Hurricanes and Average Monthly Temperature Trends in Three Different Coastal Cities along Gulf of Mexico

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Abstract: In this study, the average temperatures of three different cities (Galveston-TX, New Orleans-LA, and Tampa-FL) for three consecutive years before the hurricane events in each city have been investigated. The average temperatures before the hurricane have been modeled and compared to the past three years in each city. It was concluded that the lowest chance for a hurricane occurrence in 2014 is in Galveston, TX compared to other two cities.

1. Introduction

The Gulf of Mexico in the United States includes several states most importantly Texas, Louisiana and the west coast of Florida. The Gulf coast extends for more than 1600 miles with a high population over 20 million (U.S. Census Bureau and W&PE, Inc.). Hurricanes have become a crucial social and economic concern in the United States in recent years since it accompanies with strong winds and storm surge which kill people and destroy properties. The effect of the ocean on tropical cyclone (TC) genesis and maintenance has been well known for decades. The ocean provides the necessary energy to establish and maintain deep convection (Joseph and Eric 2003). Recent studies conducted by Shay et al. (2000) have also shown that in some instances, warm upper-ocean features can significantly impact TC intensity. While findings from these case studies are significant, it is still unclear how variations in upper-ocean thermal structure directly impact changes in storm intensity.

2. Objectives

The objective of this study was to predict the trend for the average temperatures in three different cites on Gulf of Mexico (Galveston, New Orleans and Tampa) before the Hurricane event in each city using numerical model. Same model has been used to evaluate the trend of the average temperature for the last three years in the same cities.

3. Model

The following mathematical model was used to predict the average changes in the temperature along the time before and after Hurricane events in each city:

$$y - y_o = A * Sin\big(B(t - t_o)\big) \quad \ldots\ldots (1)$$

Where: A and B are model parameters, y_o= initial correction factor for average temperature, and

t_o = initial correction factor for the time.

4. Results

In the Table 1 the model parameters of the equation 1 that used for average temperature predication have been shown. While through Figures 1 and 2 the average temperature distribution and predication for the three cities before the Hurricane event and for the past three years can be seen, respectively.

Table 1. Model Parameters for Average Temperature Predication

City	State	Before Hurricane Event						In Past Three Years					
		A	B	To	Yo	R^2	RSME	A	B	to	Yo	R^2	RSME
Galveston	TX	16	6	0.15	70	0.58	16.3	16	6	0.5	73	0.97	4.04
New Orleans	LA	15	6	0.05	65	0.93	5.9	15	6	0.55	70	0.95	5.11
Tampa	FL	12	6	0	72	0.97	3.7	12	6	0.5	72	0.96	4.05

R^2: Coefficient of correlation, RSME = root square mean error.

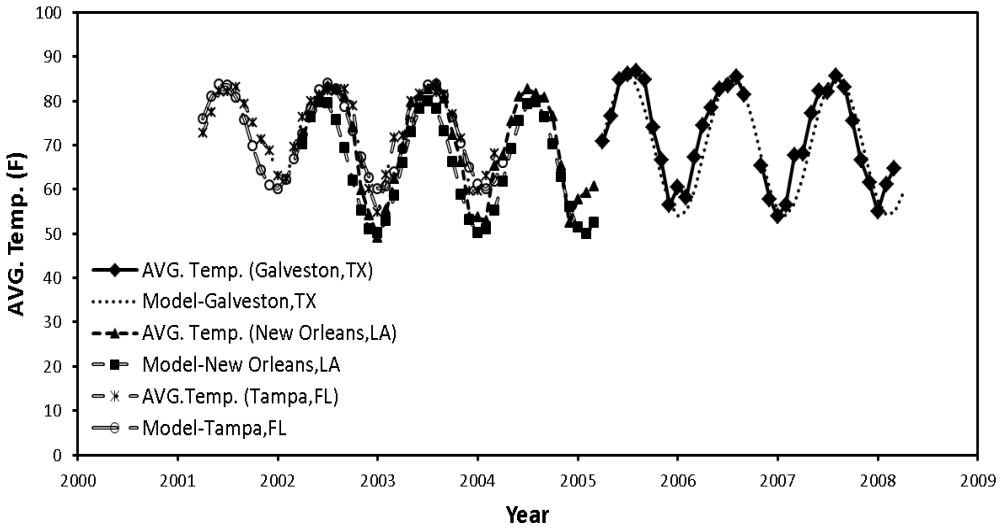

Figure 1. Comparison of Model Predication with Real Average Temp. in Three Different Cites Along Gulf of Mexico before Hurricane Event .

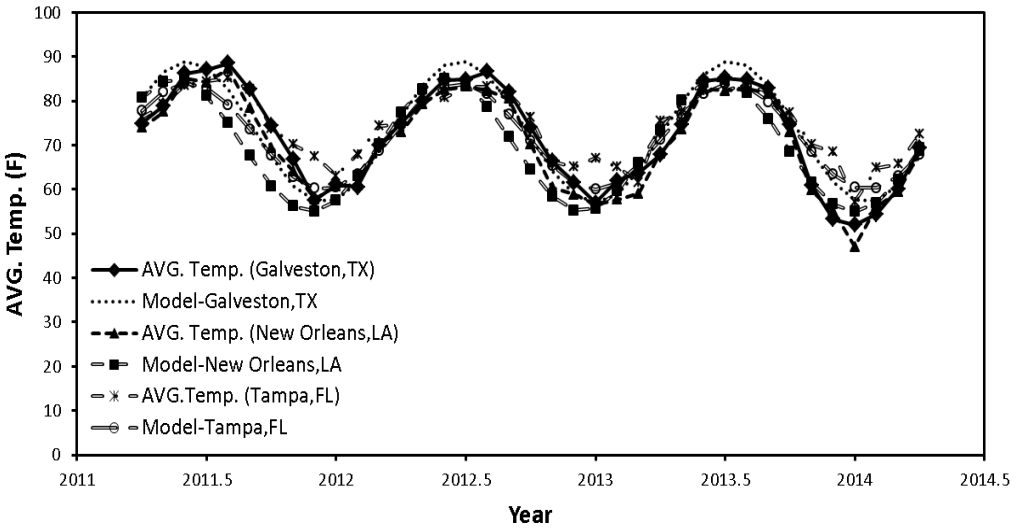

Figure 2. Comparison of Model Predication with Real Average Temp. in Three Different Cites Along Gulf of Mexico for the Past Three Years .

5. Conclusions

From the data analysis of the average temperature for the three studied cities, the chances for Hurricane occurrence in Galveston, TX in 2014 is the lowest compared to New Orleans, LA and Tampa, FL.

6. Acknowledgement

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7. References

[1] Joseph J. Cione and Eric W. Uhlhorn (2003), "Sea Surface Temperature Variability in Hurricanes: Implications with Respect to", American Meteorological Society; Vol. 131, pp (1783-1796).

[2] Shay, L. K., P. G. Black, A. J. Mariano, J. D. Hawkins, and R. L. Elsberry (1992)," Upper-ocean response to Hurricane Gilbert". J.Geophys. Res., 97, 20 227–20 248.