Shift in Weather Pattern across US

We are tasked with identifying regions in US with the largest shifts in the weather pattern in recent times

The Earth's climate is undoubtely changing. Temperatures are on the rise, similarly, snow and rainfall patterns are shifting, and much more extreme climate events – like heavy rainstorms and record high temperatures – have been witnessed on a much regular basis.

My efforts here are to identify the effects of these changes across regions in USA

In order to put together my analysis, I will be analyzing various dataset and will focus on:

1. Overall change in temperatures over time in United States
2. Hot and Cold Weather changes in specific areas
3. States with highest effect of hurricanes
4. Wild Fires in California State

Historical Climate Change: 1950 to 2013

In this spirit, I used data from various sources to help me see the differences in climate over time.

My first dataset is taken from a kaggle competition:
https://www.kaggle.com/berkeleyearth/climate-change-earth-surface-temperature-data

The specific dataset that I will utilize this data to begin my initial analysis is: Global Average Land Temperature by State

	dt	AverageTemperature	AverageTemperatureUncer…	State	Country
0	1855-05-01	25.5440	1.1710	Acre	Brazil
1	1855-06-01	24.2280	1.1030	Acre	Brazil
2	1855-07-01	24.3710	1.0440	Acre	Brazil
3	1855-08-01	25.4270	1.0730	Acre	Brazil
4	1855-09-01	25.6750	1.0140	Acre	Brazil
5	1855-10-01	25.4420	1.1790	Acre	Brazil
6	1855-11-01	25.4000	1.0640	Acre	Brazil
7	1855-12-01	24.1000	1.7180	Acre	Brazil
8	1856-01-01	25.8140	1.1590	Acre	Brazil
9	1856-02-01	24.6580	1.1470	Acre	Brazil
10	1856-03-01	24.6590	1.5470	Acre	Brazil

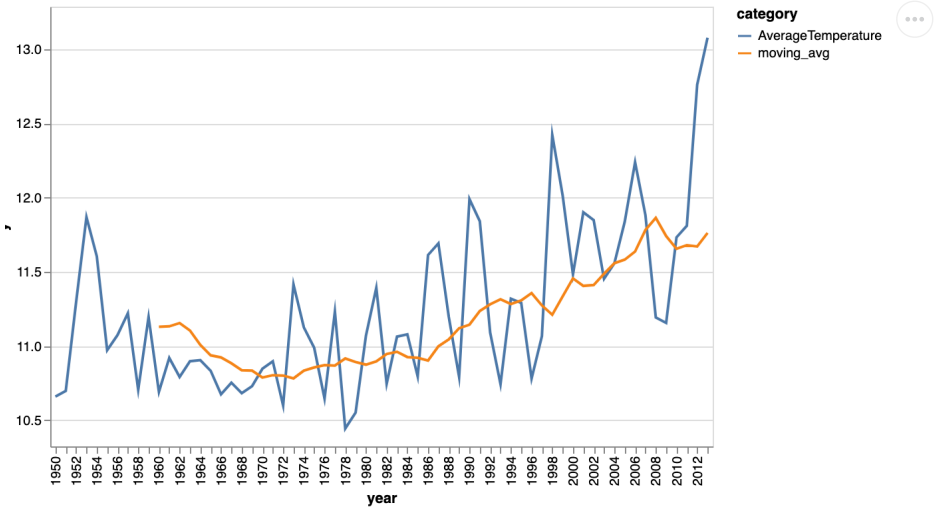
Since this data is from across the world, I will only limit it to United States, this data is in Celcicus

In the interest of more recent data, I will limit my data to 1950 and beyond

	dt	AverageTemperature	AverageTemperatureUnce…	State	Cou
9932	1950-01-01	14.9960	0.1620	Alabama	United S
9933	1950-02-01	11.9220	0.1340	Alabama	United S
9934	1950-03-01	11.5010	0.1960	Alabama	United S
9935	1950-04-01	15.0560	0.1960	Alabama	United S
9936	1950-05-01	23.1160	0.2560	Alabama	United S
9937	1950-06-01	25.3720	0.1790	Alabama	United S
9938	1950-07-01	25.4050	0.2280	Alabama	United S
9939	1950-08-01	25.1200	0.2170	Alabama	United S
9940	1950-09-01	22.3980	0.1900	Alabama	United S
	1950-10-01	18.9660	0.1280	Alabama	United S

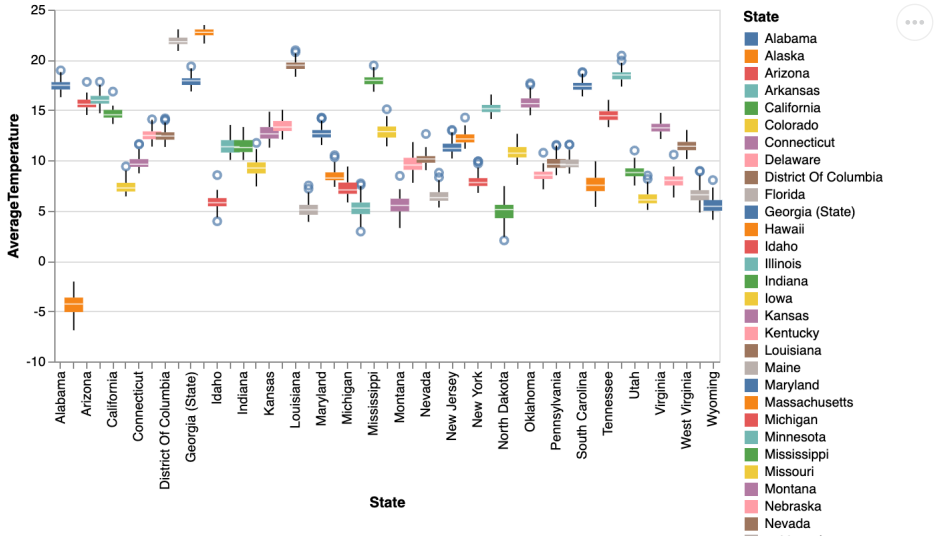
9941

Now that we have our data, we can utilize it to make various plots, one of them can be the average temperature each year,followed by a moving average(I calculated a 10 year moving average)



We can immediately see an upward trend of temperature, even compared to the moving Average and from 1950 average the temperature is almost 3 Degrees higher!!

Since this data is at State level, we can drill down to the change in temperatures across each state

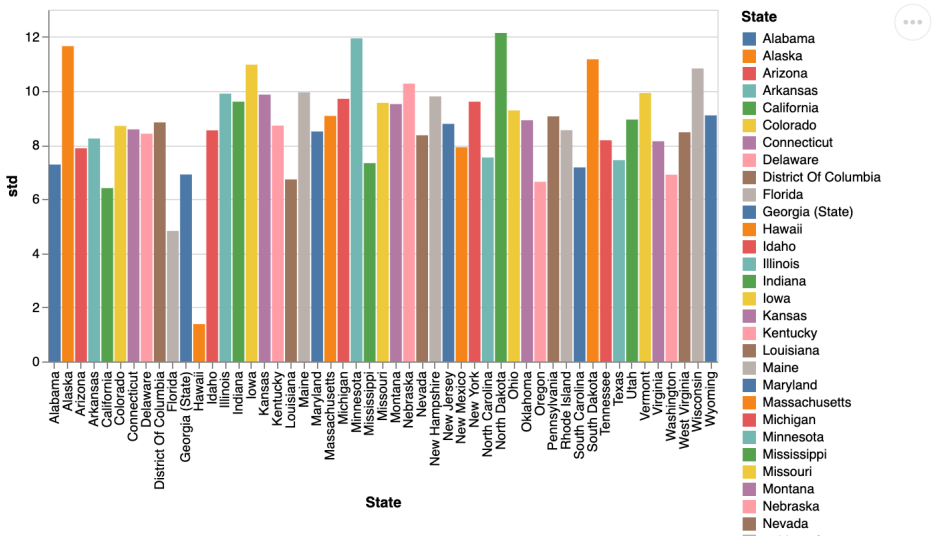


An interesting observation here is the outliers observed in states which have been cold primarily, for e.g. Minnesota, Idaho, Alaska and North Dakota

	State	std
34	North Dakota	12.1391
23	Minnesota	11.9400
1	Alaska	11.6519
41	South Dakota	11.1652
15	Iowa	10.9677
49	Wisconsin	10.8279
27	Nebraska	10.2664
19	Maine	9.9426
45	Vermont	9.9193
13	Illinois	9.8965
16	Kansas	9.8609

The table above and the chart below both explain the change in temperature changes, confirming

about North Dakota and Alaska, interestingly, Hawaii has the least fluctuations in temperature



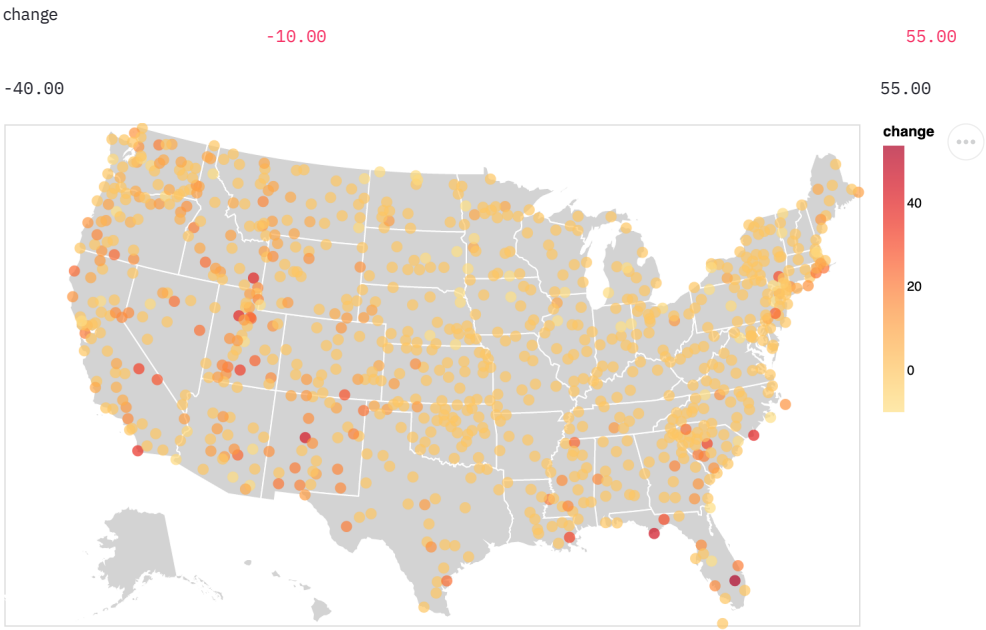
Changes in Highs and Lows acorss US: 1948-2015

To further deepen our analysis, I will introduce two new datasets taken from the webiste: https://www.epa.gov/climate-indicators/climate-change-indicators-high-and-low-temperatures

We can analyse pattern for hot and cold days here.

The trends show unusually hot temperatures at individual weather stations that have operated consistently since 1948. In this case, the term “unusually hot” refers to a daily maximum temperature that is hotter than the 95th percentile temperature during the 1948–2015 period. Thus, the maximum temperature on a particular day at a particular station would be considered “unusually hot” if it falls within the warmest 5 percent of measurements at that station during the 1948–2015 period. The map shows changes in the total number of days per year that were hotter than the 95th percentile. Red color show where these unusually hot days are becoming more common. A lighter shade indicates show where unusually hot days are becoming less common.

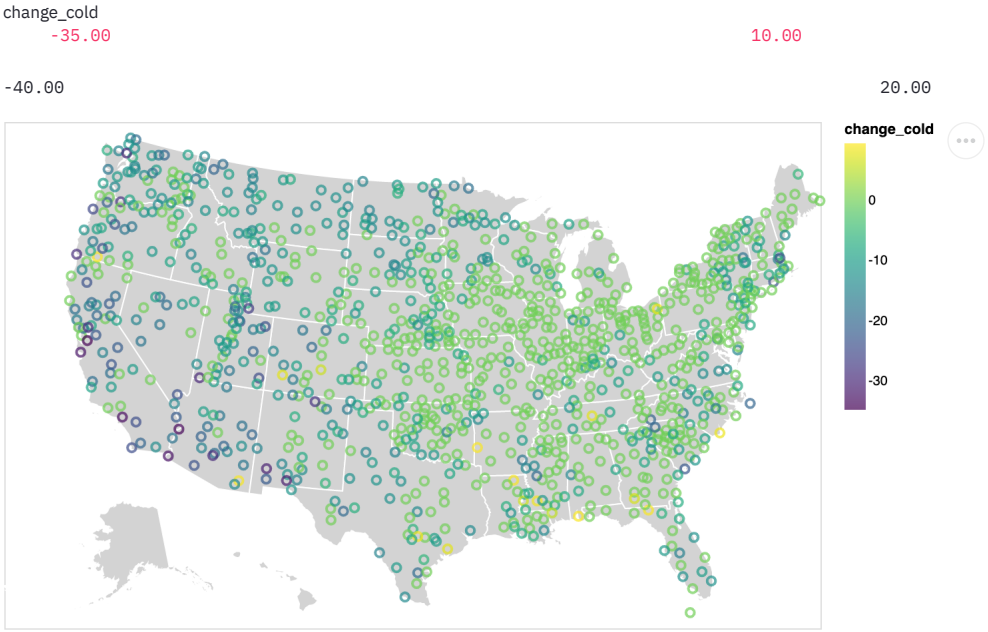
Using the slider we can find out places which have now began to get much warmer days. Most of those are located in Florida and California state. Interestingly, places in Minnesota are also getting warmer



Map: Change in Unusually Hot Temperatures in the Contiguous 48 States, 1948-2015",,,
Source: EPA's Climate Change Indicators in the United States:
www.epa.gov/climate-indicators,,,
"Data source: NOAA, 2016"

Units: Change in number of days hotter than 95th percentile

The map below points to trends in unusually cold temperatures at individual weather stations that have operated consistently since 1948. In this case, the term “unusually cold” refers to a daily minimum temperature that is colder than the 5th percentile temperature during the 1948–2015 period. Thus, the minimum temperature on a particular day at a particular station would be considered “unusually cold” if it falls within the coldest 5 percent of measurements at that station during the 1948–2015 period. The map shows changes in the total number of days per year that were colder than the 5th percentile. Light green shade show where these unusually cold days are becoming more common. The darker shades show where unusually cold days are becoming less common.



Map: Change in Unusually Cold Temperatures in the Contiguous 48 States, 1948-2015"
Source: EPA's Climate Change Indicators in the United States:
www.epa.gov/climate-indicators
"Data source: NOAA, 2016"
Units: Change in number of days colder than 5th percentile

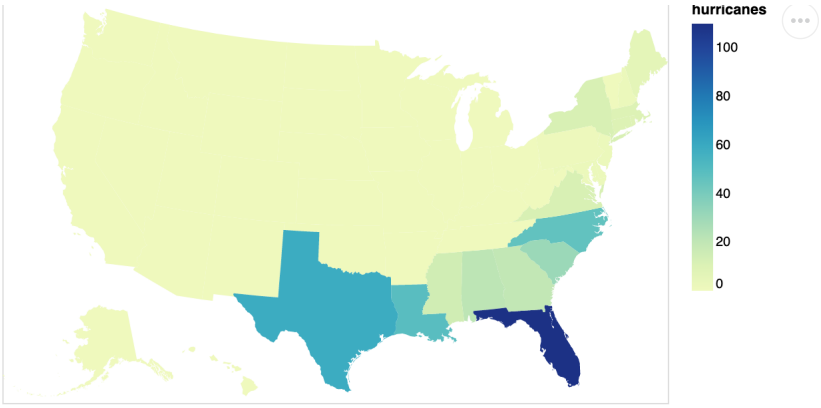
U.S. Mainland Hurricane Strikes by State: 1851-2004

What is the average number of hurricanes per year? What year(s) had the most and least hurricanes? What hurricane had the longest life? On what date did the earliest and latest hurricane occur? What was the most intense Atlantic hurricane? What was the largest number of hurricanes in existence on the same day? When was the last time a major hurricane or any hurricane hit a given community direct?

These are some of the overarching question one may have about hurricanes.

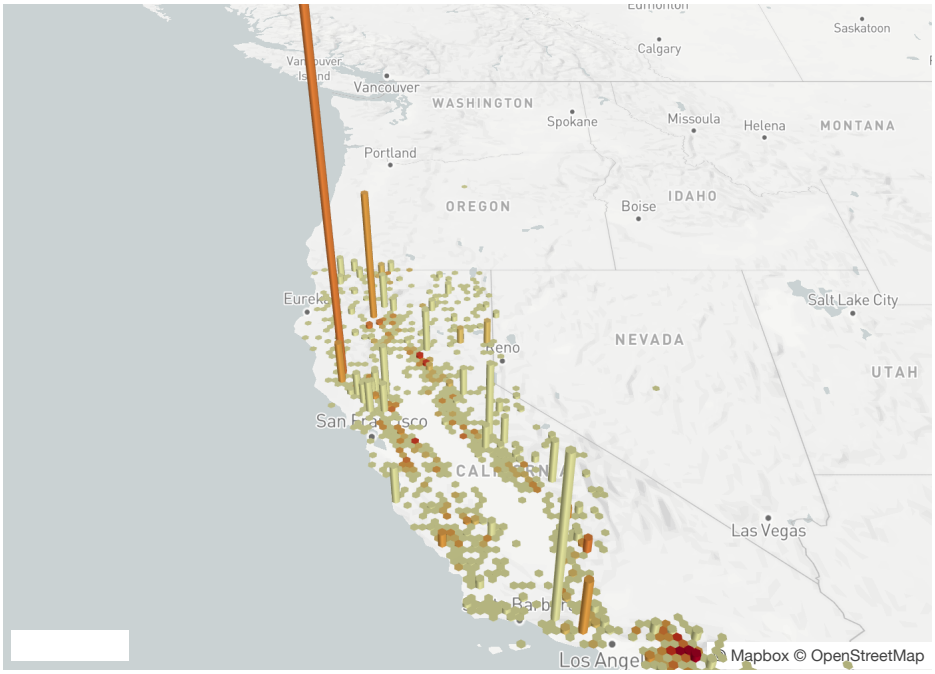
In the data below, taken from National Hurrican Center and Central Pacific Hurricane center, we can see how hurricanes have effected us.

Florida and Texas have experienced the most!



Wild Fires across California in the 7 years

Wild Fires have become a common phenomenon for the past few years, notably in the CA state. I used data available at: https://www.kaggle.com/ananthu017/california-wildfire-incidents-20132020 to generate a visualization on some of the recent fires since 2013 and the acres of land that was burned due to that



Summary

In a nutshell, quite a few regions have had a shift in weather, places which were primarliy warmer have become more warm and some of the cold ones have gotten warmer too. Not a single State has gotten colder than it was before. Most effected regions from the data are:

1. California
2. Texas
3. Florida
4. Alaska