Hurricane Predictions for Year 2024 in the
Gulf of Mexico Coast and Texas

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Abstract

It is of interest to predict the possibility and number of hurricanes expected during the hurricane season in the year 2023 in the Gulf of Mexico. Total hurricanes for 2024 in the Atlantic region predicted by the Colorado State University (CSU) and the North Carolina State University (NCSU) are 11 and 10 to 12 respectively. The National Oceanic and Atmospheric Administration (NOAA) predicted 11without 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 hurricane for the Gulf of Mexico in 2024 was 67% for one-year cycle and 63% for 10-year cycle. Also based on the THC-IT prediction, the **probability of hurricane** for Texas in 2024 was 51% for two-year cycle and 31% for the 10-year cycle. On June 8, 2024 there was the Hurricane Beryl (Category 1) in Texas and Gulf of Mexico agreeing with the THC-IT prediction for Texas based on the two-years cycle and Gulf of Mexico one-year and 10-years cycles.

1. 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 31 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 the CSU 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-years cycles) 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.

2. Objectives

The objective was to review and summarize the hurricanes predicted by the CSU, and NOAA for the year 2024 Atlantic hurricane season. Also, the probabilities of hurricanes predicted by the THC-IT is based on the 2- years and 10-years cycles for Texas and 1-year and 10 -years cycles for Gulf Coast in the United States are summarized.

3. Analyses

Hurricane prediction by CSU, NCSU and NOAA for 2024 Atlantic hurricane season are summarize in Table 1 with remarks. For 2024, the number of hurricanes varies from 10 to 12. The Frequency of Hurricane per year as estimated by THC-IT using $f(h)=\exp(-\lambda) \times \lambda^h/h!$; (h=0,1,2,…), where h is the number of hurricane per year, λ is the expected number of hurricanes during the year based on the selected cycles. By analyzing 173 years of data (1851-2023) from NOAA, the parameter λ for Texas and the Gulf Coast of the United States were 0.71 (2-years cycle) and 1.1 (1-year cycle). The probability of h hurricanes occurring in T years is, $f(h| \lambda, T)=\exp(-\lambda T) \times (\lambda T)^h/h!$; (h=0,1,2,…), and the prediction of hurricane probability in 2024 is based on different years 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 2024 (June 1, 2024)
(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), **(Above Average)**	April 4, 2024	23	11	5	Not available	Not available
Tropical Storm Risk (TSR) (London, England) **(Above Normal)**	April 8, 2024	23	11	5	Not available	Not available
North Carolina State University (NCSU)**(Above Average)**	April 30, 2023	15 - 20	10 - 12	3 - 4	Not available	Not available
National Oceanic and Atmospheric Administration (NOAA) **(Above Normal)**	April 4, 2024	23	11	5	Not available	Not available
European Center for Medium Range Weather Forecasts (ECMWF) **(Above Average)**	May 6, 2024	23	13	Not available	Not available	Not available
Texas Hurricane Center For Innovative Technology (THC-IT), University of Houston	June 1, 2024	Not available	Not available	Not available	**1 Year Cycle** No hurricane : 33% Hurricanes: 67% **10 Year Cycle** No hurricane : 37% Hurricanes: 63% (Already 15 Hurricanes)	**2 Year Cycle** No hurricane: 49% Hurricanes: 51% **10 Year Cycle** No hurricane : 69% Hurricanes: 31% (Already 3 Hurricanes)

4. Conclusions

According to the prediction by CSU, NCSU and NOAA, 2024 Hurricane numbers varied and between 10 and 12. Based on the past 173 years of data, the frequency of hurricanes in Texas and Gulf Coast of the United States was 0.71 (2-years cycle) and 1.1 per year (1-year cycle) (λ parameter). In the past 10 years Gulf Coast has already had 14 hurricanes and Texas has had 3 hurricanes. Based on THC-IT prediction, the probability of hurricane for the Gulf of Mexico in 2024 was 67% for one year cycle and 63% for 10-years cycle. Also based on the THC-IT prediction, the probability of hurricane for Texas in 2024 was 51% based on the 2-years cycle. On June 8, 2024 there was the Hurricane Beryl (Category 1) in Texas and Gulf of Mexico agreeing with the THC-IT prediction for Texas based on the two-years cycle

and Gulf of Mexico one-year and 10-years cycles.

5. Acknowledgement

6. References

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