Hurricane Predictions for Year 2023 in the Gulf of Mexico Coast and Texas

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1. Abstract

It is of interest to predict the number of hurricanes expected during the hurricane season in the year 2023 in the Gulf of Mexico. Total hurricanes for 2023 in the Atlantic region predicted by the Colorado State University (CSU) and the North Carolina State University are 6 and 6 to 8 respectively. The National Oceanic and Atmospheric Administration (NOAA) varied from 5 to 9 with 70% probability. None of these agencies predict the possibility of hurricanes in the Gulf of Mexico except for the Texas Hurricane Center for Innovative Technology (THC-IT). In the 10 year cycle Gulf Coast has already had 14 hurricanes and Texas has had 3 hurricanes. Based on THC-IT prediction, the probability of no hurricane for the Gulf of Mexico in 2023 was 33% for one year cycle and 37% for 10 year cycle. Also based on the THC-IT prediction, the **probability of no hurricane** for Texas in 2023 was 69% for one year cycle and also for the 10 year cycle.

2. Introduction

Hurricane initiation and movement in the Atlantic ocean, Gulf of Mexico and Carrabin sea are influenced by many factors including sea surface temperatures, humidity and Pacific ocean temperatures. Several institutions keep predicting the hurricane probability and total number for the Atlantic hurricane season each year. CSU has been predicting hurricane for the past 30 years. The CSU Tropical Meteorology Project has made forecast of the upcoming season's Atlantic basin hurricane activity. Its research team has shown that a sizable portion of the year-to-year variability of Atlantic tropical cyclone (TC) activity can be hind cast with skill exceeding climatology. The Texas Hurricane Center for Innovative Technology (THC-IT) has developed a hurricane prediction model based 166 years of data with a Poisson distribution and started to predict hurricane for Gulf of Mexico (GOM) and every state along GOM since 2009. Total hurricane in the year 2016 predicted by CSU, FSU and NOAA varied from 4 to 8 for year 2016, THC-IT predicted probability of no hurricane for Texas and GOM varied from 6.4% to 71% and 1.8% to 53% (1 year to 10 year cycle) respectively, and there was one hurricane in GOM and no hurricane in Texas. The Climate Prediction Center (CPC) at NOAA predict the climate variability, real-time monitoring of climate and the required data bases, and assessments of the origins of major climate anomalies.

3. Objectives

The objective was to review and summarize the hurricanes predicted by the CSU, and NOAA for the year 2023 Atlantic hurricane season. Also the probabilities of hurricanes predicted by the THC-IT is based on the 1 year and 10 years cycles for Texas and Gulf Coast of the United States are summarized.

4. Analyses

Hurricane prediction by CSU, FSU, NOAA for 2022 Atlantic hurricane season are summarize in Table 1 with remarks. For 2023, the number of hurricanes varies from 5 to 9. The Frequency of Hurricane per year

as estimated by THC-IT using f(h)=exp(-λ)xλ^h/h!; (h=0,1,2,…), where h is the number of hurricane per year, λ is the expected number of hurricanes during a year. By analyzing 172 data (1851-2022) from NOAA, the parameter λ for Texas and the Gulf Coast of the United States were 0.35 and 1.1. It means the probability for hurricane per year in Texas and the Gulf Coast (one year cycle) of the United States is 35% and 100% each year respectively. The probability of h hurricanes occurring in T years is, f(h| λ, T)=exp(-λT)x(λT)^h/h!; (h=0,1,2,…), prediction of hurricane probability in 2023 is based on different year cycles (T = 1,2,... ,10) simulation and calculations (Liu and Vipulanandan,2010; Elsner and Bossak,2001) and summarized in Table1.

Table 1. THC Hurricane Prediction in the Gulf of Mexico for Year 2023 (June 1, 2023) (https://hurricane.egr.uh.edu)

Forecaster (Comment)	Date of forecast	Number of Atlantic Storms	Number of Hurricanes	Number of Major Hurricanes	Number of Hurricanes entering the Gulf of Mexico	Number of Hurricanes entering Texas
Colorado State University (CSU), **(Below Average)**	April 13, 2023	13	6	2	Not available	Not available
Tropical Storm Risk (TSR) (London, England) **(Below Normal)**	April 6, 2023	12	6	2	Not available	Not available
North Carolina State University (NCSU)**(Average)**	April 20, 2023	11 - 15	6 - 8	2 - 3	1 -3	Not available
National Oceanic and Atmospheric Administration (NOAA) **(Near Normal)**	May 25, 2023	70% probability of 12 - 17	70% probability of 5 - 9	70% probability of 1 - 4	Not available	Not available
Meteorological Office (UK) **(Above Average)**	April 26, 2023	20	11	5	Not available	Not available
Texas Hurricane Center For Innovative Technology (THC-IT), University of Houston	June 1, 2022	Not available	Not available	Not available	**1 Year Cycle** No hurricane : 33% Hurricanes: 67% **10 Year Cycle** No hurricane : 37% Hurricanes: 63% (Already 14 Hurricanes)	**1 Year Cycle** No hurricane: 69% Hurricanes: 31% **10 Year Cycle** No hurricane : 69% Hurricanes: 31% (Already 3 Hurricanes)

5. Conclusions

According to the prediction by CSU and NOAA, 2023 Hurricane numbers varied and between 6 and 10. Based on the past 172 years of data, the frequency of hurricanes in Texas and Gulf Coast of the United States was 0.35 and 1.08 per year (λ parameter). In the 10 year cycle Gulf Coast has already had 14 hurricanes and Texas has had 3 hurricanes. Based on THC-IH prediction, the probability of no hurricane for the Gulf of Mexico in 2023 was 33% for one year cycle and 37% for 10 year cycle. Also based on the THC-IH prediction, the probability of no hurricane for Texas in 2023 was 69% for one year cycle and also the 10 year cycle.

6. Acknowledgement

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7. References

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