upward trend overall.
- The overall precipitation in San Diego is relatively small, mostly in the autumn and winter seasons.
- Overall, San Diego is a city with moderate temperatures, mostly sunny days and less precipitation. But still receiving the impact of global climate change, the temperature has risen.



Evaluations and Applications



Evaluations and Applications

Demo

- **Since we don't have an access to the comprehensive weather data for a longer duration of time, we are not able to make any comment on climate change in general.**
- **After evaluation, this project can be used to get an overall picture of the weather conditions of a city, just by plugging in the city code.**

Future Works

- **Comprehensive Evaluation:** Increase the number of cities inspected to find the more general trends and conclusions
- **Bigger Dataset:** Add the data of years before 1990 to study real - climate change
- **Data Compensation:** Optimize the way in which missing data is compensated
- **Outlier handling:** Add processing mechanism for exception data

A large, abstract graphic on the left side of the slide features several overlapping, curved bands of teal and green on the left, transitioning into thin, light gray wavy lines on the right.

Thanks!

Appendix - City Code Reference

City Name	City Code	Address
San Diego	KSAN	San Diego International Airport, California
San Francisco	KSFO	San Francisco International Airport, California
New York City	KLGA	LaGuardia Airport, New York
Boston	KBOS	Gen. Edward Lawrence Logan International Airport, Massachusetts
Seattle	KSEA	Seattle-Tacoma International Airport, Washington
Washington DC	KDCA	Ronald Reagan Washington National Airport, Virginia
Los Angeles	KBUR	Bob Hope Airport, California