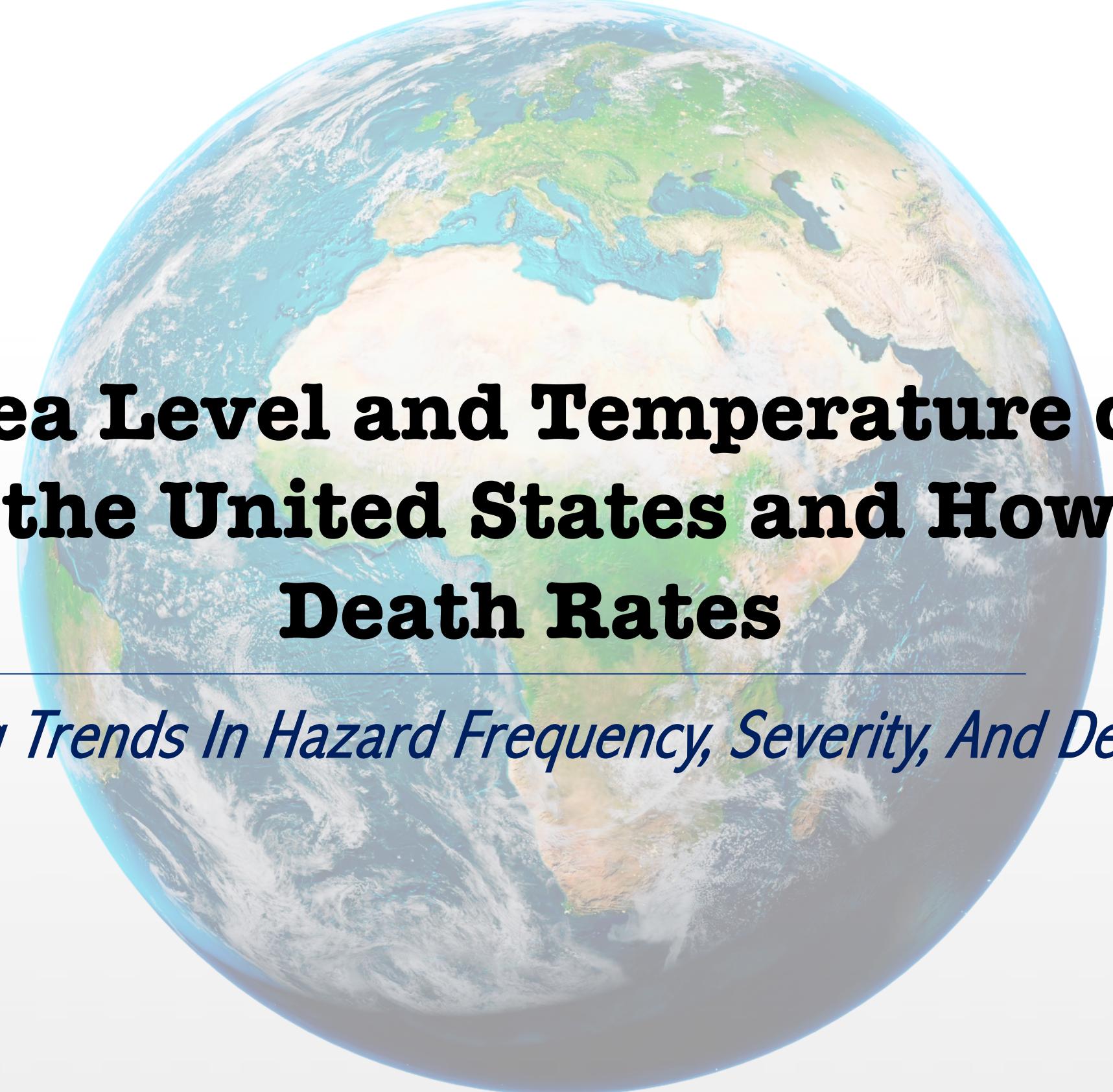


Duration: 10 min

PROJECT 1

TEAM 7

DATA ANALYSIS AND  
VISUALIZATION



# **Effects of Sea Level and Temperature on Natural Hazards in the United States and How It Affects Death Rates**

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*Exploring Trends In Hazard Frequency, Severity, And Death Rates*

Ana I Garcia, Daniel Grimm, Janet Rodriguez, Maha Pentakota, Sapir Madar Coulson



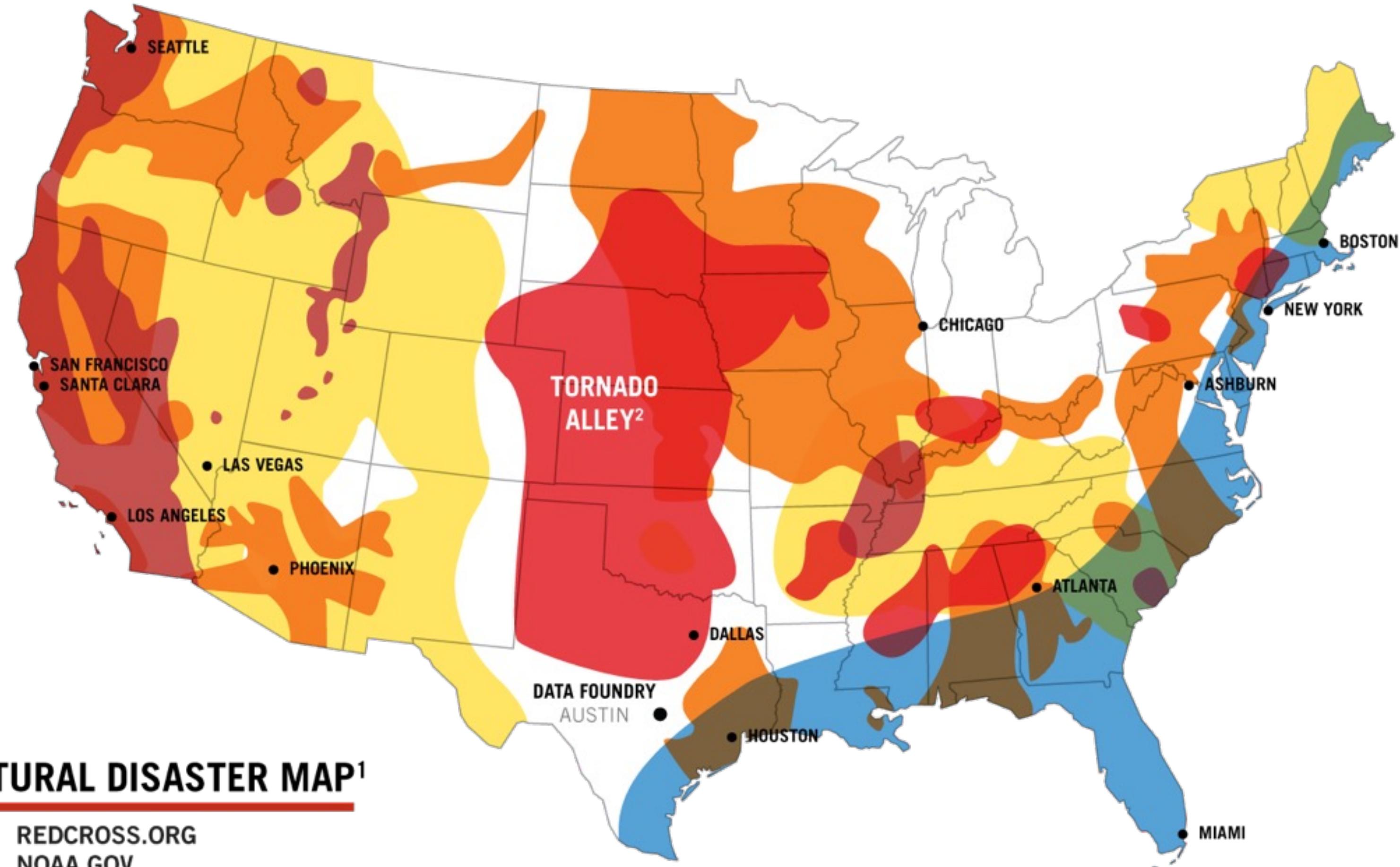
# Rising Tides, Rising Temperatures: Analyzing Climate-Driven Hazards and Death Rates

This project examines how climate change, particularly rising sea levels and higher temperatures, is increasing natural hazards in the United States, including hurricanes, wildfires, floods, and severe storms.

While these hazards are becoming more frequent and severe, fatality rates are generally decreasing.

This decline shows the impact of improvements in hazard mitigation, disaster response, and public preparedness in saving lives.

The project aims to analyze the effects of climate-driven hazards on various regions and identify trends in death rates, which is essential for enhancing community preparedness and response strategies in vulnerable areas.



## US NATURAL DISASTER MAP<sup>1</sup>

<sup>1</sup>SOURCE: REDCROSS.ORG

<sup>2</sup>SOURCE: NOAA.GOV

EARTHQUAKES (MODERATE RISK)

EARTHQUAKES (HIGH RISK)

FLOODS

HURRICANES

TORNADOES

# OUR QUESTIONS



How do changes in sea levels and temperature correlate with the frequency and severity of specific natural hazards (e.g., hurricanes, wildfires, floods) in various regions across the United States?



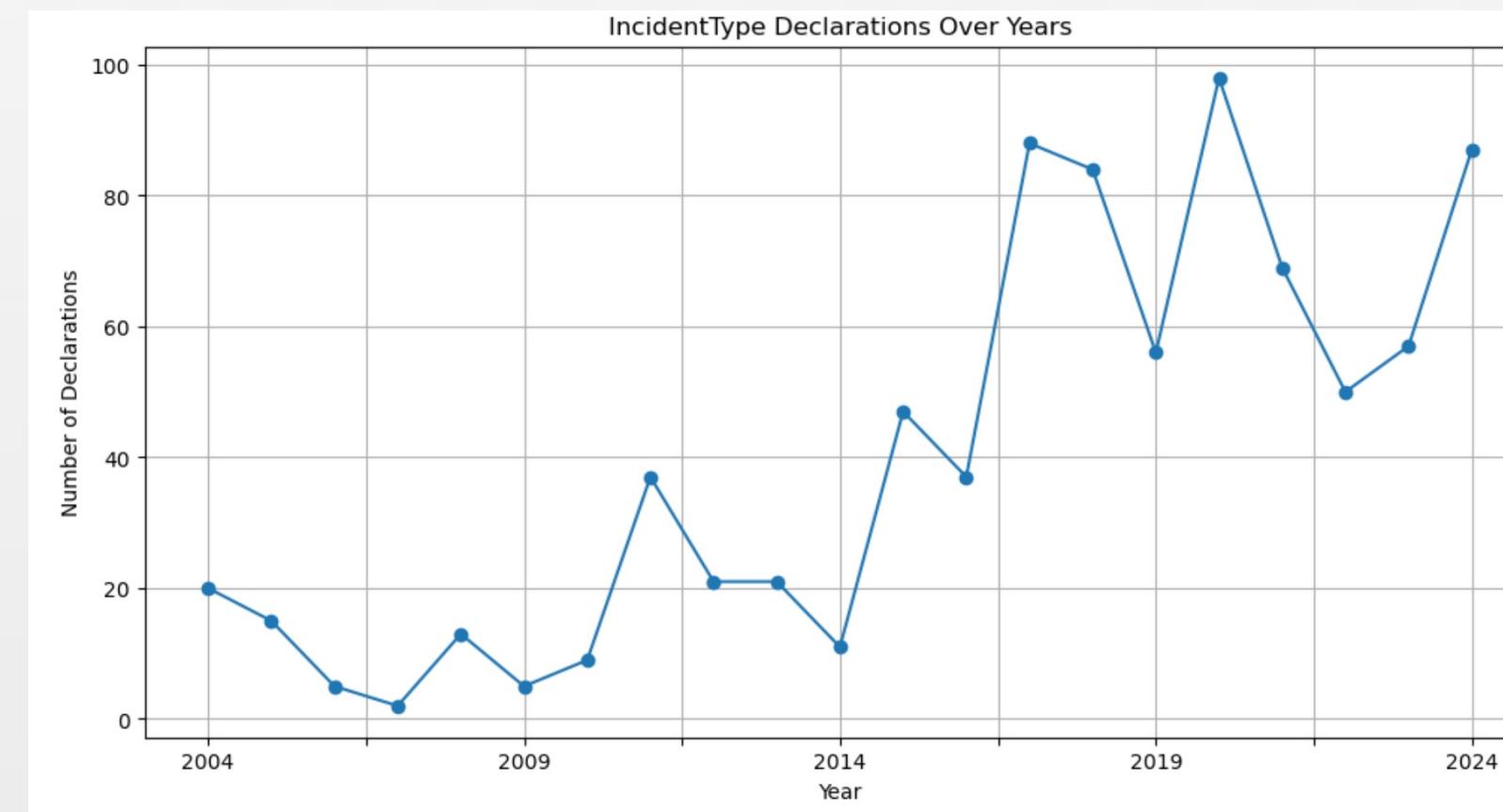
What trends in death rates have emerged in relation to different types of natural hazards, and how do these rates vary with changes in sea level and temperature?



Are there identifiable patterns or high-risk regions where the impact of rising sea levels and temperatures has led to significant changes in both natural hazard occurrence and death rates?

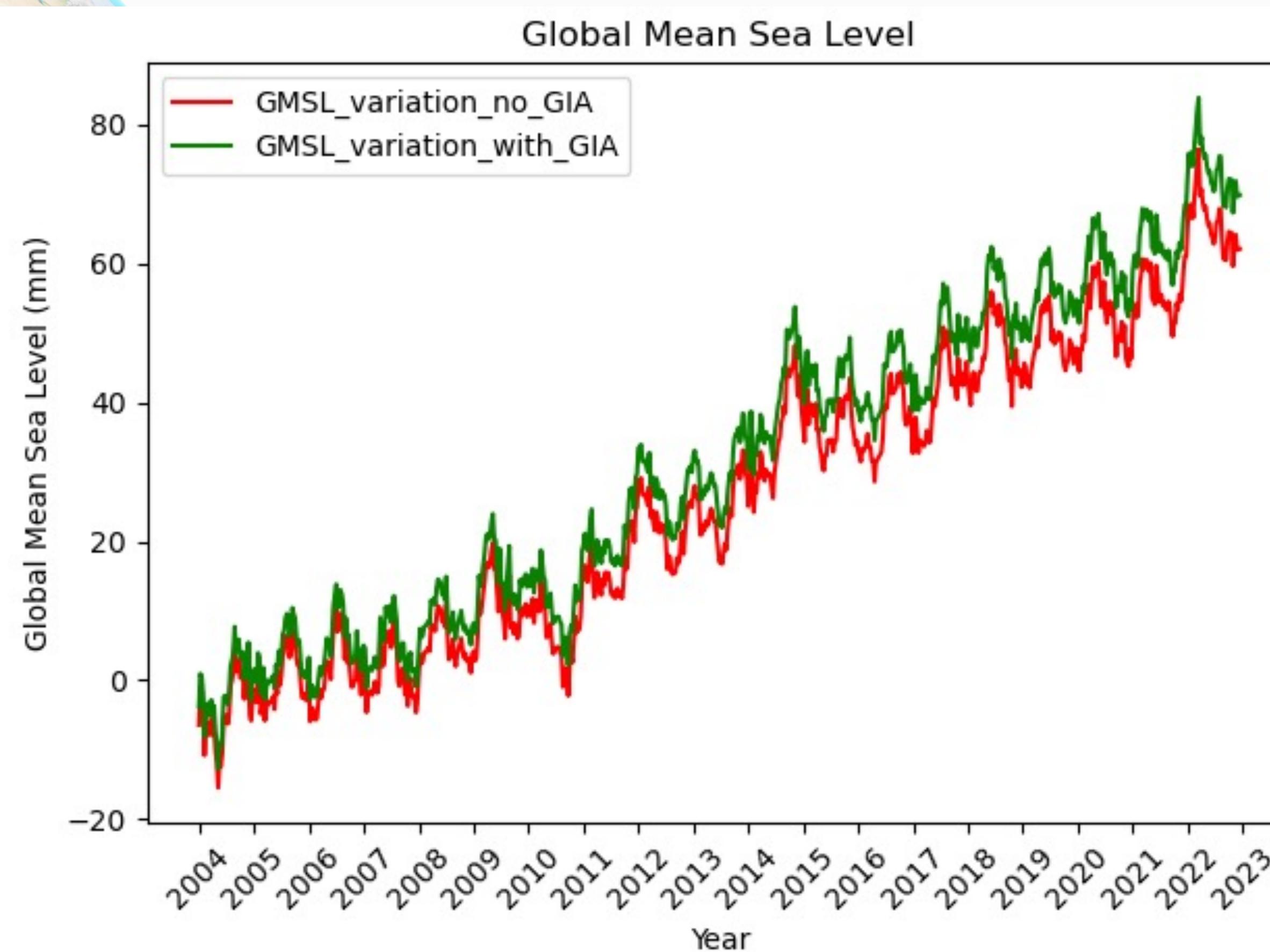
# DATA SOURCE

- For hazard information and data, we used the FEMA (Federal Emergency Management Agency) APIs (Versions 1 and 2). We also utilized CSV files from NCEI/NOAA (National Centers for Environmental Information), which provided both yearly death rate data and additional hazard information.
- To analyze sea temperatures, we accessed the NCEI.NOAA API, which shows the impact of temperature on hurricane intensity for the hurricane seasons from June to November, covering the years 2014–2024.
- For sea level data, we used a file from NASA. This file was initially in HTTP format, which we converted to CSV for easier analysis.



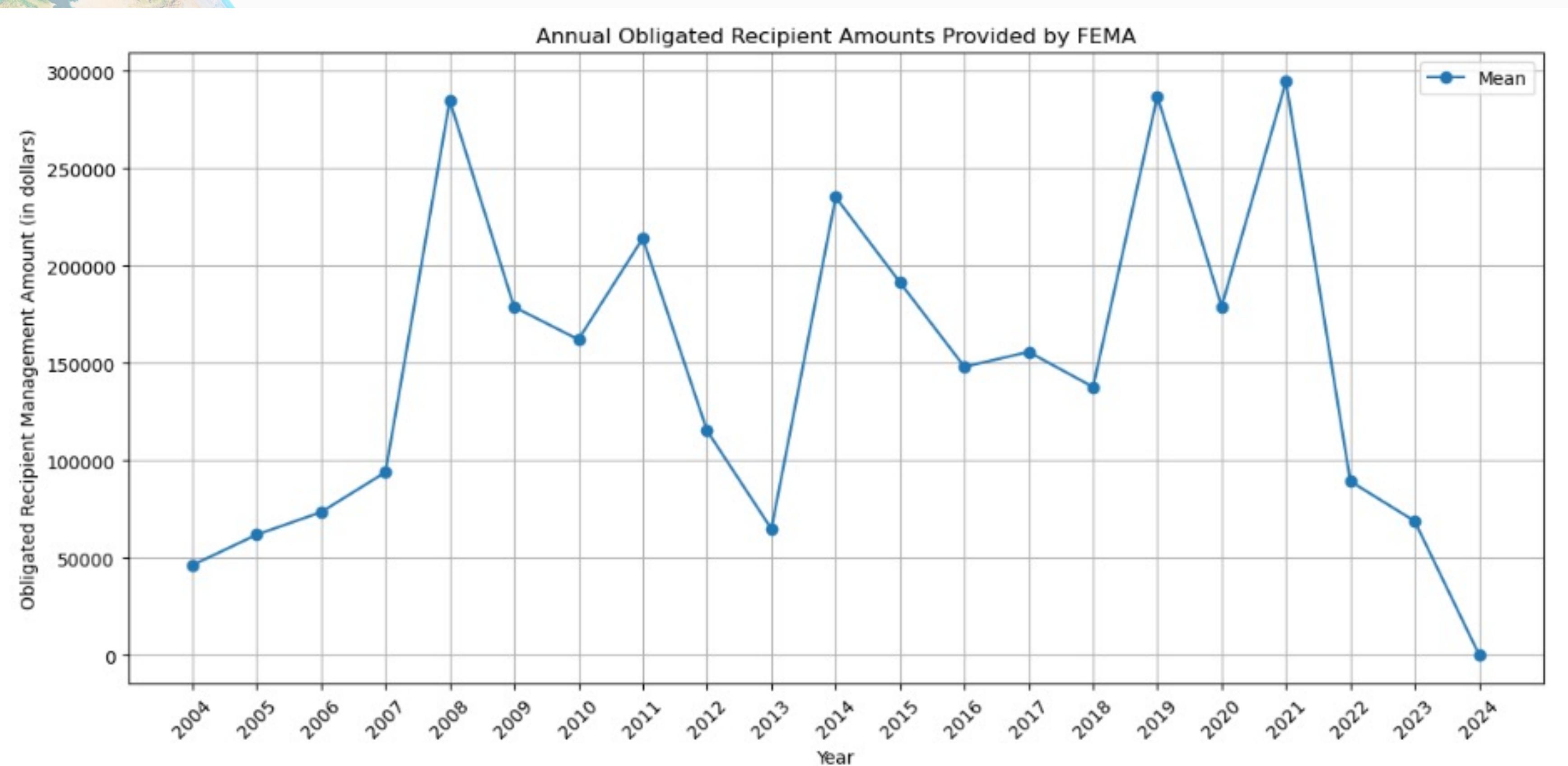
# GLOBAL SEA LEVELS from 2004-2024

GIA = Glacial Isostatic Adjustment,  
GMSL = Global Mean Sea Level



# FEMA's Annual Disaster Relief Funding 2004-2024

The following graph displays the yearly average funding provided by FEMA to provide relief for all severe storm incidents



# Severe Storms in the USA (2004-2024)

Figure 1 displays number of all disasters (Hurricane, Flood, Fire, etc)

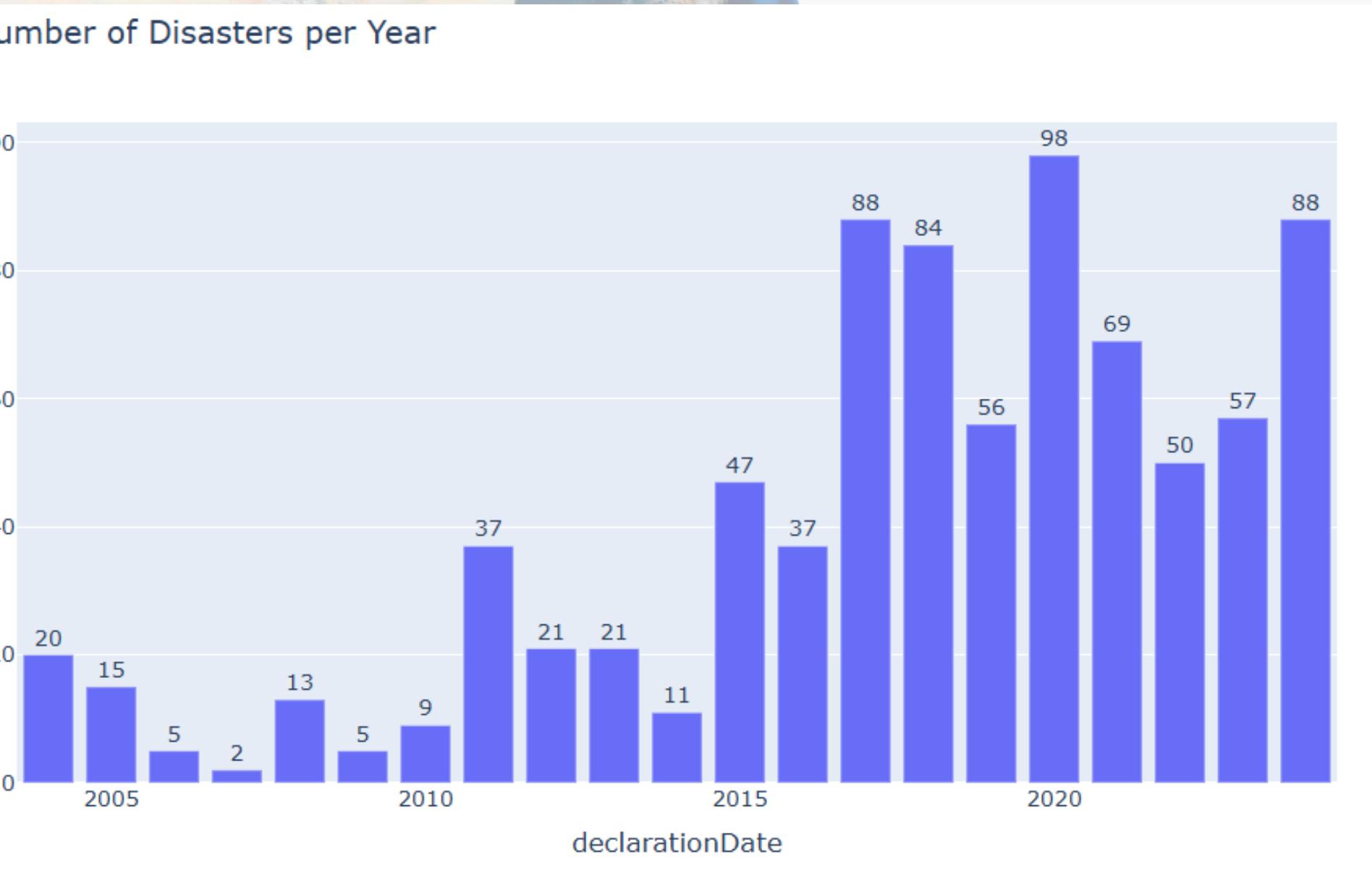
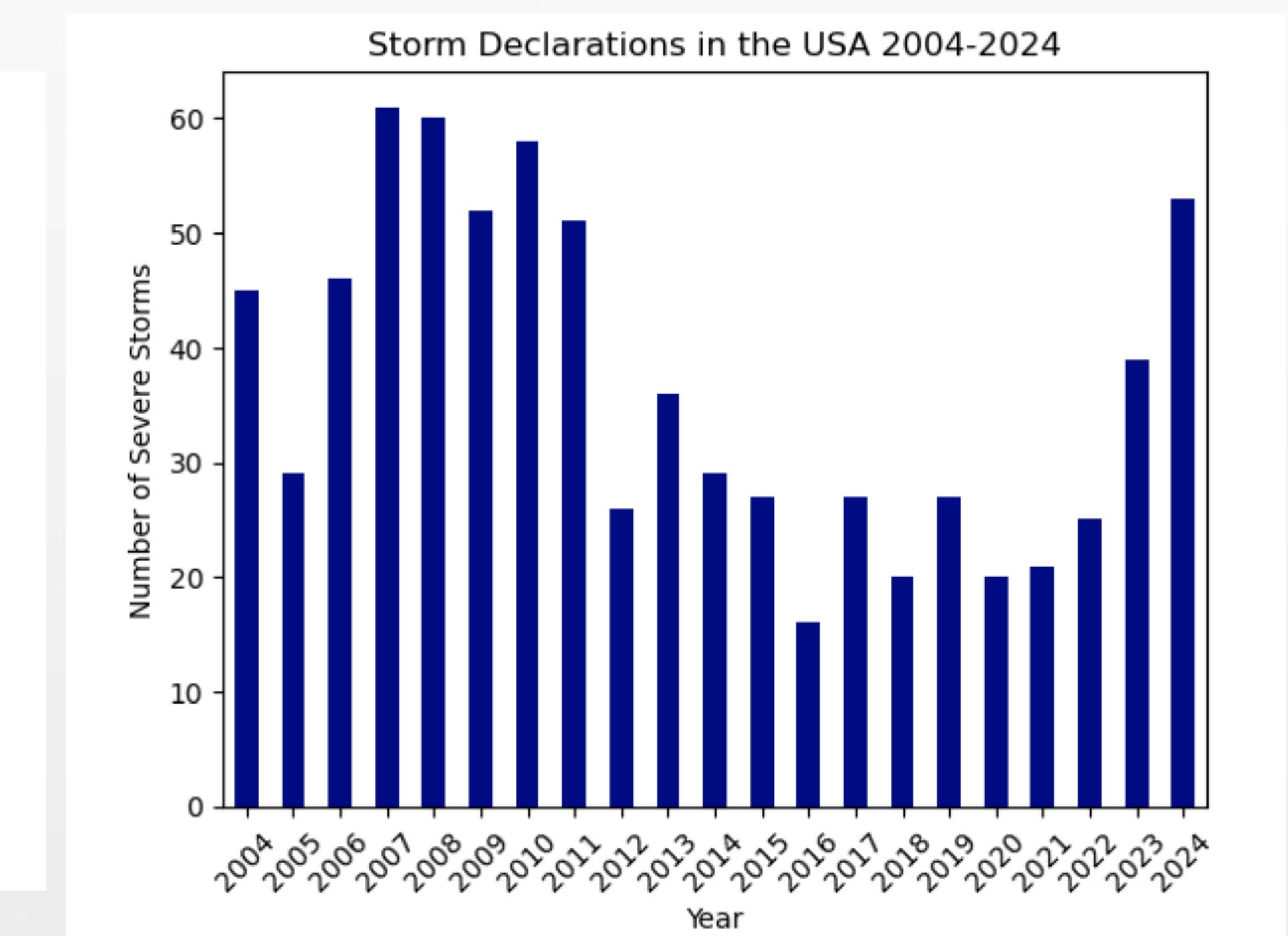
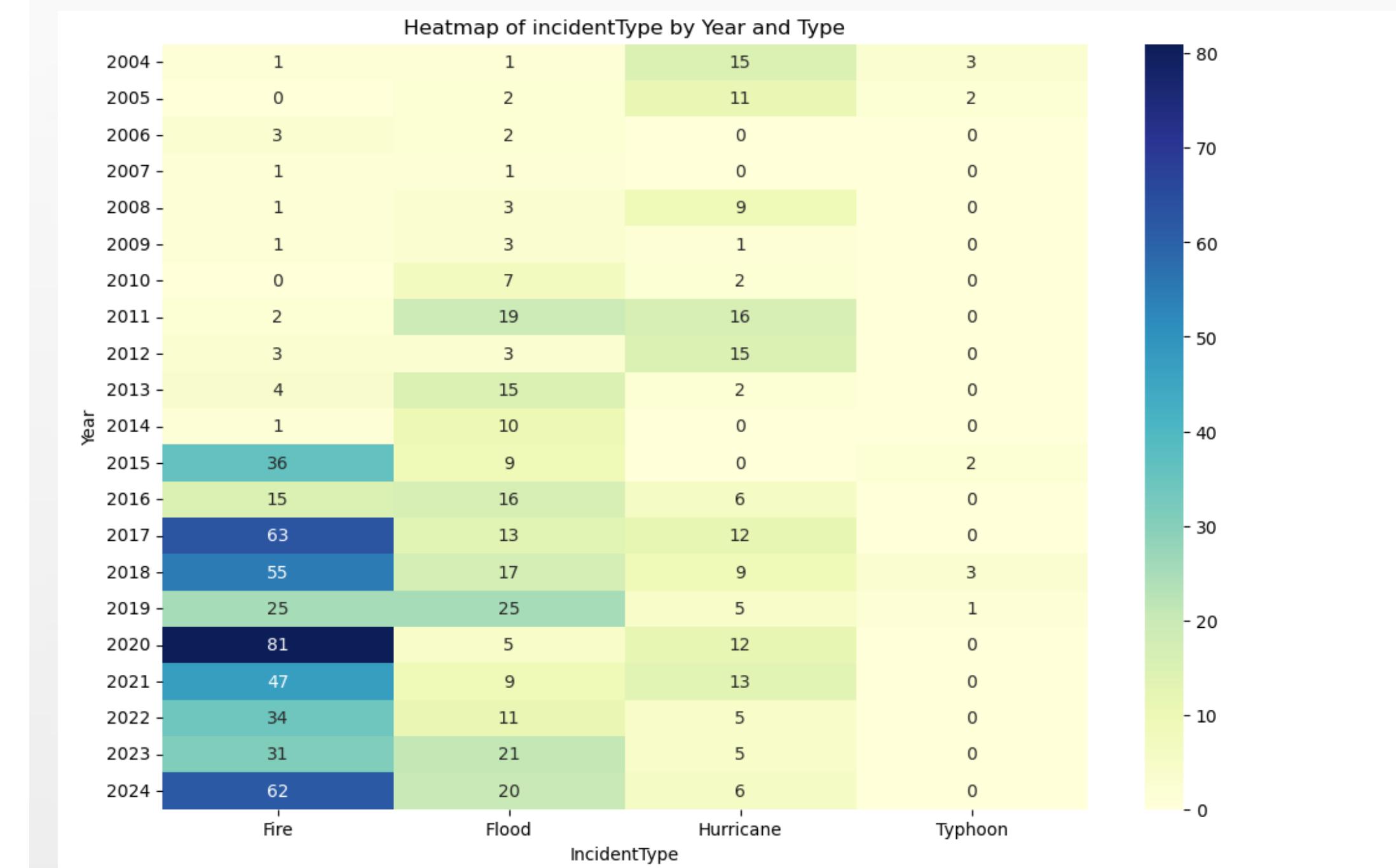
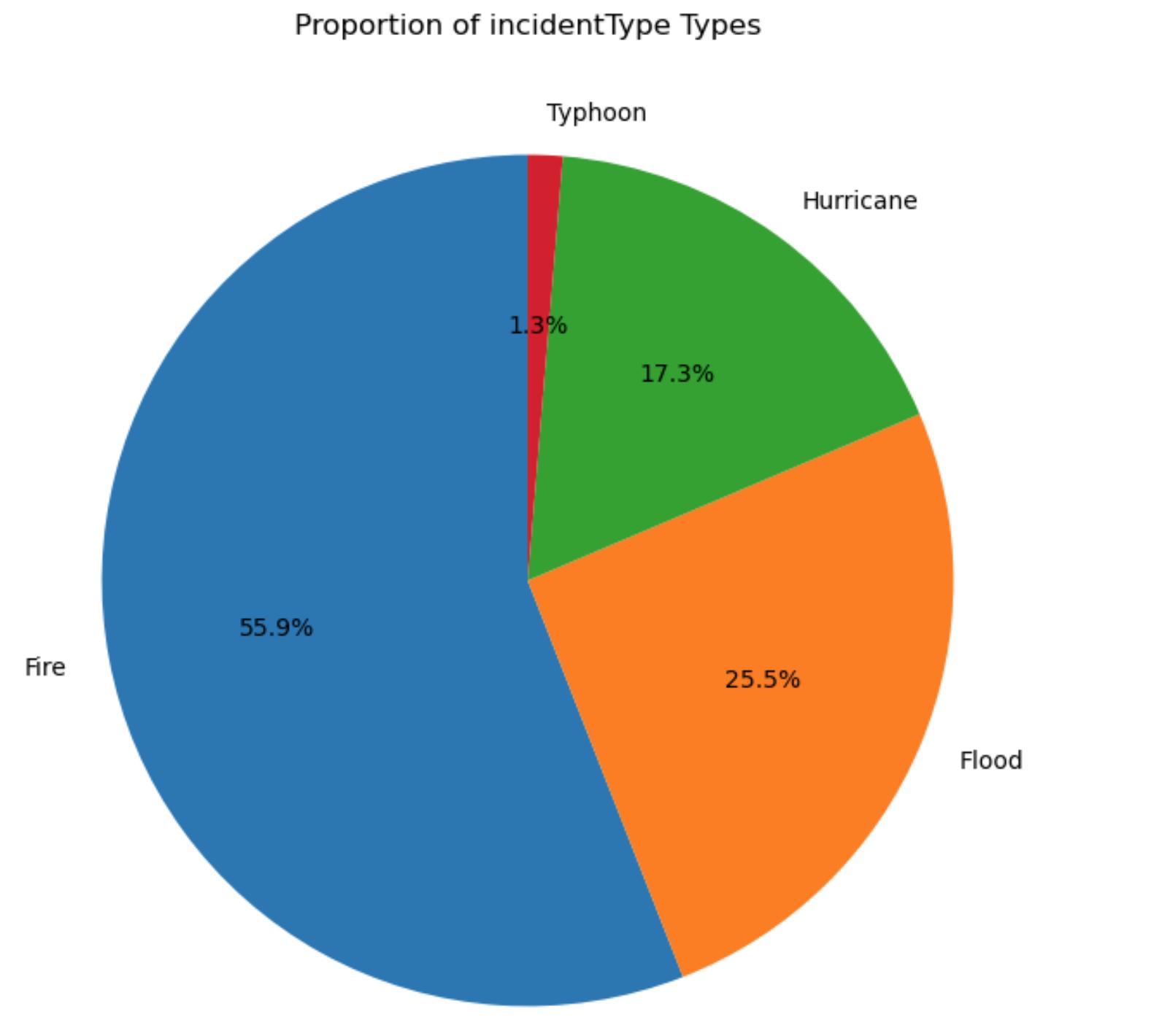


Figure 2 displays number of Severe Storms (Ice Jams, Mudslides, Winter Storms)



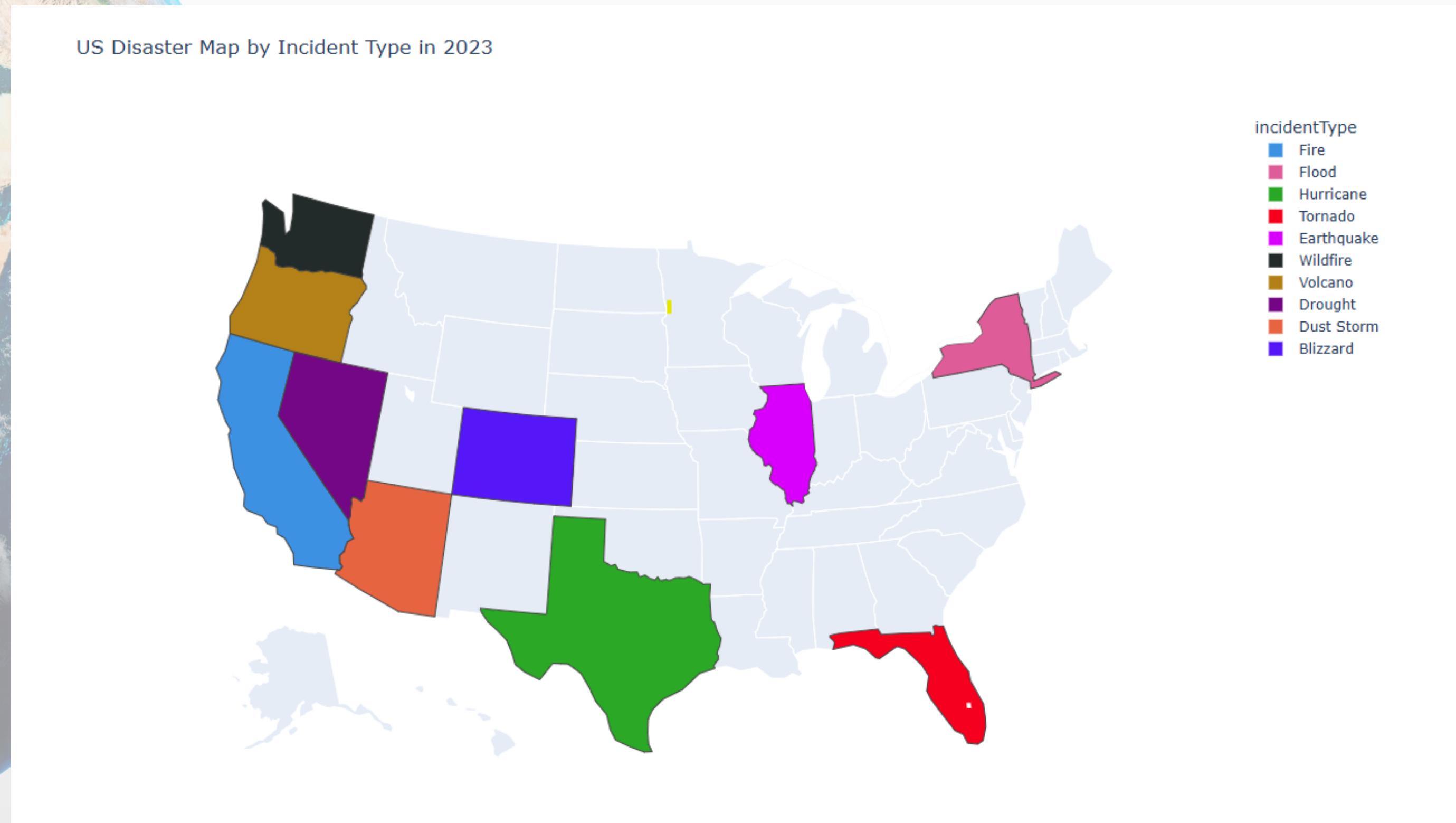
# FEMA's Disaster Map over years

The code produces a visually appealing bar chart showing the trend of disaster counts over the years. The numbers representing the disaster counts are clearly displayed above each bar, making the data easy to interpret. The chart is also saved as a PNG image for later use or inclusion in reports.



# FEMA's Disaster Map 2023

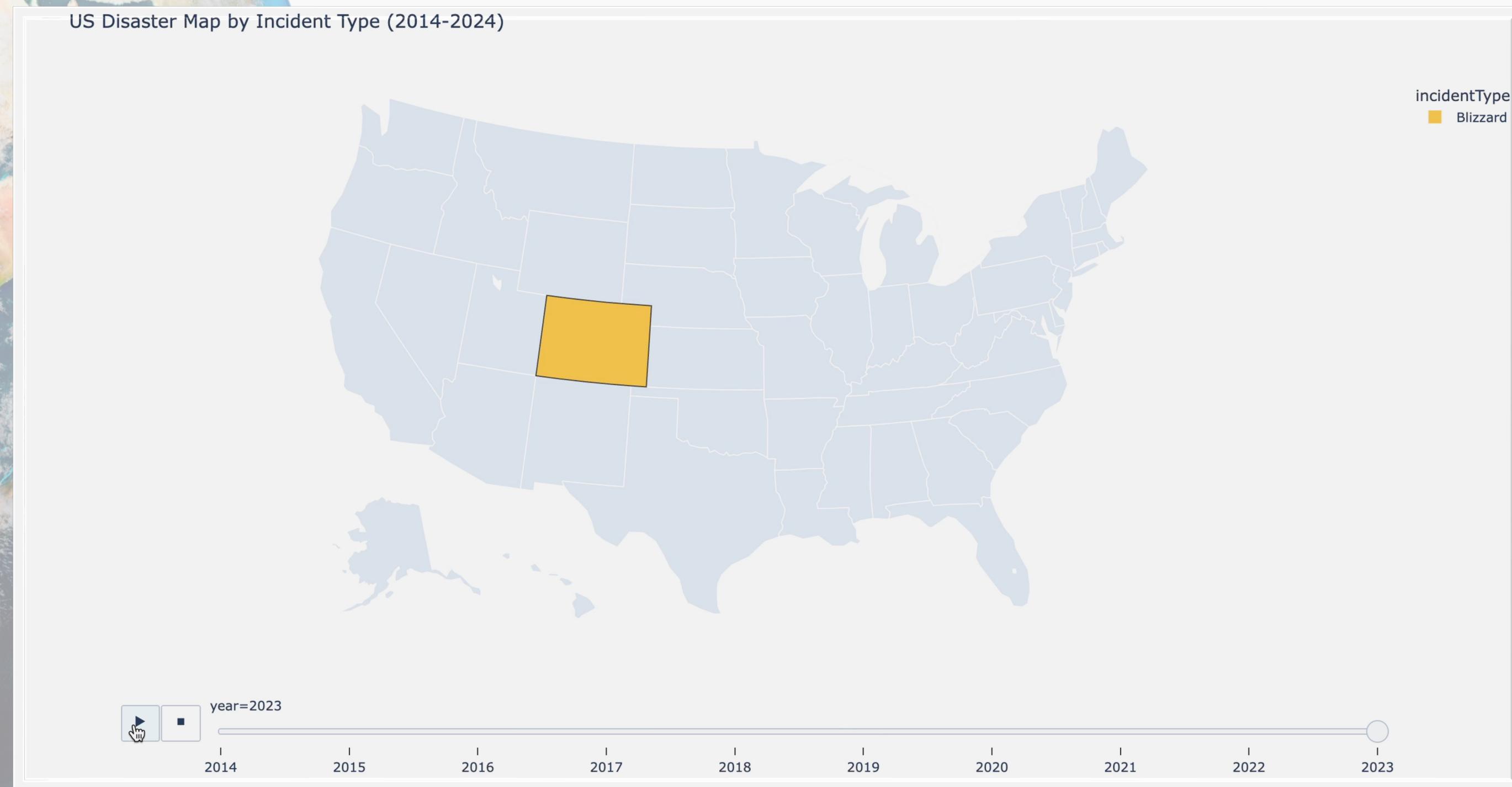
The code generates a choropleth map of the United States, visualizing disaster incidents by state. Each state is colored according to the type of incident that occurred. In summary, the map provides a visual representation of the different disaster types across various US states in 2023, allowing users to quickly compare incident types geographically and see details about each incident upon hovering.



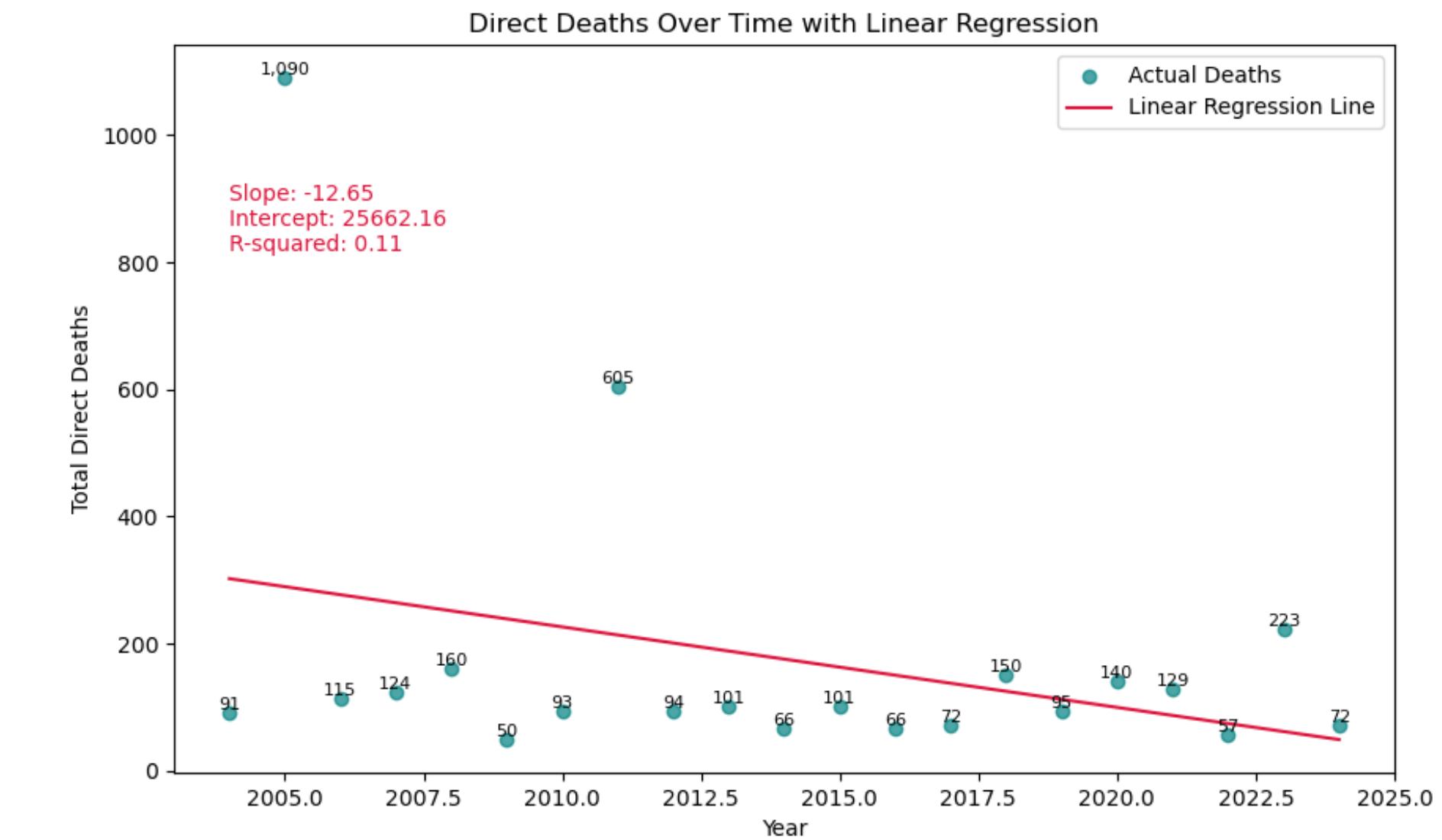
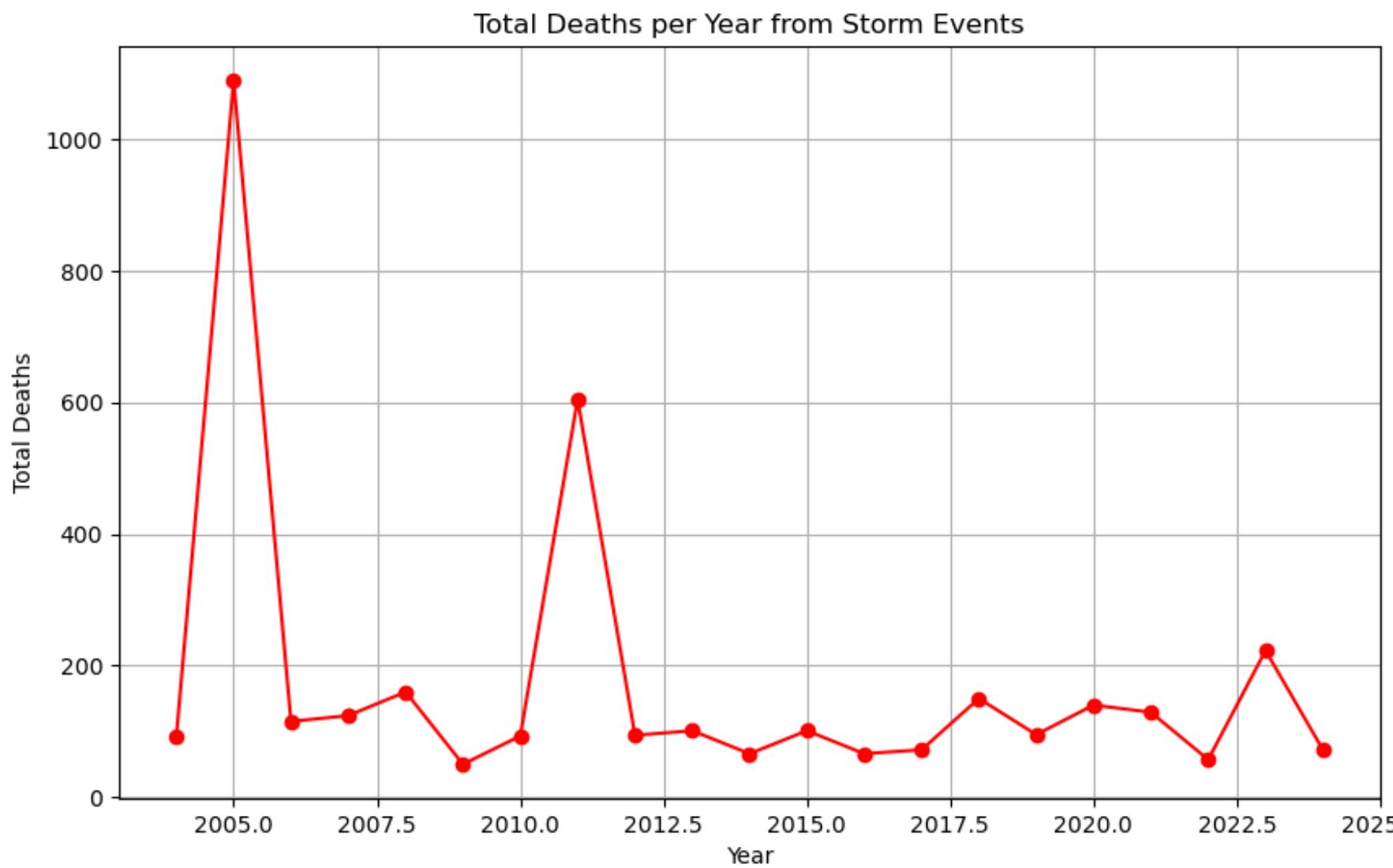
# USA DISASTER MAP - 2014-2024 (BY STATE)

As you play the animation, the map will cycle through the years, showing how the types of disaster incidents change geographically over time. For example, a state might be colored to represent a wildfire in one year and a drought in another.

In essence, this visualization provides a dynamic way to explore the spatial and temporal distribution of various disaster types across the US.

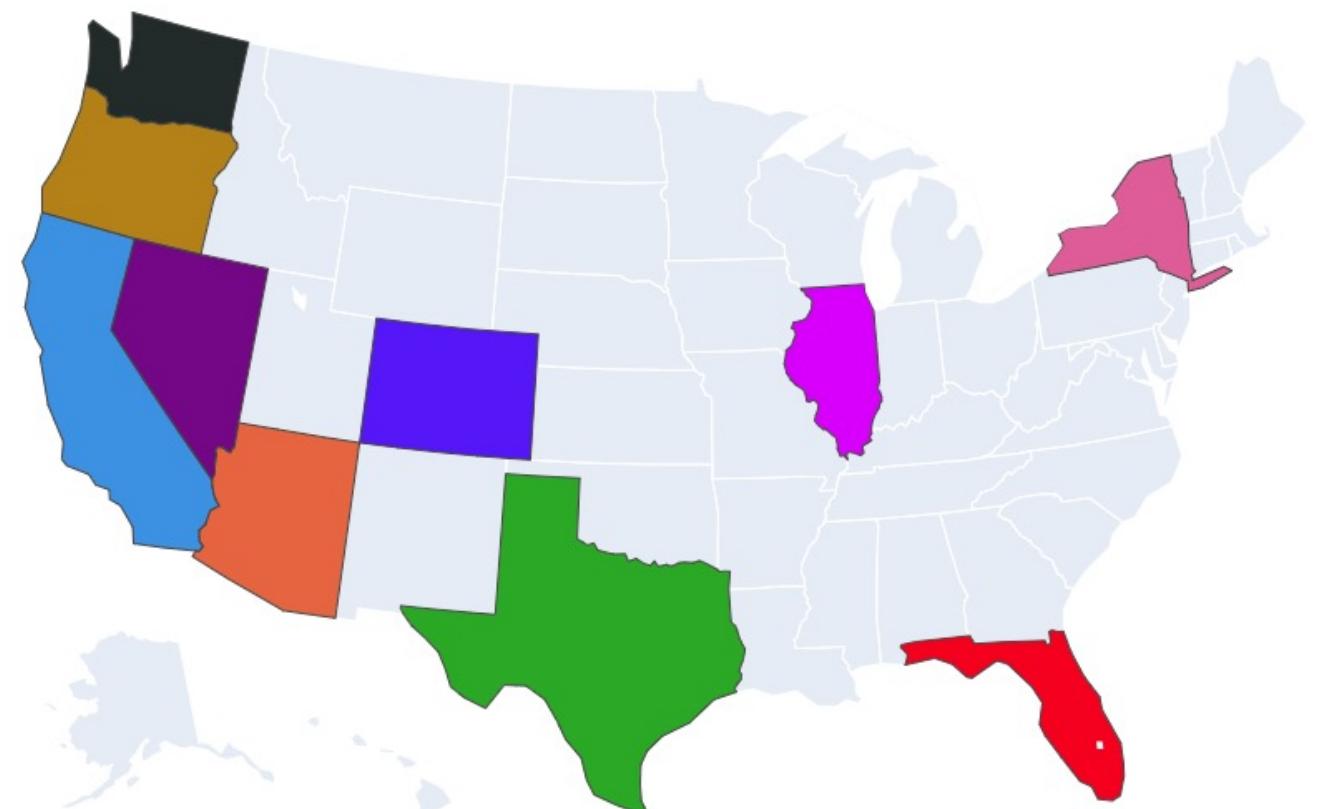


# Death rate trends over time in relation to hazards



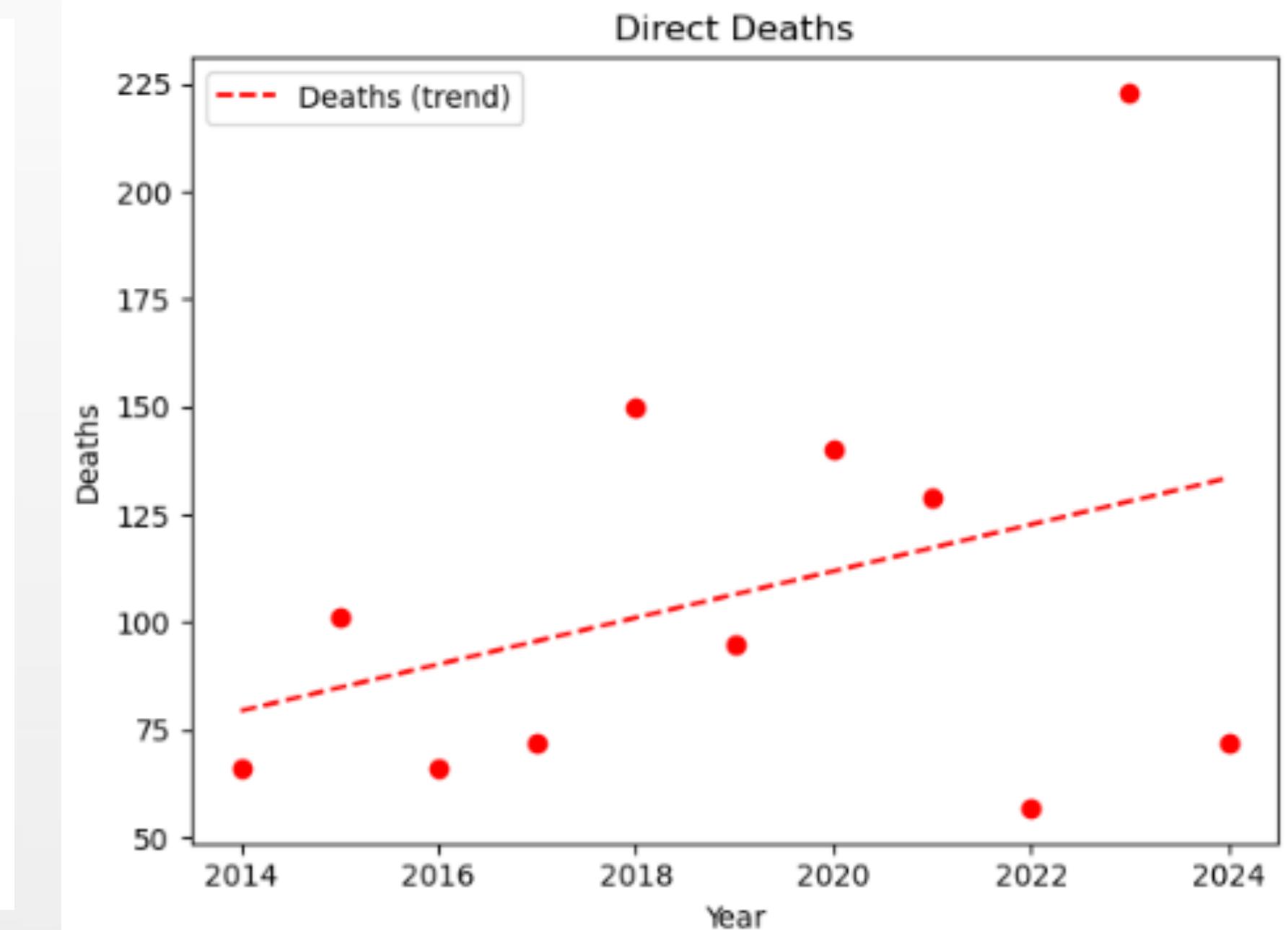
# 2023 Observations: Deaths by Incident Type (U.S. States)

US Disaster Map by Incident Type in 2023



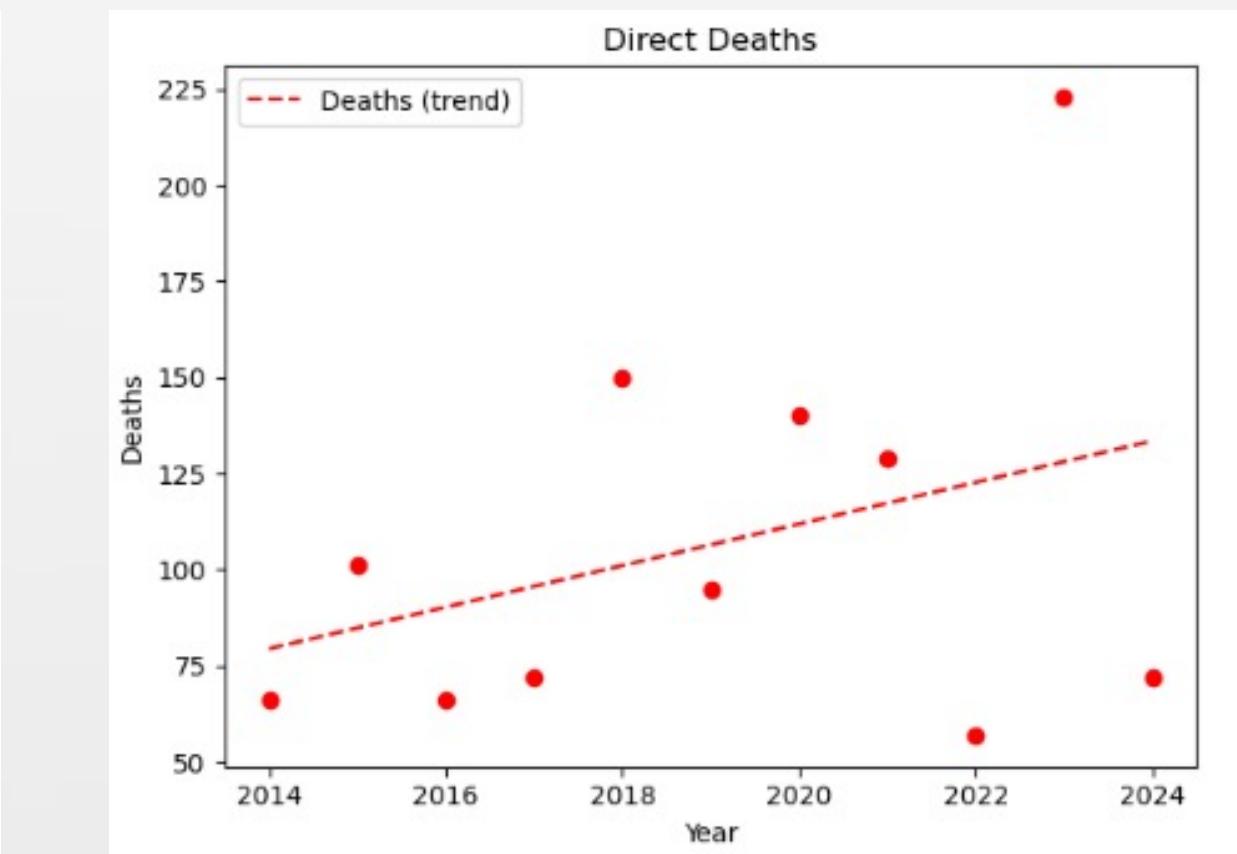
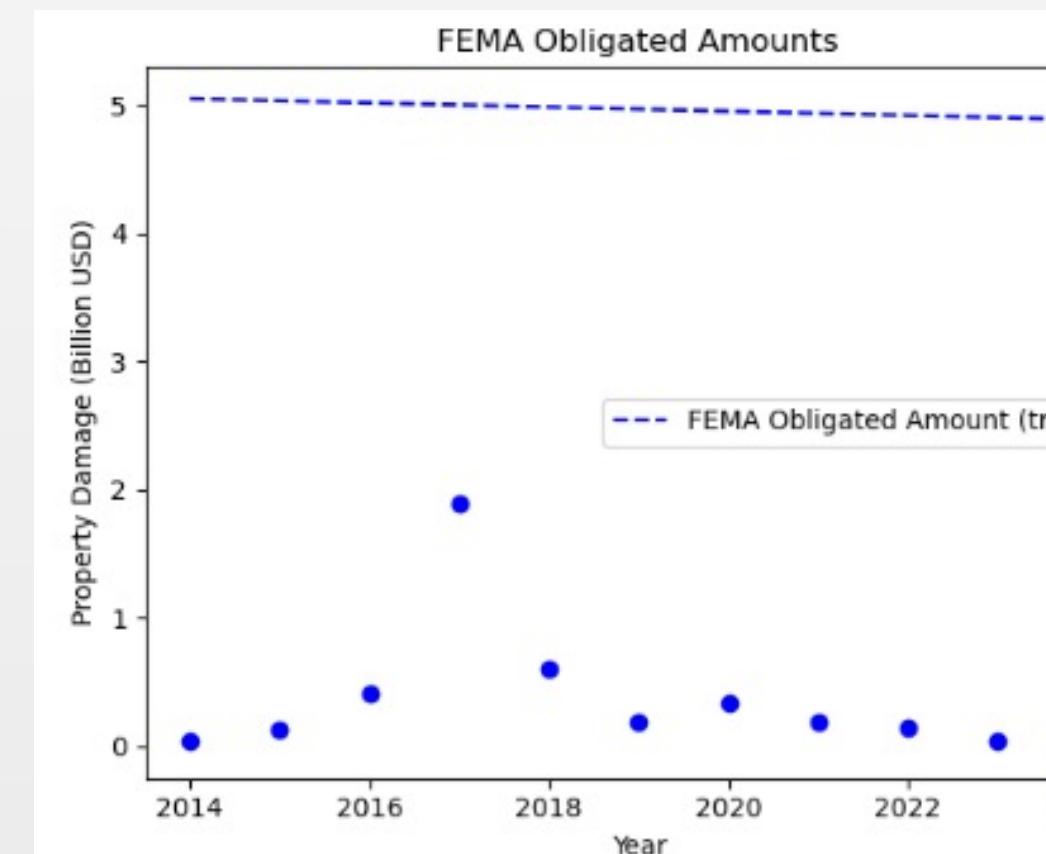
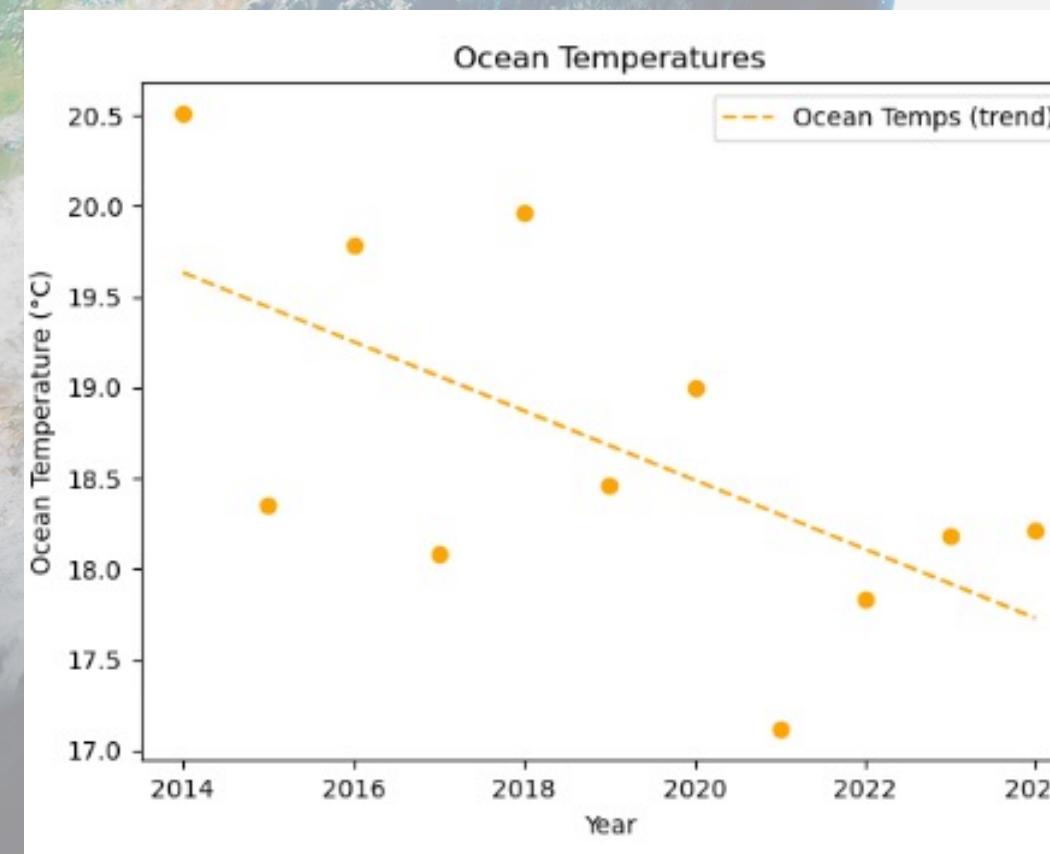
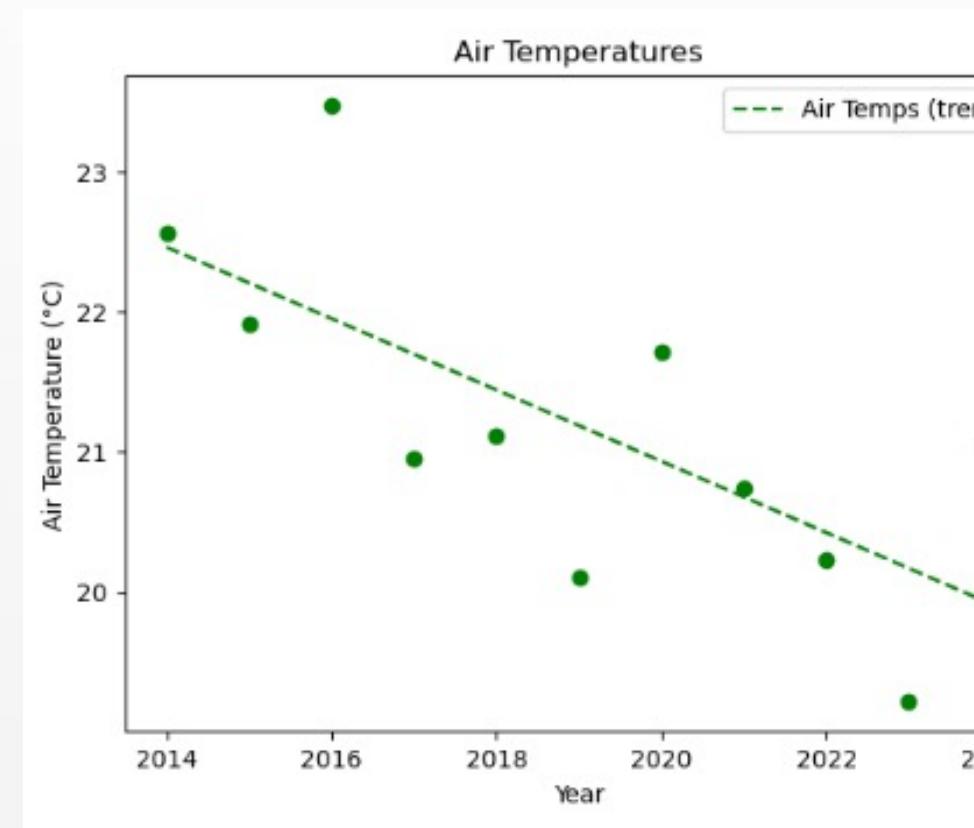
incidentType

- Fire
- Flood
- Hurricane
- Tornado
- Earthquake
- Wildfire
- Volcano
- Drought
- Dust Storm
- Blizzard



# Natural Hazards: The Role of Air and Ocean Temperatures in Death Rates and FEMA Funding from 2014 to 2024

NOAA data indicating a 10-year trend of decreasing ocean temperatures is likely influenced by natural climate cycles, such as El Niño and La Niña, which can cause temporary fluctuations that obscure the long-term warming trend linked to climate change.



# Correlation Between Climate Change and Natural Hazards:

## Ocean Temperatures and Sea Levels:

- Rising ocean temperatures and sea levels are driving more frequent and severe hurricanes and floods, especially in coastal areas like the Gulf Coast and Southeast U.S.
- The western U.S. faces more intense wildfires, partly influenced by ocean temperatures affecting atmospheric conditions and drought.

## Death Rate Trends:

- Improved forecasting, stronger infrastructure, and faster emergency responses have helped lower hurricane death rates.
- However, death rates vary depending on storm severity, community readiness, and local response efforts.

## 2023 Observations:

- 2023 saw a rise in storms and disaster-related deaths, showing a strong link between more frequent hazards and fatalities.
- This highlights the need for enhanced resilience and disaster response planning.

# Key Findings

1. **Climate Change Impact:** Rising ocean temperatures and sea levels are leading to more hurricanes and coastal flooding, particularly in the Gulf Coast and Southeast U.S., while the western regions are seeing more wildfires.
2. **Death Rate Trends:** Although natural hazards are on the rise, improved forecasting and emergency response have helped lower death rates, especially for hurricanes.
3. **High-Risk Regions:** Areas like the Gulf Coast, Southeast, and parts of California are particularly vulnerable to climate-related hazards.

## Implications:

- **Policy Needs:** There's a need for climate-resilient policies that integrate risk into planning and emergency management.
- **Disaster Response:** Investment in forecasting, public education, and preparedness is essential for effective disaster response.
- **Future Research:** Further research is critical to understand how climate change influences hazards and to find the best ways to protect communities.

# GITHUB:

project-1 Public

Watch 1

main ▾ 6 Branches Tags Go to file t + <> Code

dgrimm84	Update README.md	e410061 · 19 hours ago	62 Commits
.virtual_documents	Merge branch 'main' of https://github.co...	yesterday	
Plot Images	moving files to directories for organization	yesterday	
Resources	moving files to directories for organization	yesterday	
.gitignore	Update .gitignore	2 weeks ago	
README.md	Update README.md	19 hours ago	
air temps.ipynb	uploading project files	yesterday	
ocean temps.ipynb	ocean temps2	4 days ago	
oct29.ipynb	Update oct29.ipynb	yesterday	
pro.py	newfile	last week	
project_1_main.ipynb	uploading project files	yesterday	

Default

Branch

main

Your branches

Branch

sapir-branch

Active branches

Branch

ana-branch

janet\_branch

dan-branch

sapir-branch

maha-branch



# RESOURCES

1. Weather.gov Open Source Repository - <https://weather-gov.github.io>
2. World Bank Data Support- <https://datahelpdesk.worldbank.org>
3. National Weather Service (NOAA)- <https://www.weather.gov/>
4. FloodSmart NFIP Services- <https://nfipservices.floodsmart.gov/>
5. FEMA – Emergency Preparedness and Disaster Relief- <https://www.fema.gov/>
6. NSC Injury Facts and Statistics- <https://injuryfacts.nsc.org/>
7. Meteomatics Weather Data Services- <https://www.meteomatics.com/>
8. USGS – Geological and Natural Hazard Data- <https://www.usgs.gov/>
9. NASA Earthdata for Global Observations- <https://earthdata.nasa.gov/>
10. NASA APIs for Space and Earth Data- <https://api.nasa.gov/>
11. NASA Climate Change and Global Warming Insights- <https://climate.nasa.gov/>
12. NOAA NCDC – Environmental Data Archive- <https://www.ncdc.noaa.gov/>

## DATA RESOURCES

FEMA Web Disaster Summaries API - <https://www.fema.gov/api/open/v1/FemaWebDisasterSummaries>

FEMA Disaster Declarations Summaries API - <https://www.fema.gov/api/open/v2/DisasterDeclarationsSummaries>

NOAA Storm Events FTP Data - <https://www.ncdc.noaa.gov/stormevents/ftp.jsp>

NOAA National Centers for Environmental Information API - <https://www.ncei.noaa.gov/cdo-web/api/v2/data>

NASA Vital Signs: Sea Level (HTTP)- <https://climate.nasa.gov/vital-signs/sea-level/?intent=121>

