COM-480 Milestone 2 - Storm Events in the United States

Luc Harrison, Timo Michoud, Corentin Genton

April 18, 2025

1 Project Goal

Let us make a quick recap of our research questions:

1. How does climate change contribute to the increasing frequency of extreme weather events in the USA?
2. What are the economic and human consequences of the growing occurrence of extreme weather events?
3. How can statistical analyses of past extreme weather events help predict future occurrences ?

Our goal is to create impactful and insightful visualizations that not only deepen the understanding of the Storm Events Database but also reveal meaningful connections to critical global challenges such as climate change. We aim to give users significant freedom to explore the data - by event type, by state, by time period, or through any combination of these dimensions. Alongside this interactivity, we want to provide context and explanations, such as why certain events are more frequent in the United States and particularly in specific states. Additionally, we seek to highlight the growing human and economic costs of these events and assess the influence of climate change on their increasing frequency and severity. We thus still need to "guide" the user in a certain way on certain part of the site.

2 Project structure

The general structure of the website is depicted in Fig.3. The core concept is to begin by presenting data and visualizations concerning climate change in the United States. For example, as illustrated in Fig.1, a choropleth map displays the temperature anomaly across the United States relative to the 1901–2000 average.

Next, the website will present texts, maps, and figures related to storm event data. We aim to familiarize the user with the various types of events that occur in the United States, while also explaining why the country experiences such a wide range of phenomena. For instance, we include a spike map, as illustrated in Fig.2, illustrating the number of events across the U.S and the areas in which they occurred. Similar visualizations can also be used to represent the economic and human costs of those events.

In the final section, we aim to draw connections between our climate change data and the storm events data. For example, we include interactive plots for each state that display both the number of storm events and temperature trends over the years when the user clicks on them. Additionally, we provide explanatory text discussing scientifically established links between these phenomena, along with direct references to research papers for curious readers.

We now list and describe the necessary tools and datasets used for the figures mentioned above. It is worth noting that additional figures and visualizations will likely be added in the future . Those presented here are simply the main examples we are currently considering.

2.1 Visualizations

1. A map displaying temperature anomalies across the United States, highlighting both national warming trends and regional disparities. This visualization is intended to offer clear evidence of climate change and its uneven impact across various parts of the country.

    - Lectures and Tools: Data, Maps/Practical Maps, Interactions, D3.js

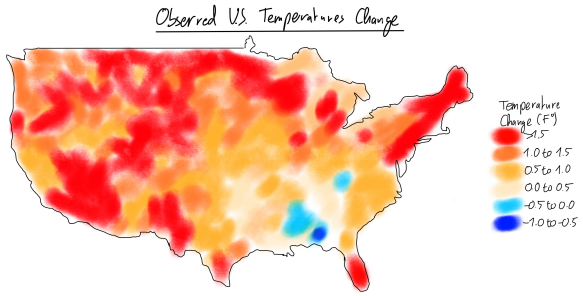

Figure 1: Map of temperature anomalies in the USA.

2. A spike map illustrating the number of storm events across the country, with one spike per county and the height of the spike representing the economic or human cost of such events (can be chosen by the user). The goal of this visualization is to convey a tangible sense of the storms' impact by emphasizing the areas most affected by damage. Through this map, viewers can quickly grasp the scale and intensity of destruction associated with each event.

    - Lectures and Tools: Data, Maps/Practical Maps, Interactions, D3.js

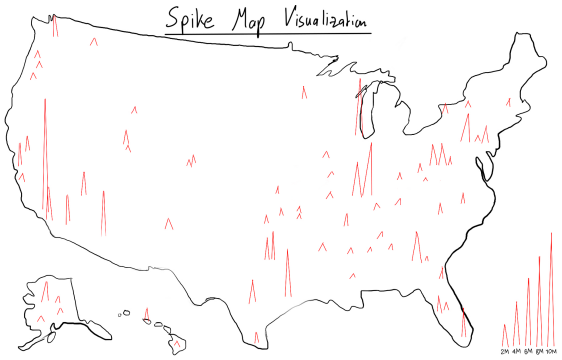

Figure 2: Spike map representing the number of storm events in the USA.

3. An interactive map of the United States with clickable states, providing state-specific plots such as the monthly average temperature over multiple years and the number of storm events over time. This allows users to compare trends across different states (see Fig. 3, third part).

    - Lectures and Tools: Data, Maps/Practical Maps, Interactions, D3.js

3 Additional Ideas

As mentioned earlier, we will certainly add more visualizations, such as an animated map illustrating the evolution of storm events over time, with options to filter by event type or state. This dynamic feature will allow users to observe how different events unfold both geographically and temporally, providing deeper insights into regional patterns and trends.

If time allows, we can also enhance some of the existing visualizations, for example, by enabling the spikes to grow dynamically as the user interacts with the visualization, or by allowing users to click on a state to view the spike map for that state alone. Should time permit further, we could enrich the user experience by incorporating videos of selected events. These videos would serve as powerful visual supplements, helping users better understand the intensity and real-life impact of certain storms.

Figure 3: General sketch of the website