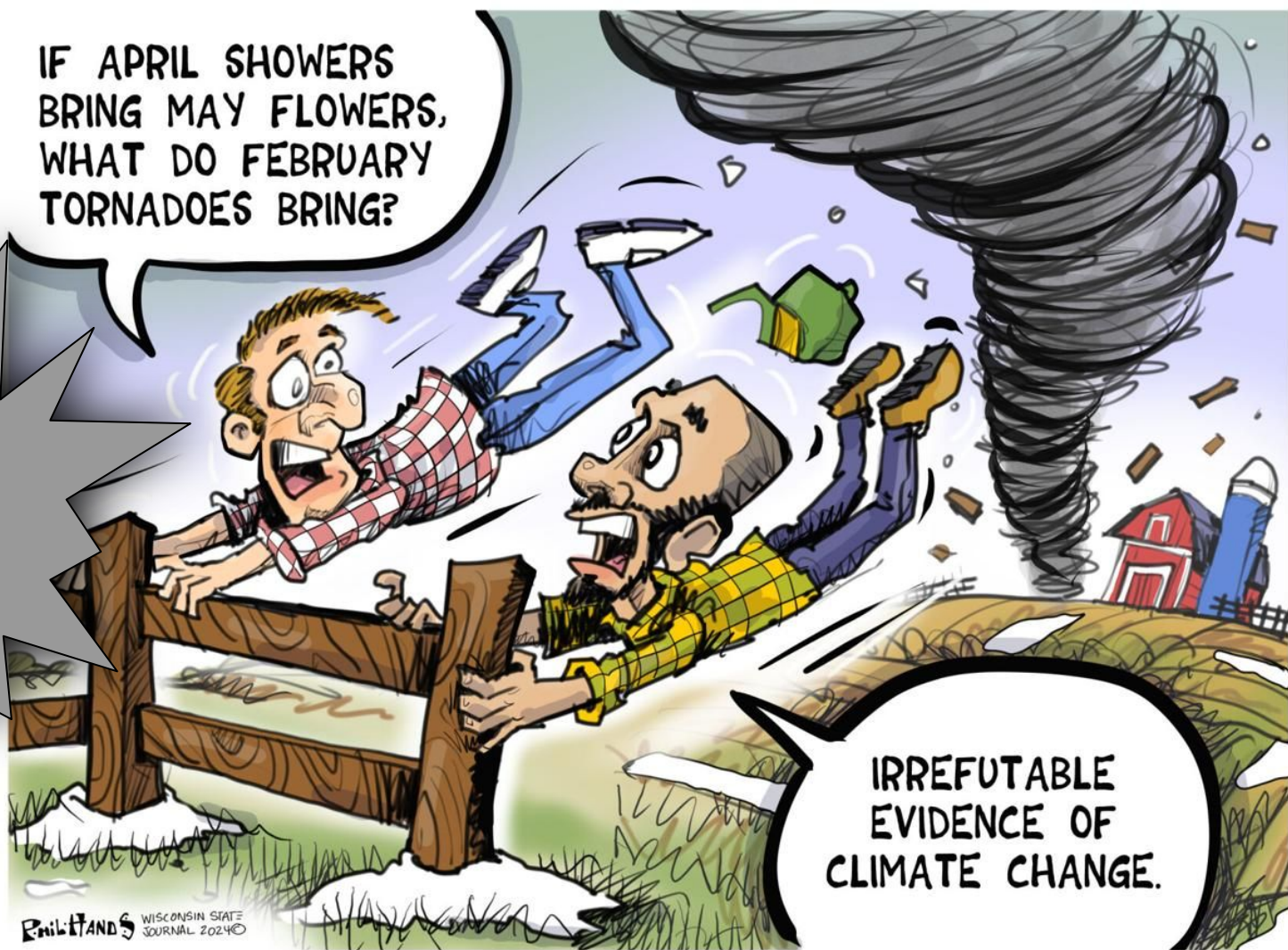


IF APRIL SHOWERS  
BRING MAY FLOWERS,  
WHAT DO FEBRUARY  
TORNADOES BRING?

PROJECT 3  
GROUP 1:  
TORNADO  
ANALYSIS



# Topic Motivation

We wanted to understand the implications of global warming in the United States through the lens of severe weather events.

## Data Retrieval

We retrieved the data from the [Storm Prediction Center](#) and [Tornado Data from 2023](#).



# Data Cleaning

SPC provided a lot of data (1361) entries (collections). We were only interested in the following data points:

- Year
- Month
- Day
- Date
- State
- Magnitude
- Damages
- Starting Lat
- Starting Long
- Hour (of Day)

The data also indicated there were some null values (unrecorded tornadoes) with a magnitude of -9. We dropped those values as they weren't relevant to our analysis.

We were left with 1092 entries (collections).

# MongoDB/Flask & JavaScript Libraries

## MongoDB as a Centralized Data Store:

- Stored tornado data, including key attributes like date, state, magnitude, and damages, in MongoDB.
- Enabled efficient querying and retrieval of data based on specific criteria (e.g., filtering by month).

## Flask as the Backend Framework:

- Served as the core web framework for handling HTTP requests and delivering dynamic content.
- Created API endpoint that dynamically generated GeoJSON data from MongoDB queries, which was then fetched by the frontend (webpage) for visualization.
- Rendered different visualizations (heatmap, bubble map, line graphs) by serving real-time GeoJSON data generated based on user input.

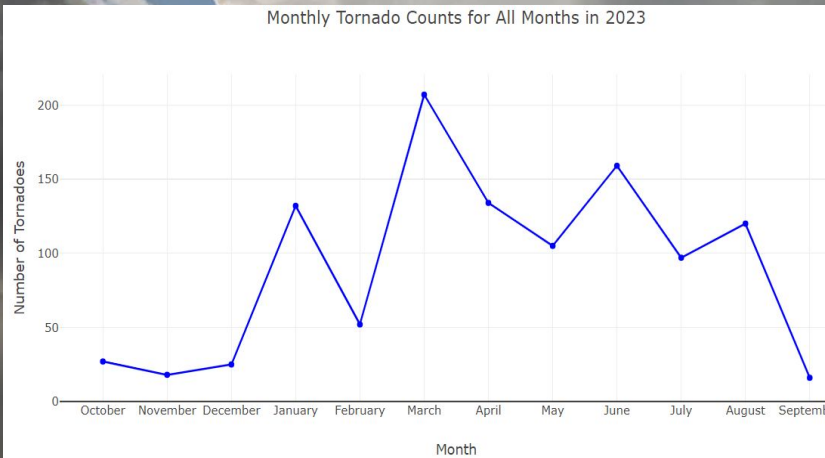
## Dynamic Interaction Between MongoDB and Frontend:

- Enabled users to interact with the data (e.g., filtering by month) via the frontend, with Flask dynamically querying MongoDB and providing the necessary data to update the visualizations.

**Leveraged the following JavaScript libraries:** D3.js, Leaflet.js, Plotly.js, and **Turf.js**

# Tornado Frequency

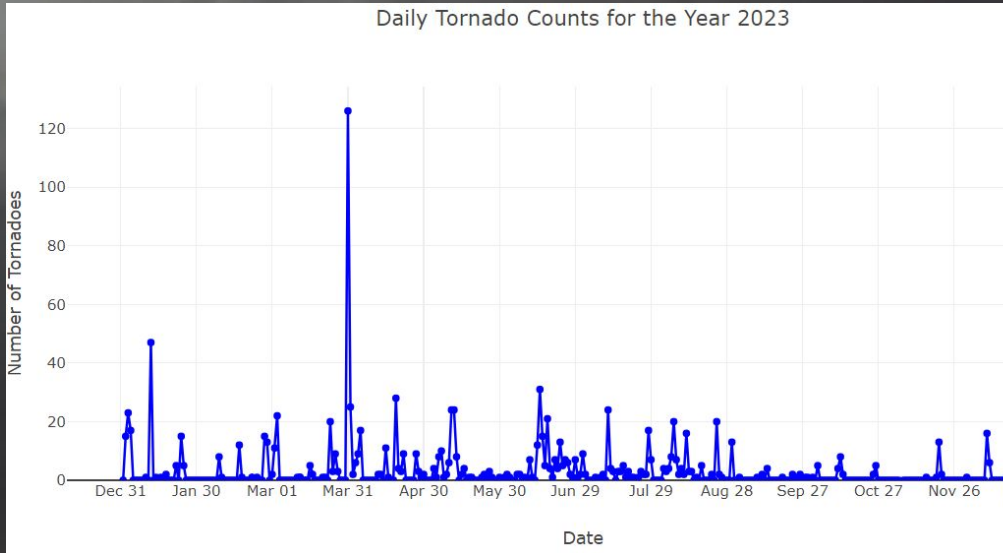
Monthly Tornado Counts for All Months in 2023



Highest activity observed in March with over 200 tornadoes.

April and May see a decline, with secondary peaks in June and August. Sharp drop in tornado activity from September onwards.

Daily Tornado Counts for the Year 2023



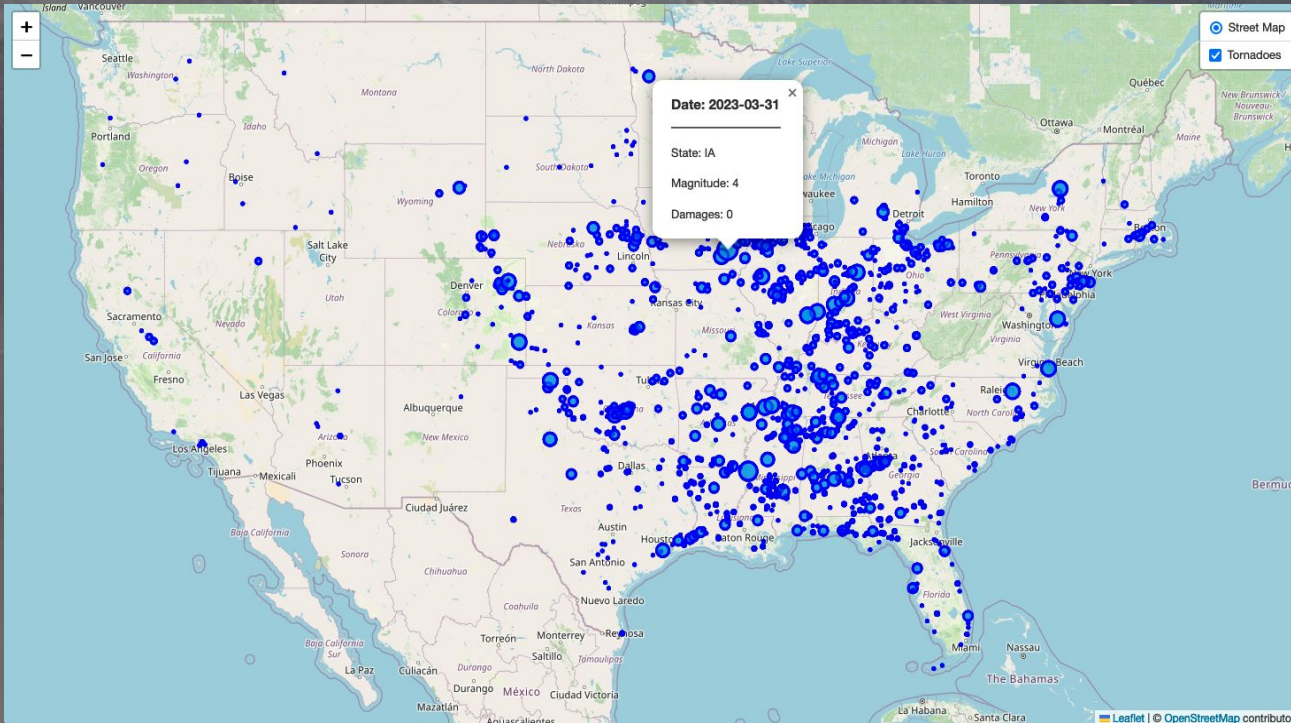
Significant daily variability in tornado counts.

Major spike on March 31st with over 120 tornadoes. Other moderate spikes in late spring and summer.

Plotly.js was leveraged



# Tornado Magnitude



Magnitude is represented by the size of the bubbles on the map

Higher magnitude tornadoes seem to be focused on the central to eastern regions

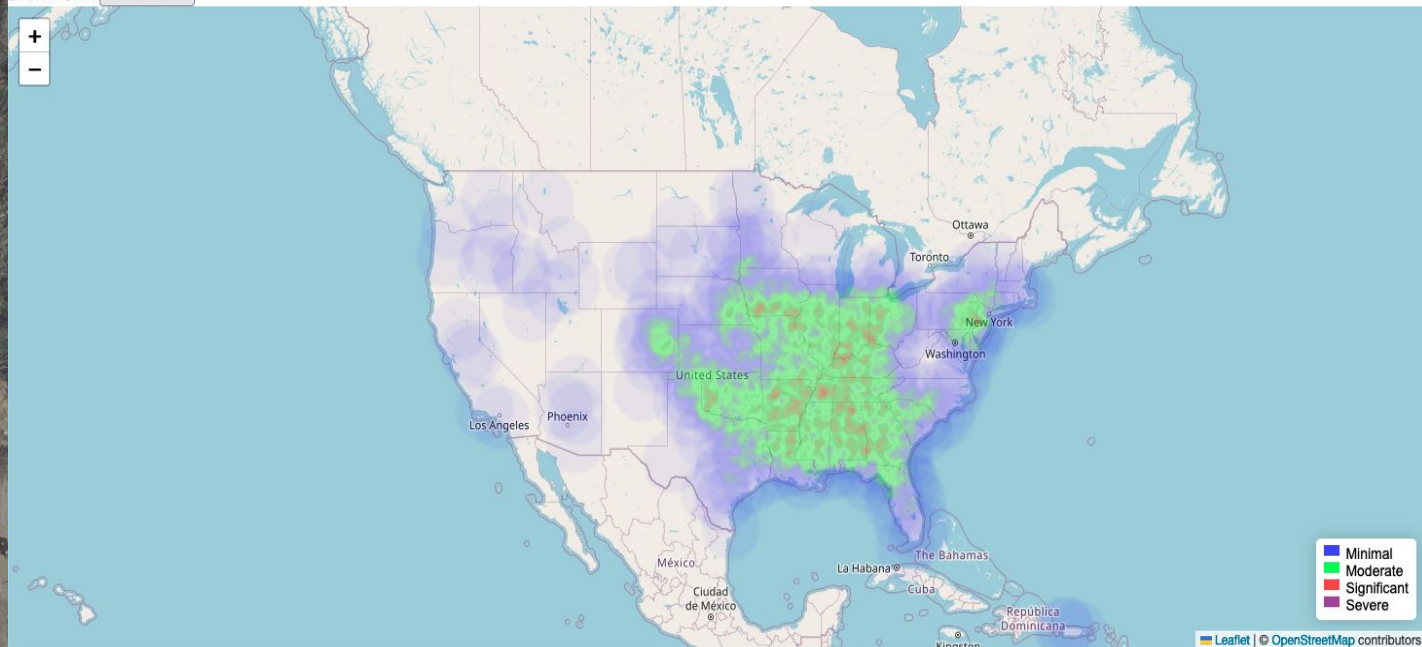
States along the Atlantic and Gulf have tornadoes along the coast, and states along the Pacific have very few on the coast.

Leaflet.js and D3.js were leveraged

# Tornado Damages

## Tornado Damage Heatmap

Select Month: All Months



Tornado damages were heaviest in the Midwest, Southern, and Southeastern regions.

January '23 and March '23 had the highest damages

“Minimal” damages indicate \$0-\$0 (0%-30%).

“Moderate” indicates \$0-\$500 damages (30%-42%). “Significant” indicates \$500-\$5,000 damages (42%-57%).

“Severe” indicates \$5,000-\$300,000 damages (57%-90%).

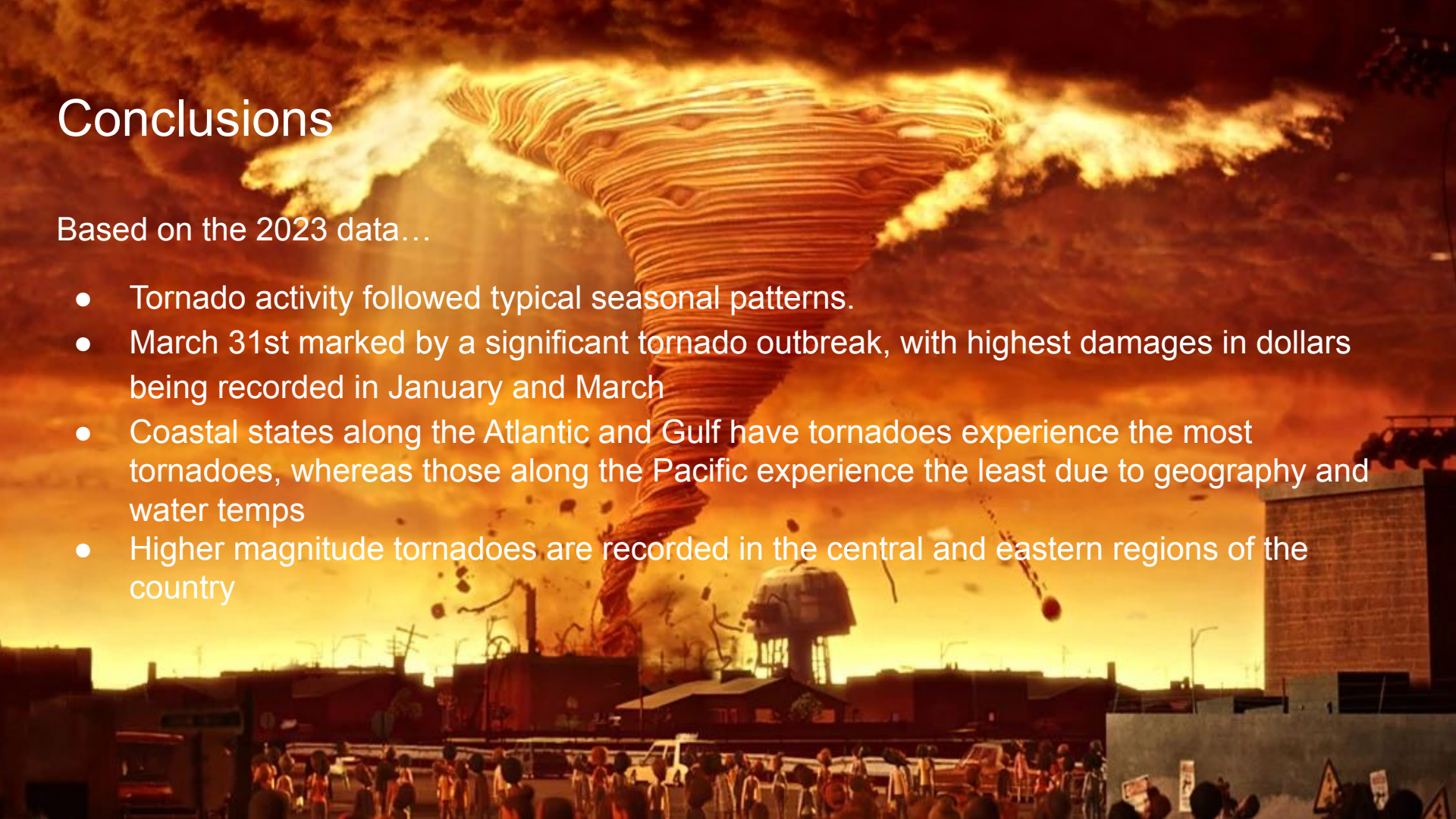
Turf.js and Leaflet.js were leveraged



# Conclusions

Based on the 2023 data...

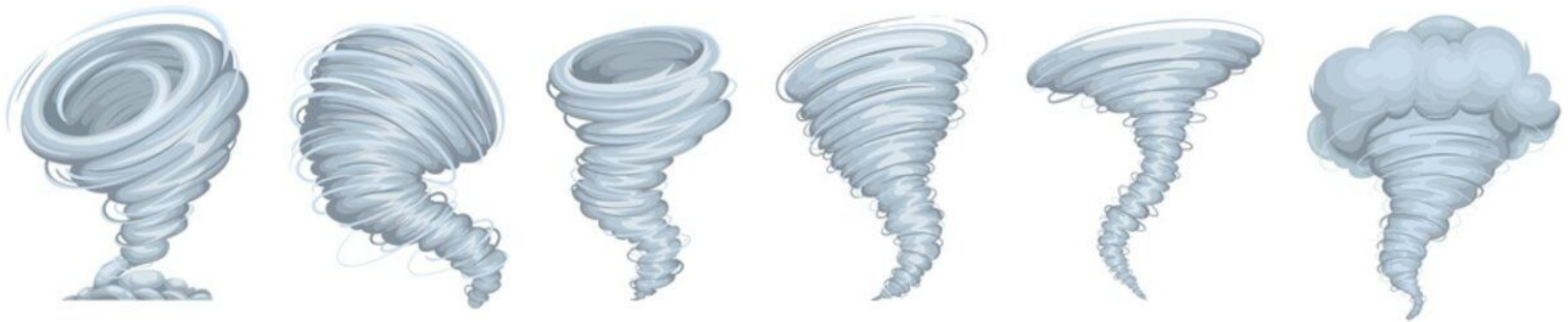
- Tornado activity followed typical seasonal patterns.
- March 31st marked by a significant tornado outbreak, with highest damages in dollars being recorded in January and March
- Coastal states along the Atlantic and Gulf have tornadoes experience the most tornadoes, whereas those along the Pacific experience the least due to geography and water temps
- Higher magnitude tornadoes are recorded in the central and eastern regions of the country





# Ethical Implications

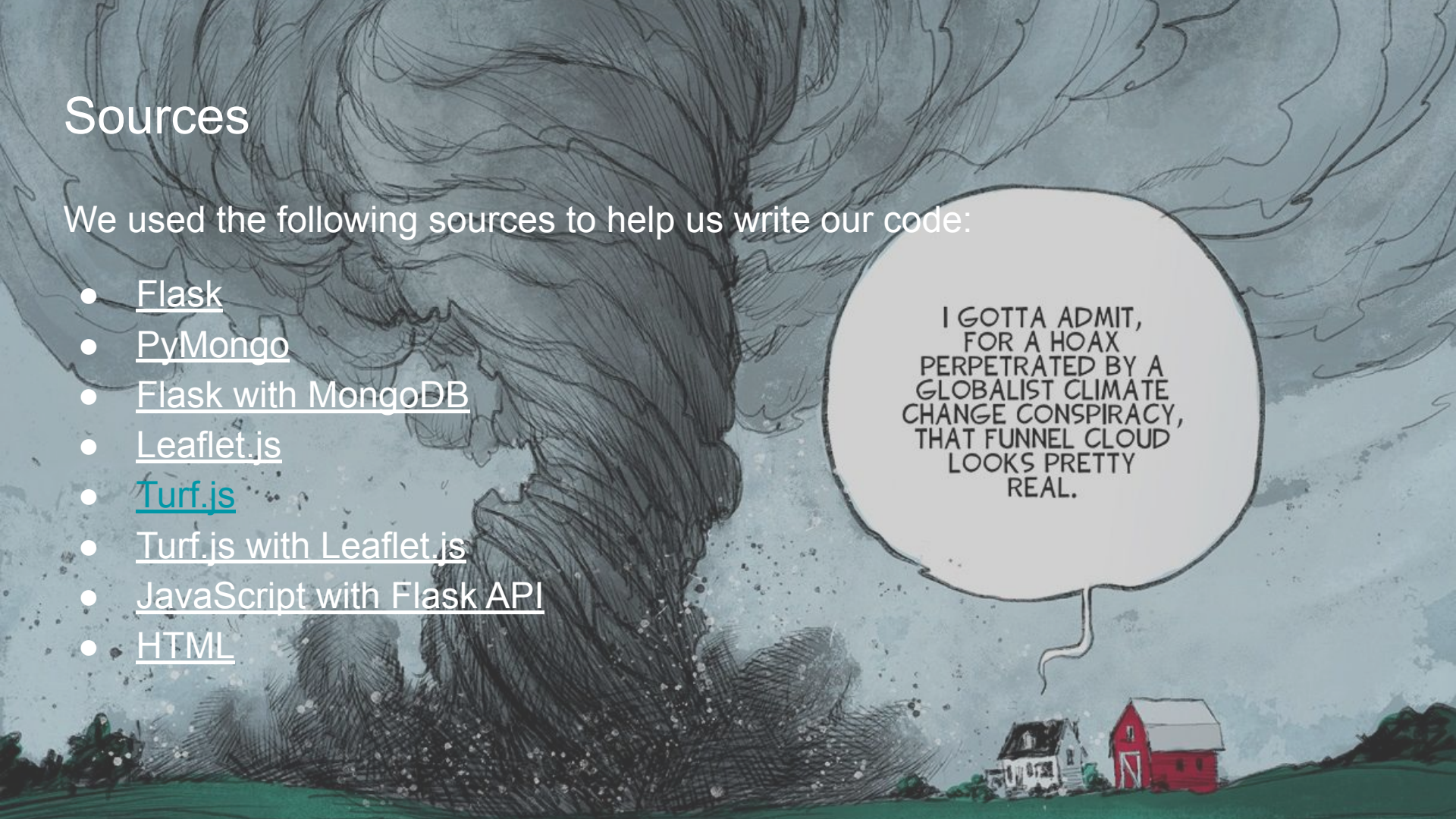
We chose ethically sourced data that is not copyrighted and is free for public use. Due to the non-proprietary nature of the data, there is no issue with us displaying this data in any form. We may want to take into consideration the emotional implications of showing this data—we are not interested in scare tactics. This is purely educational.



# Sources

We used the following sources to help us write our code:

- [Flask](#)
- [PyMongo](#)
- [Flask with MongoDB](#)
- [Leaflet.js](#)
- [Turf.js](#)
- [Turf.js with Leaflet.js](#)
- [JavaScript with Flask API](#)
- [HTML](#)



I GOTTA ADMIT,  
FOR A HOAX  
PERPETRATED BY A  
GLOBALIST CLIMATE  
CHANGE CONSPIRACY,  
THAT FUNNEL CLOUD  
LOOKS PRETTY  
REAL.