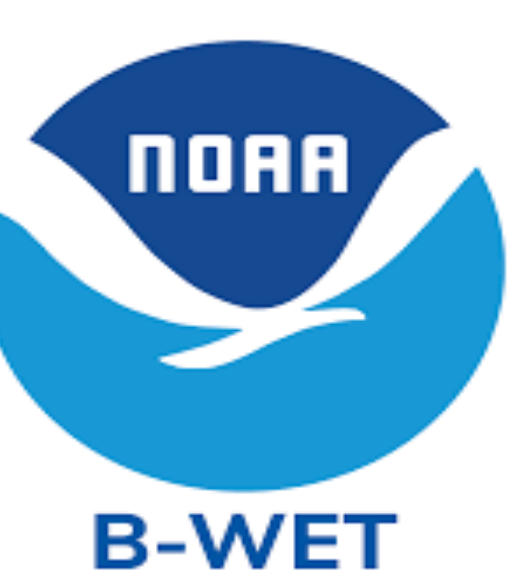




How Does Barometric Pressure Affect Storm Intensity

Evi Cogle, David Hopkins, Jakorey Johnson, Kyle Knutson, Ryleigh Spann

Christian Collegiate Academy



Abstract

Barometric pressure can be used to help predict weather when used with other atmospheric data including radar. Our team wanted to know if barometric pressure could be used to forecast severe weather and severe storms. Using GLOBE atmosphere protocol data from INFINITY Science Center in Pearlington, MS dating from 07/02/18 to 11/20/20, we examined the relationship between the recorded barometric pressure for 415 atmosphere measurement. Looking at the low pressures recorded we also examined rainfall/precipitation within the dataset. While most low barometric pressure readings in the dataset may have been errors, two were followed by precipitation and one with a large amount of precipitation. GLOBE data is very helpful in looking for trends or patterns.

Research Question

Research Questions: How does barometric pressure affect storm intensity?

Hypothesis: Barometric pressure can indicate high-and-low pressure systems which help to predict storms and storm intensity.

Introduction

Barometric pressure can determine how intense a storm can be. Barometric pressure is the “weight” of the air pressure, and to know the change of the pressure is on a barometer (NOAA, n.d.). To Determine whether it will be an intense storm is by checking to see if it is a high-or low-pressure system. The higher the pressure is, the weather is fair and mild. The lower the pressure is, indicates a storm will come. When the pressure falls rapidly the storm intensity becomes worse (Rao, 2013). Slowly falling pressure indicates rain is coming. When the barometric pressure falls it indicates a storm is approaching within twelve to twenty-four hours. During a low-pressure system, the humidity begins to build up and the moisture in the air starts to collect with the dust particles and forms clouds. After the clouds form, the pressure will fall, and a storm will begin to approach. After the storm passes the barometric pressure rises into a high-pressure system (NOAA, n.d.).

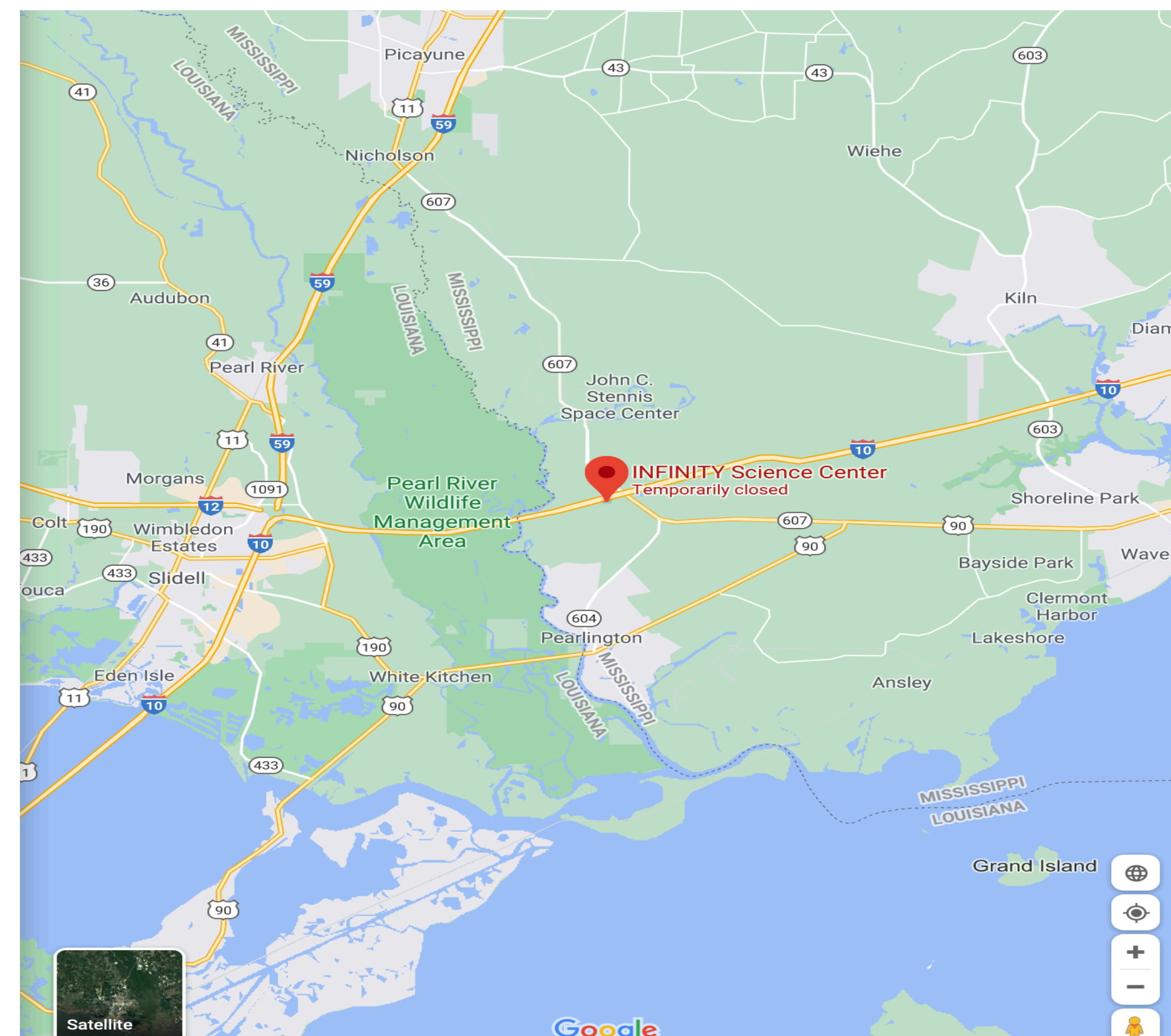


Field Photos

Research Methods

Planning Investigations

- GLOBE atmosphere data from INFINITY Science Center was used for our research. Our team also collected data using the GLOBE atmosphere protocol at our school, Christian Collegiate Academy to learn about the protocol. We learned to use a digital hygrometer, a barometer, a rain gauge, pH strips to measure rain pH, and a cloud chart to help us identify clouds and cloud type.
- Data collection strategy including how the time of day of data collection would be selected, how frequently data would be collected, and the timing and location of sample collection and measurement.
- The GLOBE data retrieval tool was used to download data.
- Both CCA and INFINITY Science Center are on the Gulf Coast of Mississippi. The climate is tropical to sub-tropical.



Carrying Out Investigations

- INFINITY Science Center has been collecting atmosphere data for many years. Below is a map (map credit: Google, 2021). Using data over a longer time helps our team better understand the relationship of barometric pressure and storms.

Results

Analyzing Data

- In two strong storm systems, our team found GLOBE barometric pressure data showing the low-pressure system before the storms.
- Barometric pressure along with wind speed help to predict storm intensity.
- Barometric pressure and rainfall at INFINITY Science Center in Pearlington, MS matched intense storms that caused emergency declarations in Mississippi and Louisiana.
- GLOBE data from our school showed a low pressure just before Hurricane Zeta hit our area on October 28, 2020.

Figure #1 – Graph of barometric pressure from GLOBE data

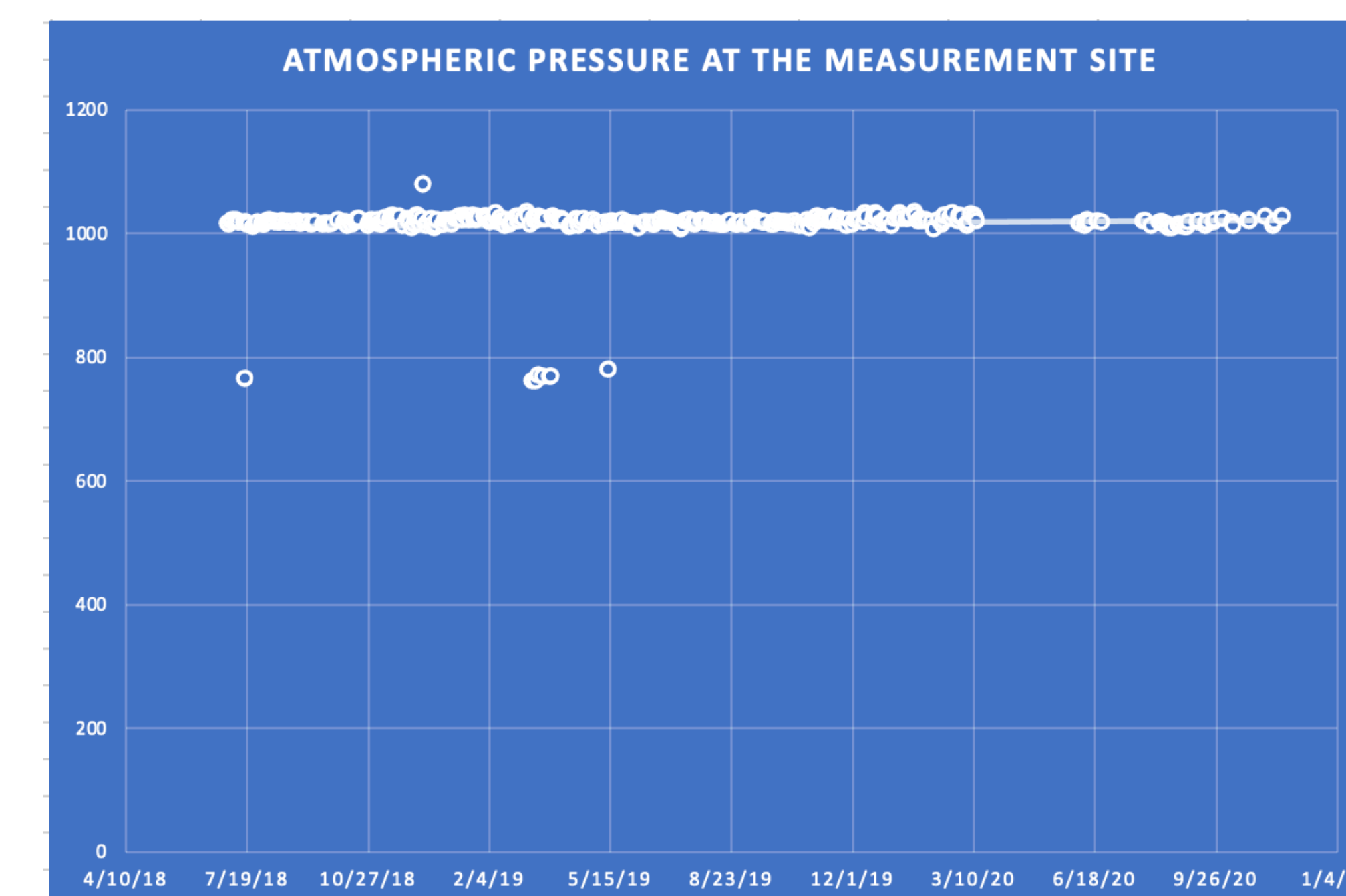
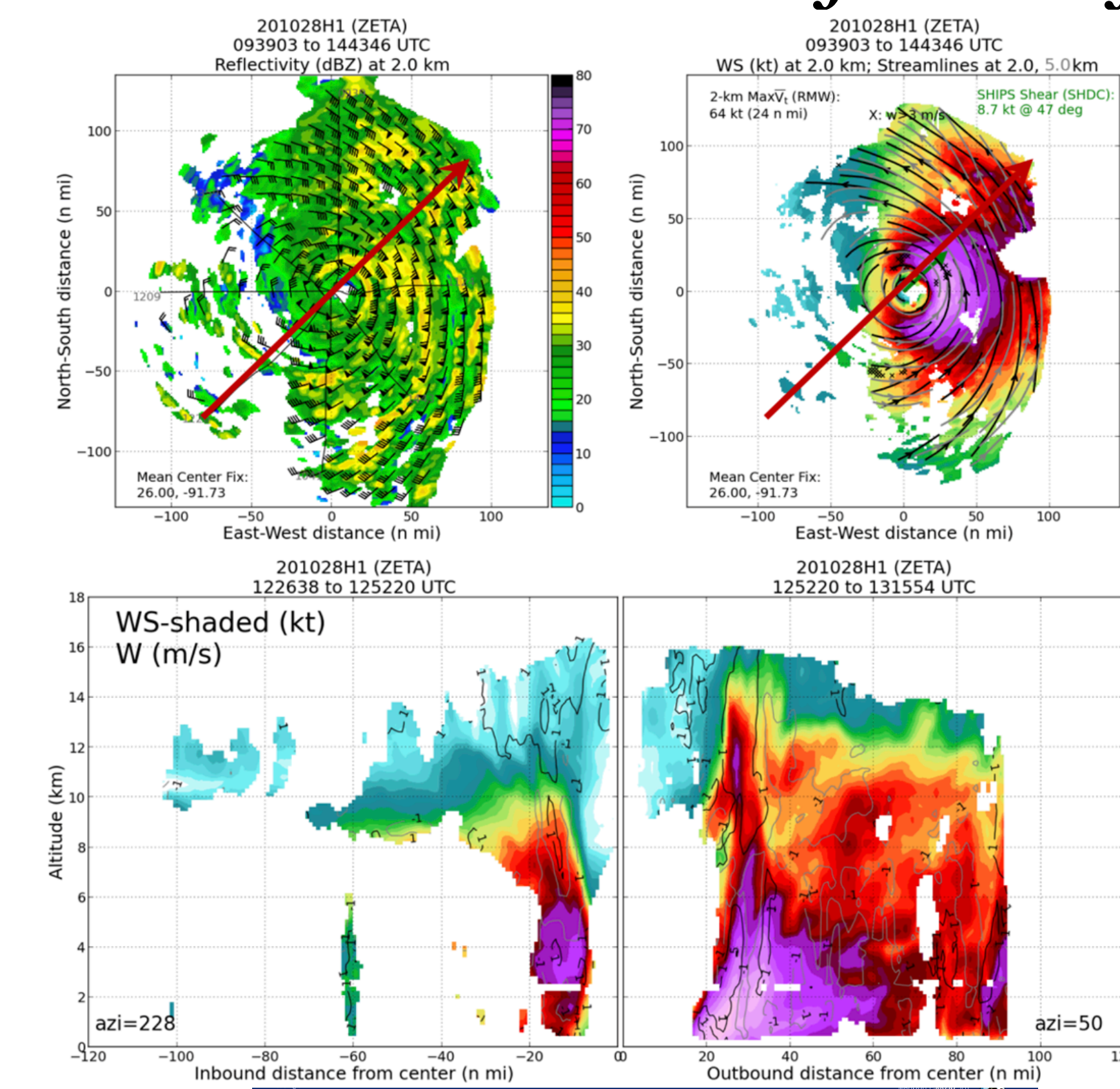


Figure #2 – NOAA Hurricane Research Division, 2020. Doppler showing Hurricane Zeta 8 hours before landfall.



Discussion

Interpreting Data

- The data supports the fact that barometric pressure can be used to predict storm intensity.
- Looking at the INFINITY data, there are several dates in a row that show low pressure barometric readings but do not show any rainfall or other conditions that would indicate a storm.
- These readings that do not seem to indicate a storm could have been because of errors reading the barometer.
- Even though barometric pressure can be used to predict storms, it cannot predict the amount of damage from the storm.



Photo Credit: Luka Lflippo, Sun Herald, 2020. Photos shows Hurrican Zeta moving ashore on October 28, 2020.

Conclusions

Drawing Conclusions & Next Steps

- Our team learned that barometric pressure is used to predict storms and storm intensity.
- Barometric pressure reading errors can lead to incorrect assumptions about a storm.
- Learning the GLOBE atmosphere protocol helped us to understand weather conditions that caused Hurricane Zeta and a lot of damage to the Gulf Coast where we live.
- It is important to learn more about how doppler helps with storm prediction and about storm warning systems.

References

Farmer's Almanac. (2010, August 12). *Predicting weather using a barometer and wind direction.* <https://www.almanac.com/content/predicting-weather-using-barometer-and-wind-direction>

Lumen. (n.d.). *Weather Forecasting.* Earth Science. <https://courses.lumenlearning.com/sanjac-earthscience/chapter/weather-forecasting/>

NOAA. (n.d.). Air - Atmospheric Climate Variables. <https://www.climate.gov/maps-data/primer/air-atmospheric-climate-variables>

UCAR. (n.d.). *The Highs and Lows of Air Pressure.* Center for Science Education. <https://scied.ucar.edu/learning-zone/how-weather-works/highs-and-lows-air-pressure>