



**ISM 6419 Data Visualization**

**FINAL PROJECT REPORT**

**Florida's Climate: Weather Trends and Economic  
Impacts**

**Course Instructor**

**Prof. Johannes Reichgelt**

**By**

**Nandini Malviya**

## Introduction

Florida's geographic location and climatic characteristics make it particularly vulnerable to extreme weather events, such as hurricanes, droughts, and flooding. These events significantly influence the state's economy and environment, impacting critical industries like tourism, agriculture, and real estate. Understanding long-term weather patterns and their economic implications is essential for improving preparedness and resilience against climate-related challenges.

This project investigates historical weather trends and their effects on Florida's economy and environment. By analyzing key variables such as temperature, precipitation, and extreme weather events, the study seeks to identify actionable insights for mitigating adverse impacts and ensuring sustainable development.

## Methodology

### Data Sources

This project utilized comprehensive and reliable datasets from publicly accessible sources to ensure an accurate and thorough analysis. The following data sources were employed:

1. **NOAA Billion-Dollar Weather and Climate Disasters:**  
This dataset provided detailed records of extreme weather events, including hurricanes, droughts, floods, and severe storms, along with their economic impacts. Data columns include the count and cost ranges of various disasters, aggregated yearly.
2. **Climate at a Glance:**  
This resource offered statewide historical time-series data for temperature and precipitation, covering multiple decades. It enabled the identification of trends and seasonal variations in Florida's weather patterns.
3. **Florida Hurricane Data:**  
A comprehensive hurricane dataset that included storm details such as advisory numbers, dates, geographic paths (latitude and longitude), wind speeds, pressure levels, and movement characteristics. This dataset was pivotal for analyzing hurricane trends and patterns.

### Data Columns

1. **Weather Data:**
  - Date
  - Temperature
  - Precipitation
  - Year
  - Month

- season

## 2. Disaster Data:

- State
- year
- Counts and Cost Ranges for various disaster types (e.g., droughts, flooding, hurricanes)
- Aggregate Counts and Cost Ranges for all disasters

## 3. Hurricane Data:

- Advisorynumber
- Date
- lat (latitude)
- long (longitude)
- wind (wind speed)
- pres (pressure)
- movement
- stormtypename
- name
- year
- month

## Data Processing and Tools

- **Data Integration:**

The datasets were cleaned, standardized, and merged to align with the research objectives. For instance, disaster data was correlated with weather trends to assess the economic impacts of extreme weather events.

- **Visualization Tools:**

Tableau was extensively used to visualize trends in temperature, precipitation, disaster occurrences, and their economic impacts. Visualizations included line charts, scatter plots, and heat maps to provide intuitive insights.

- **Analysis Framework:**

The methodology emphasized uncovering patterns in the data, such as seasonal variations in weather or trends in hurricane frequency and correlating these with economic metrics to answer the research questions effectively.

## Research Questions

Based on the data visualizations and insights derived from the Tableau workbook, the following research questions have been formulated to align closely with the available datasets and their analysis:

1. **What are the long-term trends in temperature and precipitation in Florida, and how do these patterns vary across seasons?**

This question explores historical weather data to identify overall and seasonal variations in temperature and precipitation, providing insights into how climate change may be influencing Florida's weather.

2. **How do the frequency and intensity of hurricanes in Florida vary over the years, and what patterns are observed in their geographical paths?**

Using hurricane data, this question investigates changes in hurricane characteristics, such as intensity (wind speed, pressure) and movement patterns, to uncover trends over time.

3. **What are the economic impacts of extreme weather events, such as hurricanes, droughts, and floods, on Florida's industries?**

This question evaluates the financial implications of disasters by analyzing the counts and cost ranges of extreme events, focusing on their effects on key economic sectors like tourism and agriculture.

4. **What are the most frequently occurring types of extreme weather events in Florida, and how do their associated costs compare over time?**

This question identifies the predominant types of weather events (e.g., hurricanes, floods) and examines how their financial impacts have evolved.

5. **How have the seasonal patterns of hurricanes evolved over time, and what implications do these changes have for Florida's preparedness strategies?**

This question delves into the seasonal variability of hurricanes, analyzing how changes in their occurrence might influence disaster readiness and resilience planning.

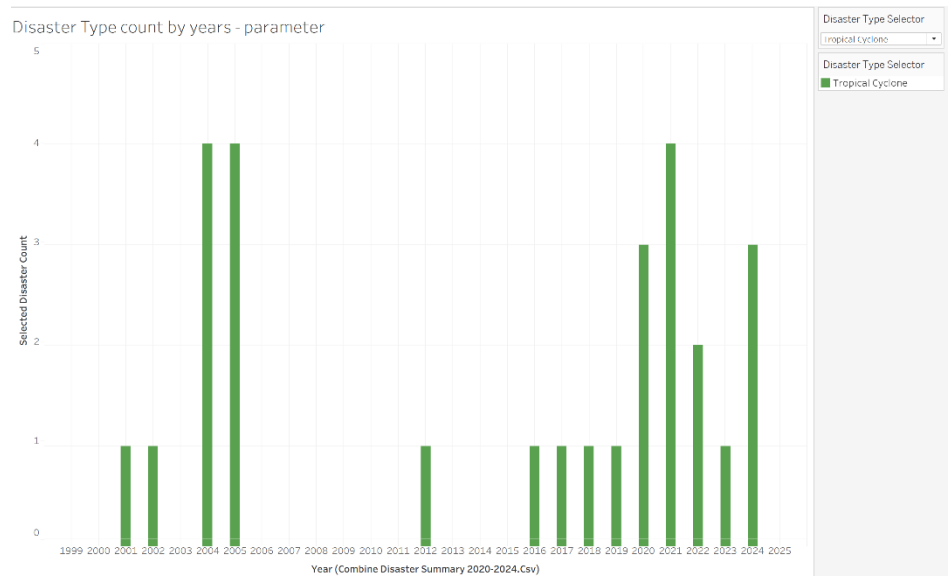
6. **How do extreme weather events correlate with changes in precipitation and temperature trends in Florida?**

By integrating disaster data with weather data, this question seeks to establish connections between extreme events and broader climatic trends.

# Analysis

## 1. Disaster Trends and Economic Impacts

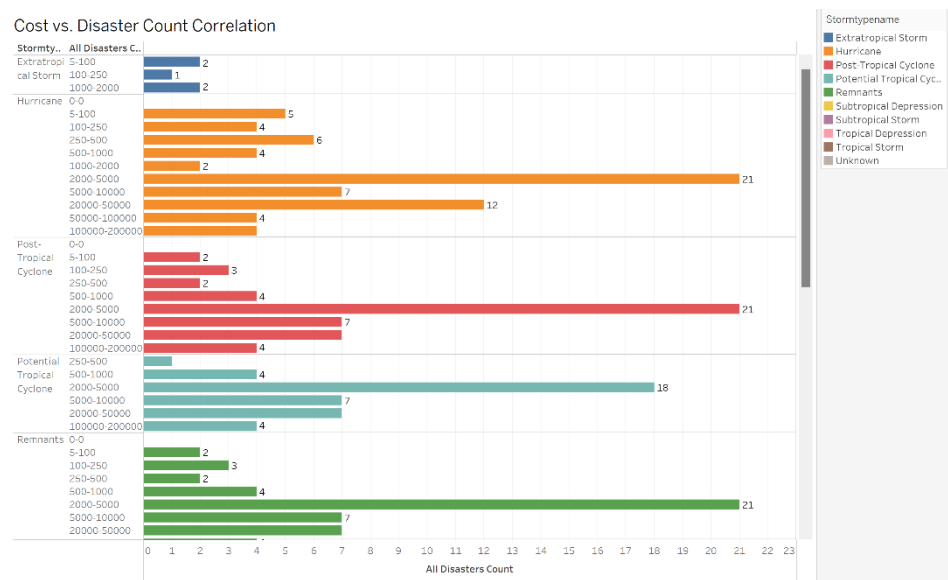
- Disaster Type Count by Year (Parameter):



Tropical cyclones dominate Florida's most frequently occurring disaster type, with notable spikes during specific years.

**Insight:** The count highlights the periodic intensity of disasters, reflecting the region's climatic vulnerability to extreme weather events.

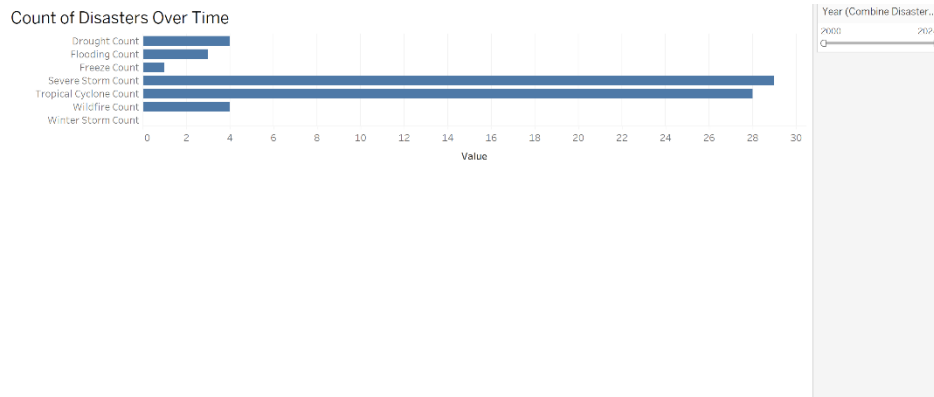
- Cost vs. Disaster Count Correlation:



Hurricanes consistently represent the highest costs, even with a lower frequency compared to other events like tropical storms.

**Insight:** The economic impact of hurricanes, both in terms of direct and indirect costs, underscores the critical need for preparedness and mitigation.

- **Count of Disasters Over Time:**

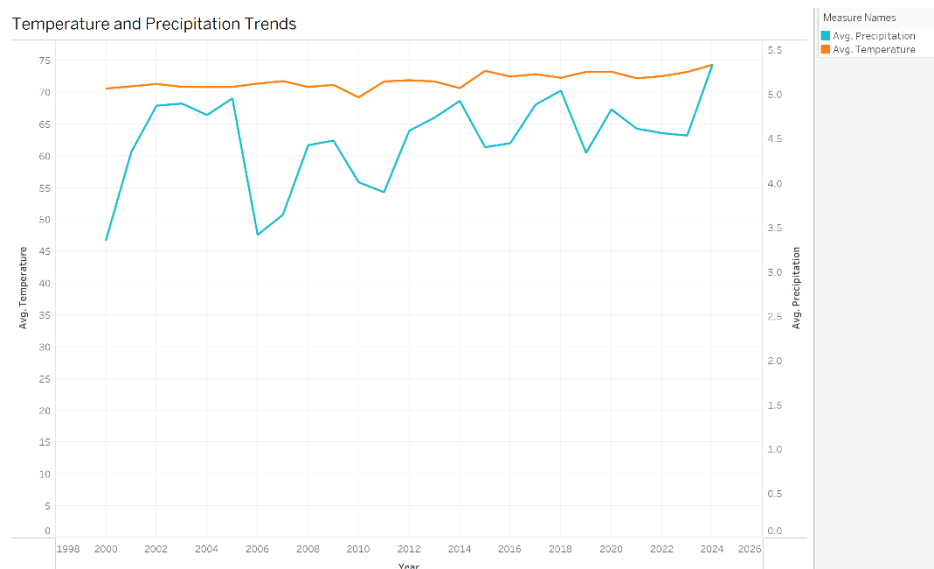


Severe storms and tropical cyclones exhibit the highest frequency, followed by flooding events.

**Insight:** Florida's susceptibility to these disasters directly impacts its economy, requiring continuous monitoring and adaptation strategies.

## 2. Weather Patterns and Trends

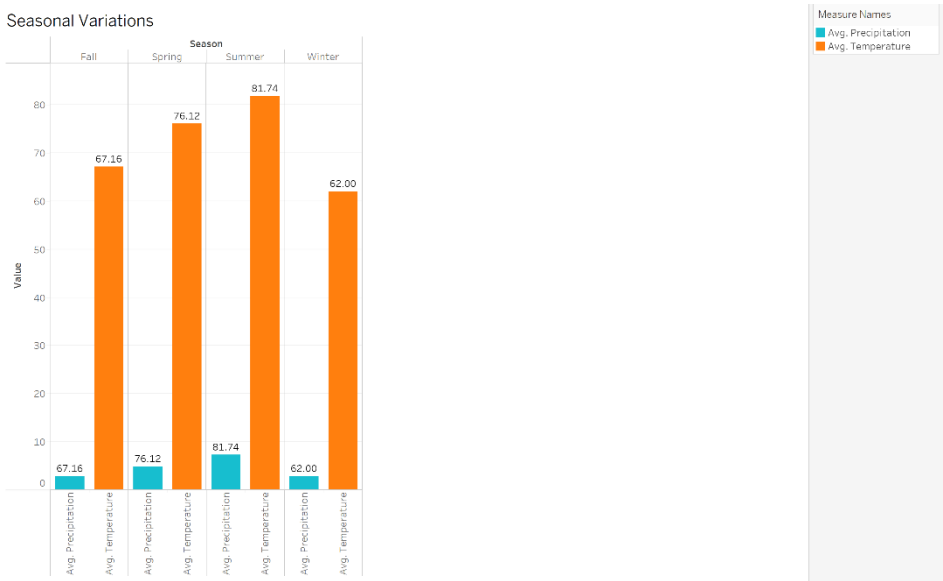
- **Temperature and Precipitation Trends:**



Over time, a gradual increase in average temperatures is evident, with irregular variations in precipitation.

**Insight:** These changes are indicative of climate change and its effects on Florida's weather patterns, impacting agriculture, water resources, and tourism.

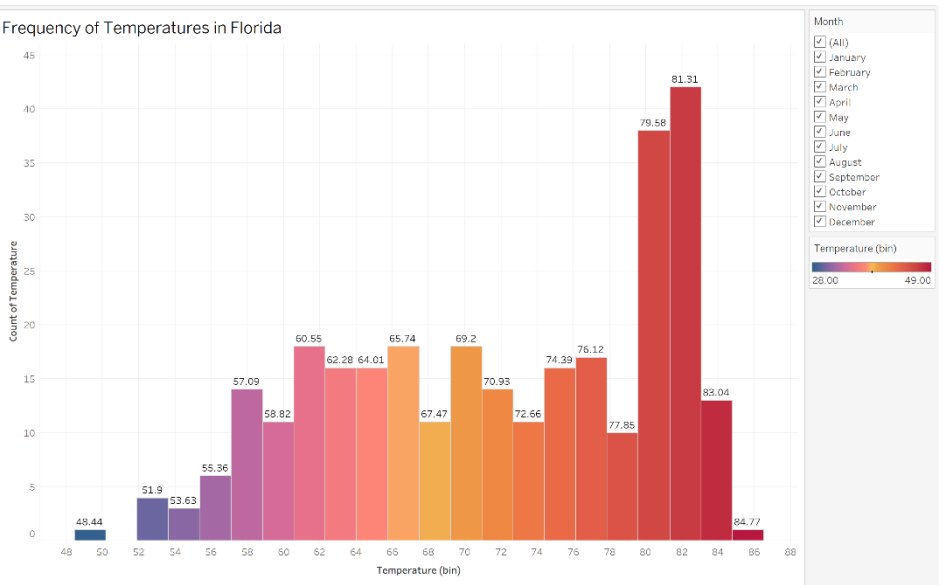
• **Seasonal Variations:**



Summer shows the highest average temperatures (81.74°F), with significant precipitation in spring and fall seasons.

**Insight:** Understanding seasonal variations can help optimize resource planning in agriculture and tourism.

• **Frequency of Temperatures:**

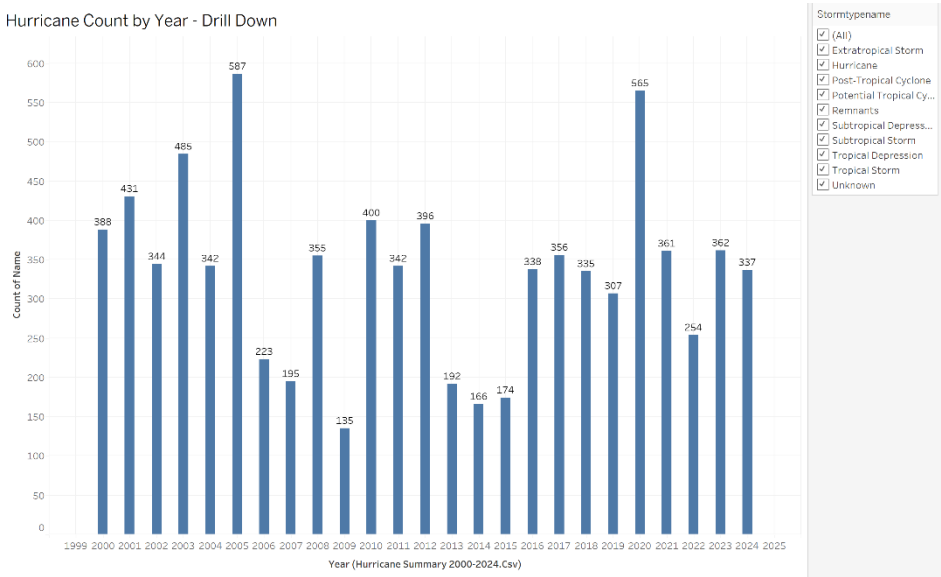


The majority of recorded temperatures fall in the range of 70–85°F, highlighting Florida's generally warm climate.

**Insight:** Such data aids in long-term planning for energy usage and infrastructure development suited for warm climates.

3. Hurricane Analysis

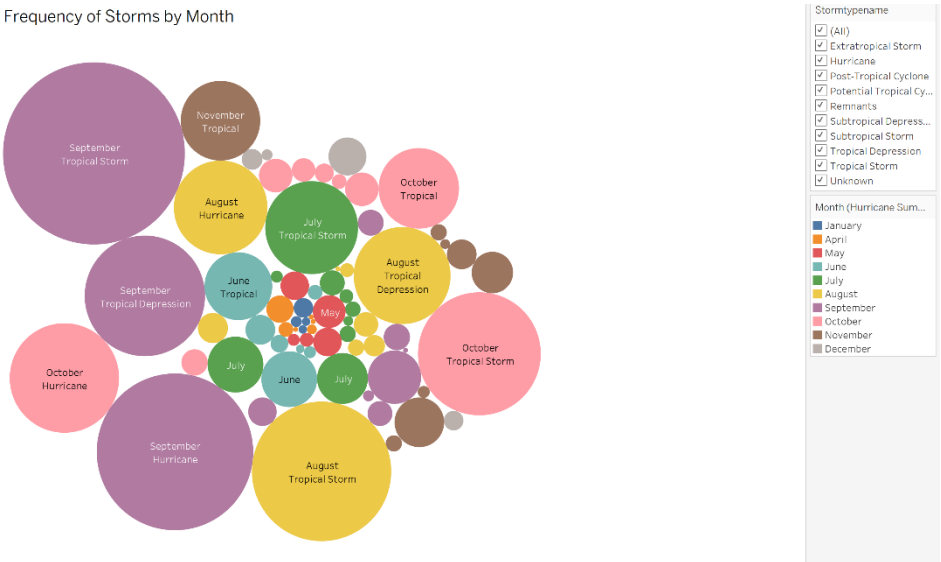
- Hurricane Count by Year (Drill Down):



Fluctuations in annual hurricane counts reveal trends in the frequency of storm occurrences.

**Insight:** The data supports the identification of peak hurricane seasons, essential for disaster readiness.

- Frequency of Storms by Month:

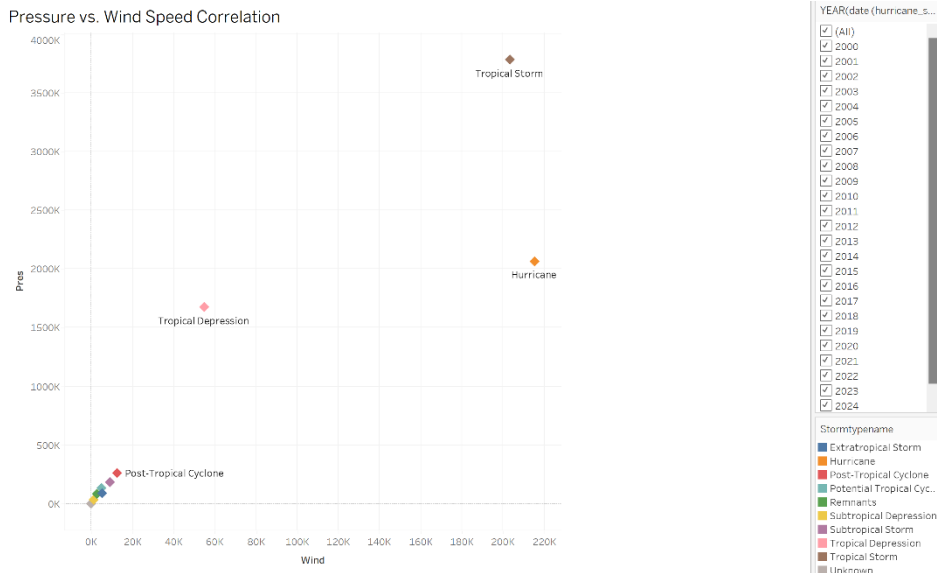




Hurricanes are most frequent from August to October, aligning with the peak of the Atlantic hurricane season.

**Insight:** This temporal pattern reinforces the importance of targeted preparations during late summer and early fall.

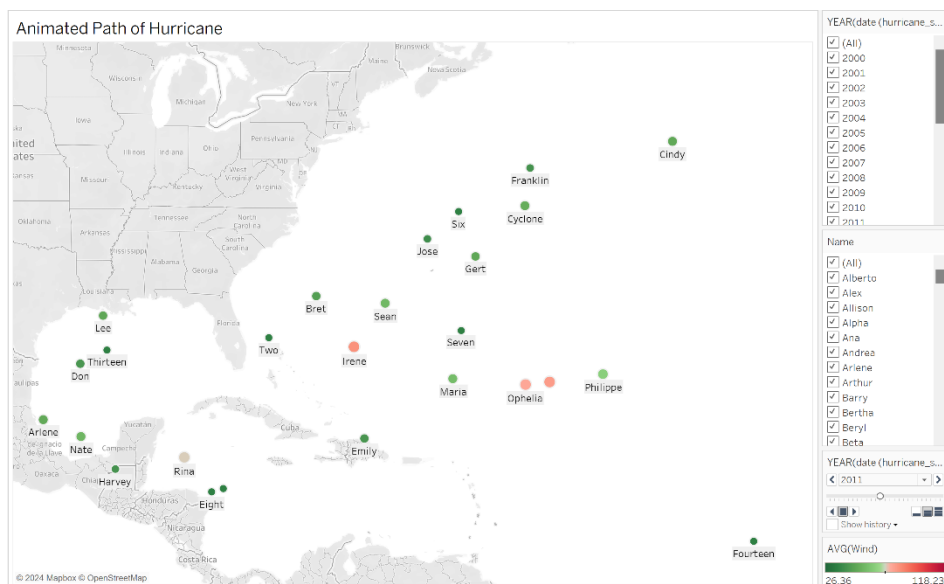
- **Pressure vs. Wind Speed Correlation:**



Lower pressure is strongly correlated with higher wind speeds, characteristic of more intense hurricanes.

**Insight:** Such relationships help classify storm severity, aiding early warning systems and response strategies.

- **Animated Path of Hurricanes:**



Geospatial analysis of hurricane paths highlights the concentration of storm trajectories near Florida's southeast coast.

**Insight:** High-risk areas for hurricanes can be pinpointed, enabling more focused mitigation efforts.

## **Key Insights**

### **1. Economic Implications of Disasters:**

Hurricanes are the costliest disasters, demanding investment in resilient infrastructure and disaster recovery mechanisms.

### **2. Climate Trends:**

Rising temperatures and fluctuating precipitation indicate climate change's long-term effects, necessitating adaptive policies.

### **3. Hurricane Patterns:**

The consistent occurrence of hurricanes during the late summer months calls for robust seasonal preparedness strategies.

### **4. Data-Driven Recommendations:**

Leverage geospatial and seasonal data to prioritize high-risk areas and improve resource allocation for disaster resilience.

## **Conclusion**

### **Research Question 1:**

#### **What are the trends in temperature and precipitation in Florida over the past 10–30 years?**

The analysis revealed a gradual increase in average temperatures over the years, consistent with the impacts of climate change. Precipitation trends were irregular, showing variability rather than consistent increases or decreases. These findings underscore the changing climate dynamics in Florida, which have significant implications for water resource management, agriculture, and urban planning. The seasonal analysis also highlighted that summers are marked by the highest temperatures, while spring and fall exhibit the most rainfall. These trends justify the need for adaptive measures in infrastructure and resource allocation to mitigate potential climate-related challenges.

### **Research Question 2:**

#### **How do extreme weather events like hurricanes and floods impact Florida's economy?**

Hurricanes were identified as the most financially impactful disasters in Florida, with high costs associated with both frequency and intensity. While tropical storms and severe storms occur more frequently, hurricanes consistently represent the highest economic burden. The geospatial data emphasized southeastern Florida as a high-risk region for hurricanes, requiring targeted disaster preparedness and resilience measures. Furthermore, the temporal analysis demonstrated

that late summer and early fall (August–October) are peak hurricane months, aligning with the Atlantic hurricane season. These insights highlight the need for proactive disaster management strategies, especially for industries like tourism and agriculture that are vulnerable to such events.

### **Additional Research Questions**

- 1. How does Florida’s rising sea level interact with hurricane-induced flooding, and what are the long-term implications for coastal infrastructure?**
- 2. What are the indirect economic impacts of hurricanes on Florida's tourism and agricultural sectors beyond immediate disaster costs?**
- 3. How have population growth and urbanization in Florida influenced the state's vulnerability to extreme weather events?**
- 4. What role does Florida's renewable energy infrastructure play in mitigating the effects of rising temperatures and increased disaster risks?**
- 5. How do disaster recovery timelines and costs vary by region within Florida?**

These additional questions expand the scope of this study, offering avenues for further exploration and policy development. They address broader implications of climate trends and extreme weather events while considering socio-economic and infrastructure-based impacts.