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## Sea Surface Temperature Influence on Tropical Storms and Hurricanes

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# Sea surface temperature influence on tropical storms and hurricanes

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## Background

Hurricanes are both dangerous and difficult to predict because of the various factors that influence the size and intensity of storms, where sea surface temperature (SST) is one of the most relevant variables (1). As temperatures are increasingly rising due to climate change, the effect on storm size, intensity, and frequency is going to be greater (2). There have been many studies how individual storms are affected, but less so on the overall frequency of hurricanes (2, 3, 4). This study assesses the number of hurricanes each year in comparison to the SST and the average wind speed of each hurricane. I predict that years with a higher frequency of hurricanes will have a higher average SST. I also predict that the years that have a higher frequency of hurricanes will have higher average wind speeds of hurricanes that year. The formation of tropical storms depends upon the relationship between SST and the temperature of the atmosphere; therefore, I am predicting that an increase in SST would lead to a year with more hurricanes overall (4).

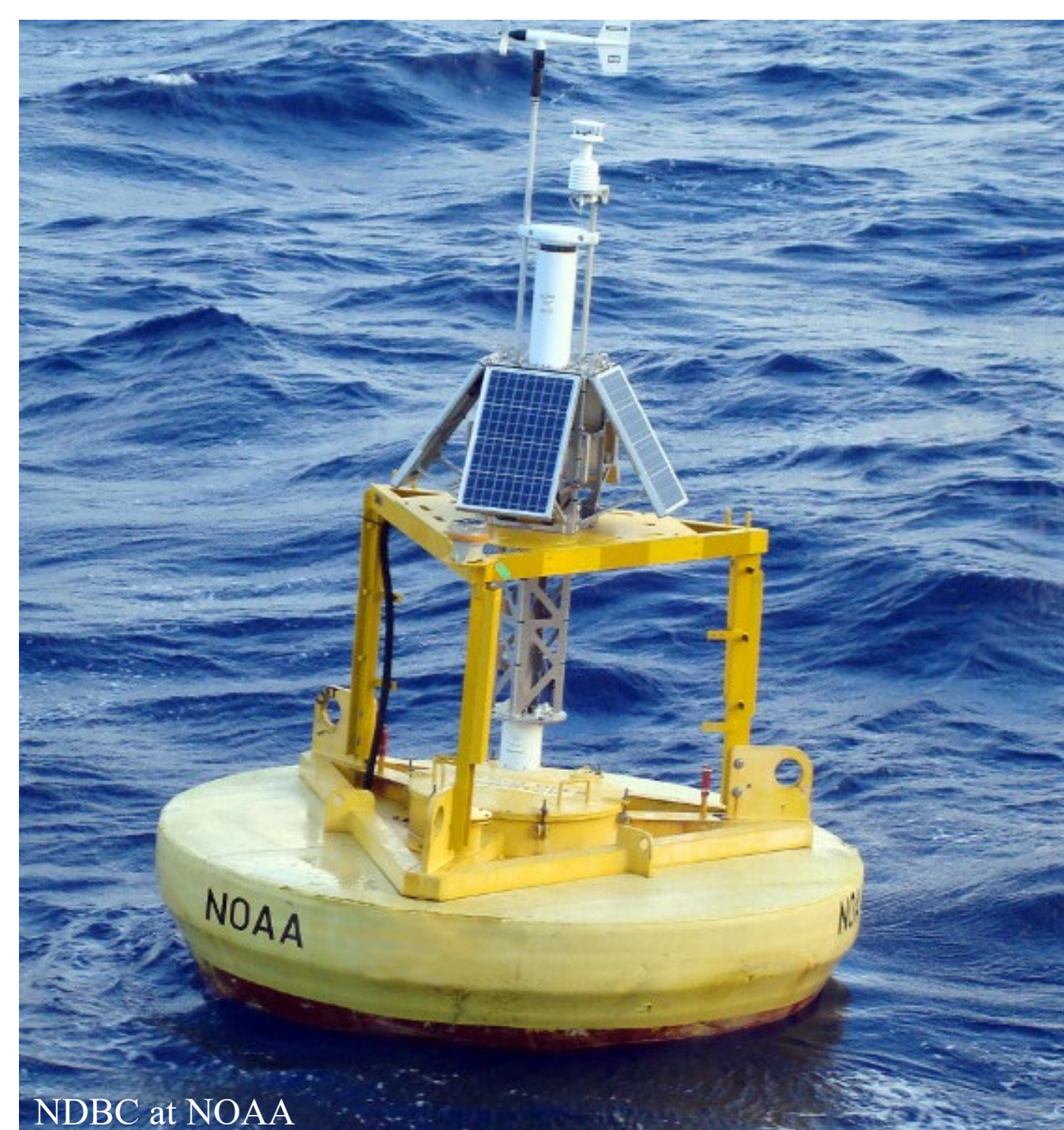


Fig 1. ISD Station, Pensacola, FL



Fig 2. Tropical Storm Arlene in the Gulf of Mexico. 6/2/23

## Methods

All data were collected and recorded by the National Oceanic and Atmospheric Administration (NOAA). SST and wind speed were collected from an Integrated Surface Dataset station in Pensacola, FL and the tropical storm archive data were recorded by the National Hurricane Center of NOAA. Data ranges from 2008 to 2023, with none in 2016 due to the ISD station being out of order during this period. The station collects temperature hourly and year-round. These data were then averaged together by year.

## Results

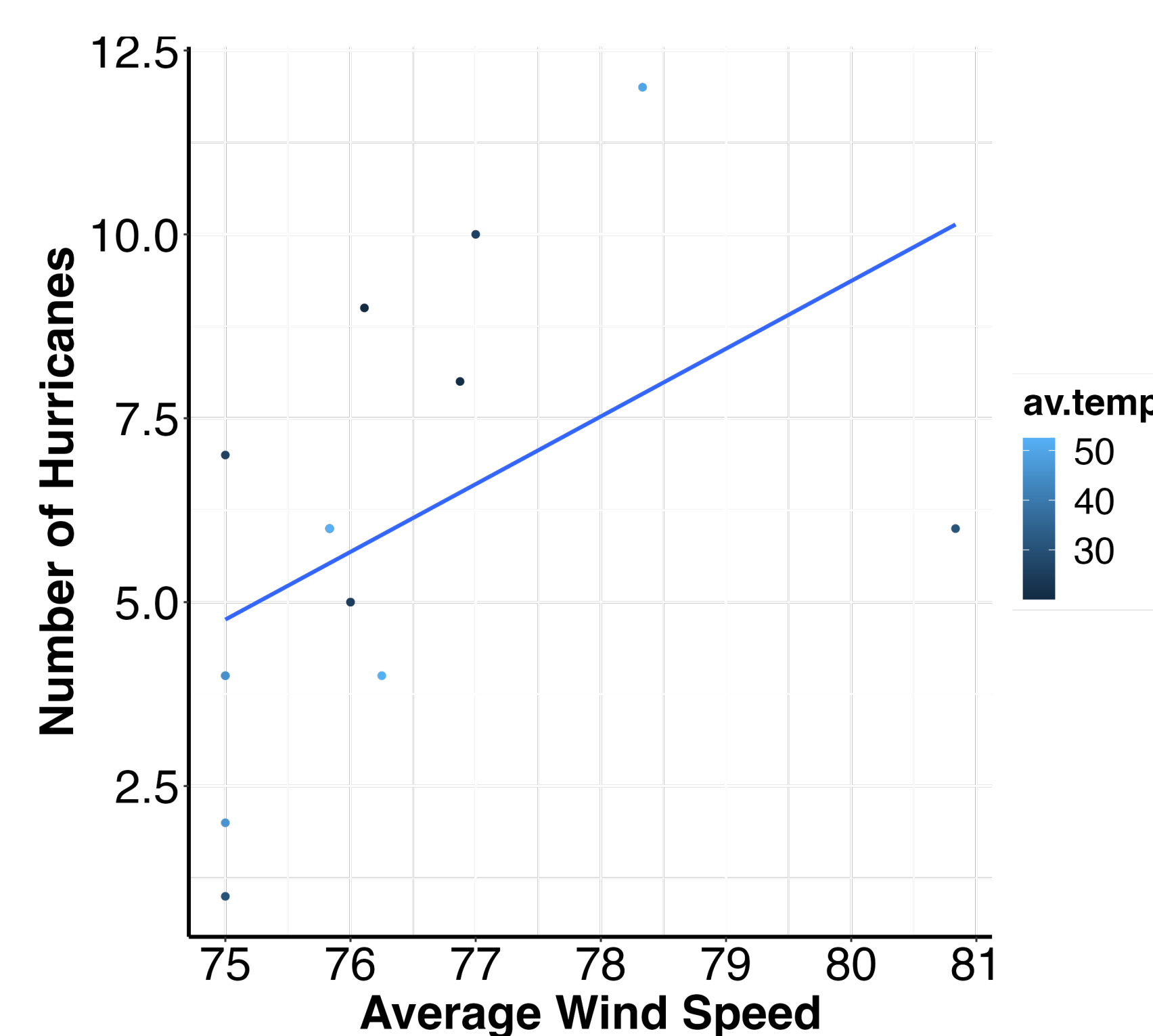


Fig 3. Av. Wind speed compared to number of hurricanes, showing average temperature of each year, using a GLM.

The average SST was not statistically significant in terms of the number of hurricanes annually (GLMM poisson,  $X^2 = 0.6676$ ,  $df = 1$ ,  $p = 0.41390$ ). However, the combination of average SST and average wind speed did have a significant impact on annual storms (GLMM poisson,  $X^2 = 4.1831$ ,  $df = 1$ ,  $p < 0.05$ ) similarly to the significant effect of average wind speed on number of storms (GLMM poisson,  $X^2 = 4.2449$ ,  $df = 1$ ,  $p < 0.05$ ).

## Conclusion

This study suggests that the number of hurricanes annually is affected by both the average SST and the average wind speed of hurricanes for the given year. A combination of high wind speeds and warm ocean water will form more hurricanes on average. There is not a correlation between just the SST and count of hurricanes, so it is likely that there is more variables to be considered due to the complexity of the formation and intensity of hurricanes. For a better ability to predict the frequency of hurricanes in the future, I would recommend comparing how SST and the atmospheric temperature in a given area relate to frequency and formation of hurricanes.

## Acknowledgements

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