Integrated Multi-Hazard and Vulnerability Modelling for Flood Risk Assessment in the US Gulf Coast

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1. Background

More than 65% of the world's population will live in cities by 2050, and flood hazards are a threat to a proportion of the world's population[1]. Gulf Coast exposures have seen a compound annual growth rate of about 4% over the past decade, and the intensity and frequency of strong hurricanes *(Category 4 and 5, Saffir Simpson Scale)* are likely to increase[2]. A non-commercial model for researchers to measure resilient strategies for managing coastal risks has become increasingly essential[3].

2. Research Aim

This research aims to develop a statistical catastrophe model based on individual events to forecast the total losses caused by high wind speeds (such as tropical cyclones and hurricanes) and their impact on precipitation and flooding, using probabilistic and statistical modelling techniques.

3. Objectives

- Developing a hazard model to quantify the impact of windstorms and heavy rainfall.
- Constructing a statistical-based vulnerability model for estimating losses in individual buildings.

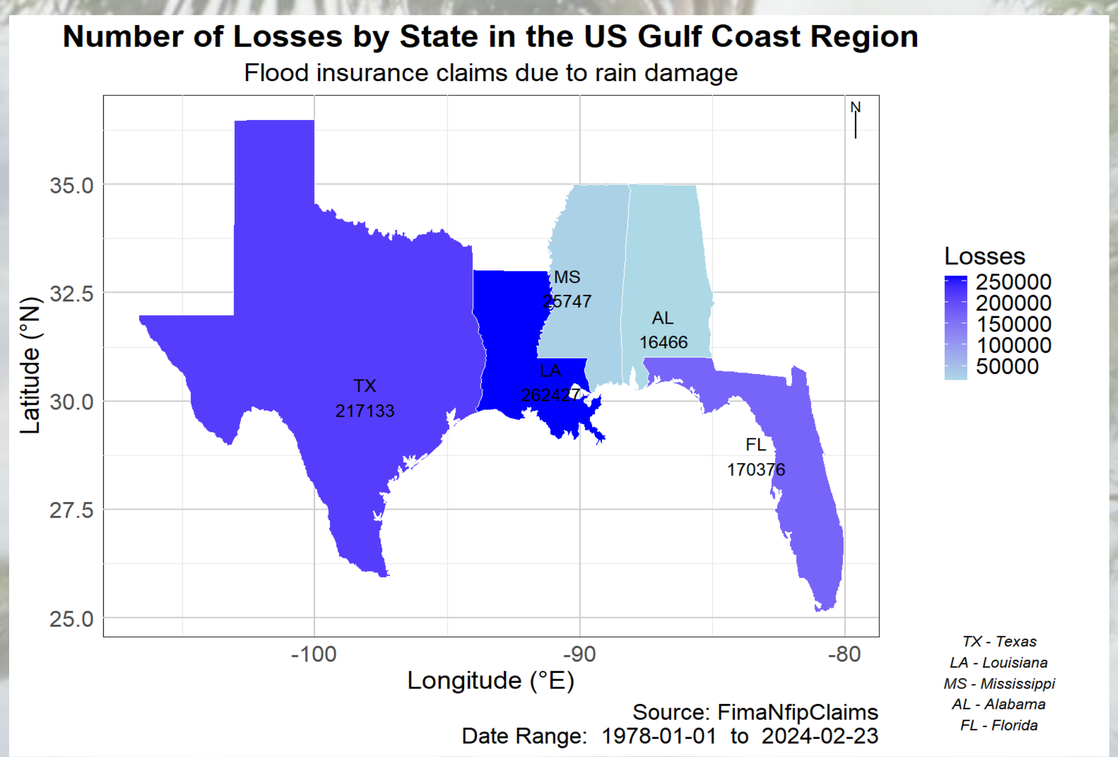


Figure 1: Number of Losses by State in the US Gulf Coast Region

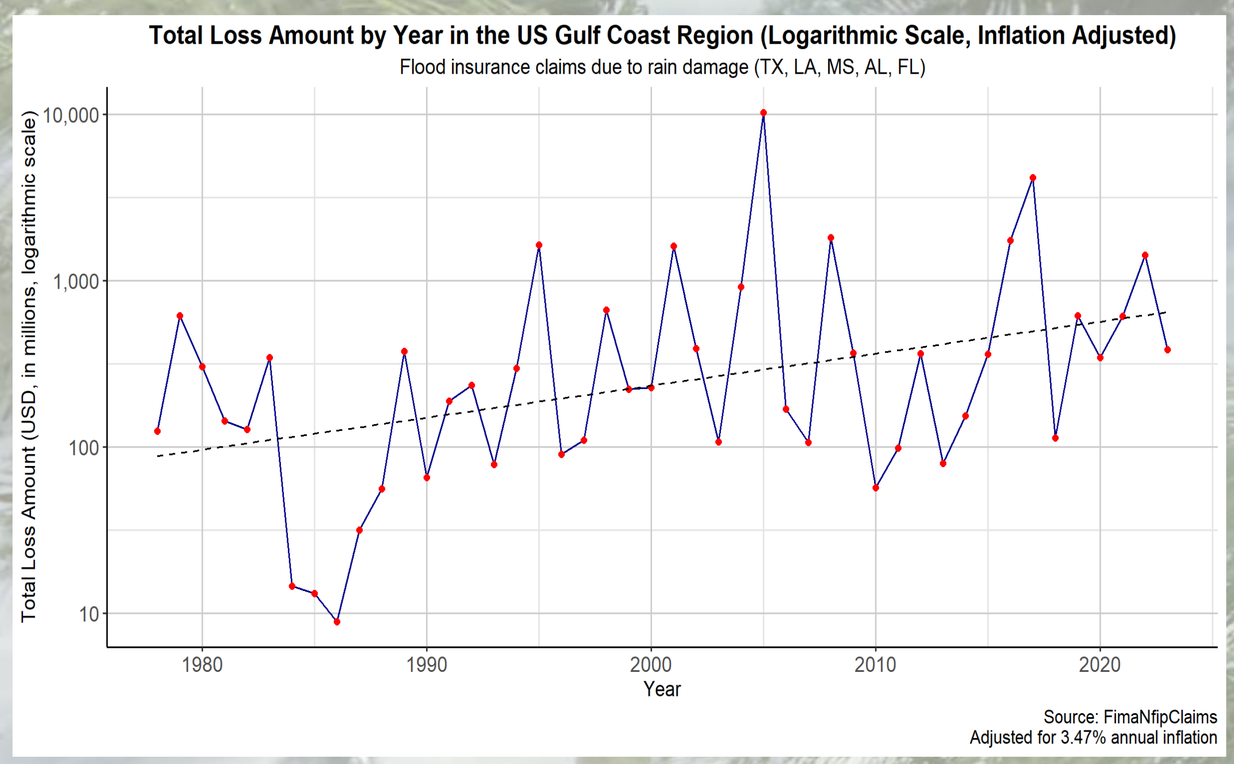
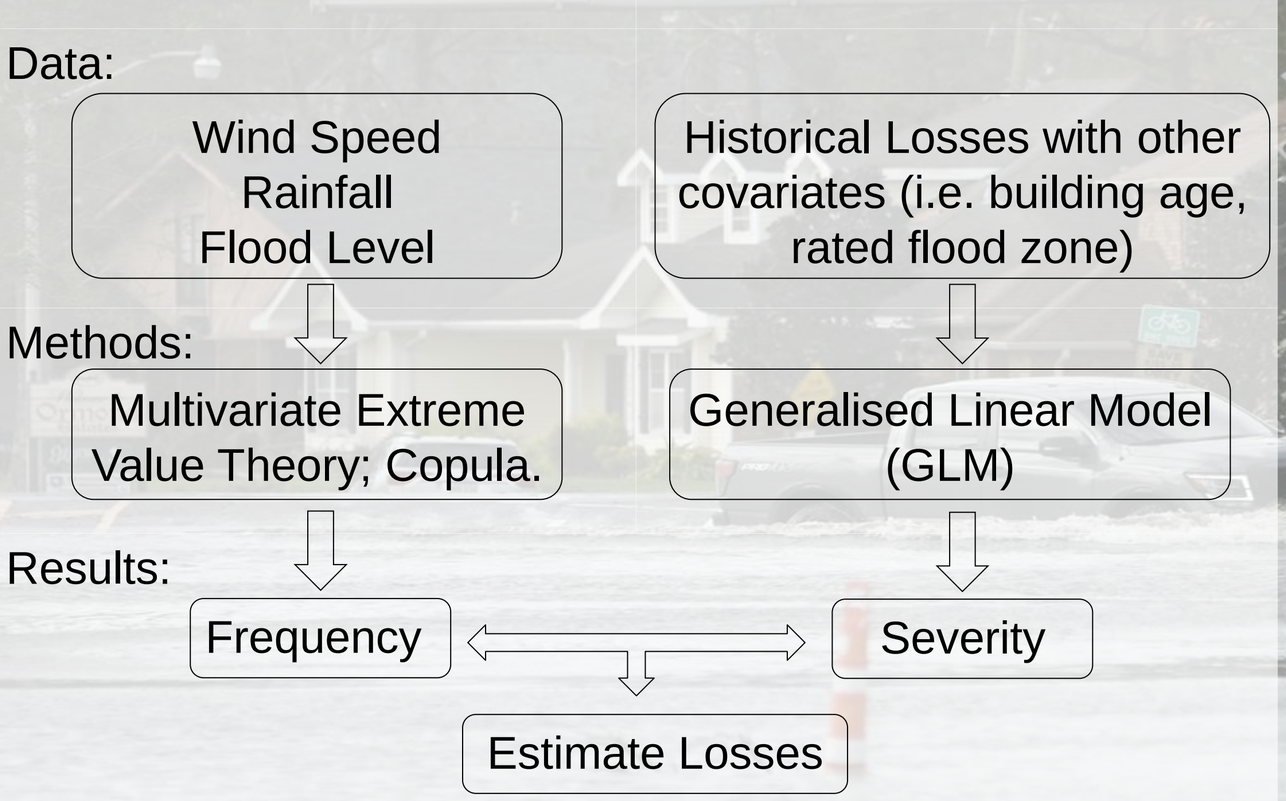


Figure 2: Total Loss Amount by Year in the US Gulf Coast Region

4. Methodology



5. Data Sources

- NCEI Climate Data Online (CDO);
- Open FEMA Dataset

6. Expected Outcome and Potential Applications

The expected outcome is the direct losses from coastal wind surge events and the exceedance probability for specific loss amounts. The expected outcome is a tool that can help us manage and understand the risks associated with wind-related hazards and their cascading effect, potentially contributing to disaster management, urban planning, and the insurance and reinsurance industry.

7. Future Work

Future work will focus on refining the model's accuracy, expanding its applicability to different geographic regions, and incorporating high-resolution mapping will further enhance the model's utility.

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