

Predicting the Annual and 10-Year Hurricane Frequencies in Florida and Texas

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Abstract: Frequency of annual and 10-year cycle of hurricanes along Florida and Texas was represented by using the Bayesian analysis and Poisson distribution based on the data collected for the past 158 years. The average number of hurricanes in a 10-year cycle in Florida and Texas were 6.38 and 3.15 respectively. The annual average hurricanes per year in Florida and Texas were 0.56 and 0.54 respectively.

1. Introduction

Florida and Texas are the two most populated states in the U.S. that will be affected by the hurricanes originating from the Atlantic Ocean or Gulf of Mexico. Over 70% of Floridians and 25% of Texans live along the coast in the respective states. Texas's position at the northwestern region of the Gulf of Mexico makes it vulnerable to hurricanes. Some of the most destructive hurricanes in U.S. history have impacted Texas. A hurricane in 1875 killed approximately 400 people in Indianola, followed by another hurricane in 1886 that destroyed the town, which was at the time the most important port city in the state. This allowed Galveston to take over as the chief port city, but it was subsequently devastated by a hurricane in 1900 that killed approximately 8,000 people (possibly as many as 12,000), making it the deadliest natural disaster in U.S. history. Other devastating Texas hurricanes include the 1915 Galveston Hurricane, Hurricane Audrey in 1957, which killed over 600 people, Hurricane Carla in 1961, Hurricane Beulah in 1967, Hurricane Alicia in 1983, Hurricane Rita in 2005, and Hurricane Ike in 2008 [Blake et al. 2007].

Florida has had more than its fair share of hurricanes. Florida Keys Labor Day Hurricane (1935) was one of the most intense land falling U.S. hurricanes in recorded American history. The winds were estimated up to 250 miles per hour. This intense storm (category 5) caused significant damage. Hundreds of World War I veterans who had been sent to the Keys to build the Overseas Railroad were killed. The storm surge floated an entire train away. Hurricane Katrina in 2005 was the largest natural disaster in the history of the United States. At least 1,836 people lost their lives in the actual hurricane and in the subsequent floods, making it the deadliest U.S. hurricane since the 1928 Okeechobee hurricane. Total damage was \$81 billion (2005 USD) [Knabb et al. 2007].

2. Objectives

The Objective of this study was to investigate the annual and 10-year cycle of hurricane frequencies in Florida and Texas.

3. Analyses

Observational information on past hurricane activity is available from instrumental records and historical accounts, with the historical accounts having a greater degree of uncertainty. The Bayesian statistical approach provides a rational and coherent foundation for using all available information, while explicitly accounting for differences in uncertainty (Elsner et al. 2001).

The arrival of hurricanes on the coast can be considered a Poisson process. The probability of h hurricanes occurring in T years is, $f(h | \lambda, T) = \exp(-\lambda T) (\lambda T)^h / h!$; ($h=0,1,2,\dots$), where T is 10 for 10-

yr cycle analyses. By analyzing 150 data (1851-2000) from NOAA data base (<http://www.nhc.noaa.gov>), the parameter λ for Texas was 3.15; the parameter λ for Florida was 6.38. The number of hurricanes in Florida was twice as larger than Texas in 10-yr cycles.

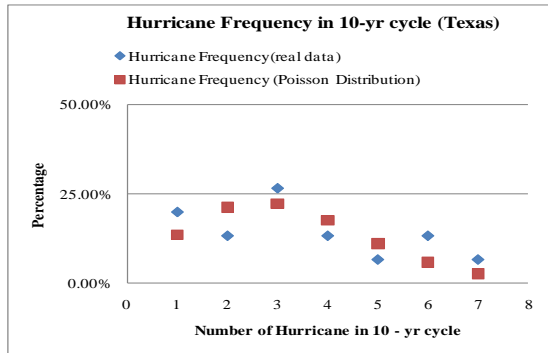


Figure 1. Hurricane Frequency in 10-Year Cycle (Texas)

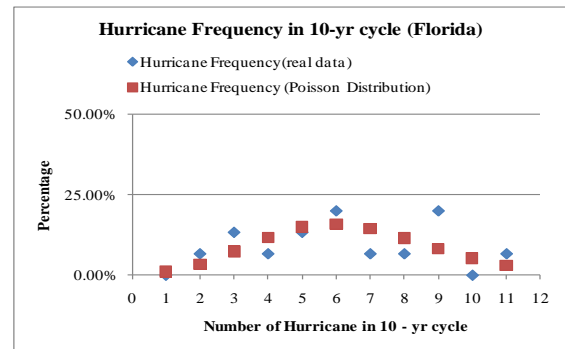


Figure 2. Hurricane Frequency in 10-Year Cycle (Florida)

For Frequency of Hurricane per year, $f(h)=\exp(-\lambda)\lambda^h/h!$; ($h=0,1,2,\dots$), where h is the number of hurricane per year, λ is the expected number of hurricanes during a year. By analyzing 158 data (1851-2008) from NOAA, the parameter λ for Florida was 0.56. It means the probability for hurricane in Florida is 0.56 each year. λ for Texas was 0.54[Vipulanandan et al.2009].

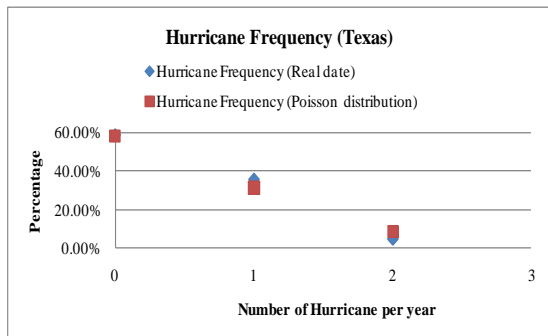


Figure 3. Hurricane Frequency (Texas)

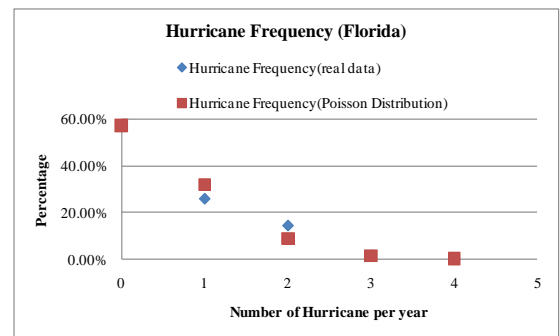


Figure 4. Hurricane Frequency (Florida)

4. Conclusions

The frequency of annual number of hurricanes and the 10-yr cycles can be represented by the Poisson’s distribution. Florida has had more than double the amount of hurricanes in Texas.

5. Acknowledge

The study was supported by the THC-IT (<http://egr.uh.edu/hurricane>).

6. References

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