1. Introduction

- Hurricanes can generate large waves that damage offshore and coastal infrastructure and contribute to deadly storm surge and inland flooding.
- Ocean wave models are used to predict wave behavior using physics formulations and observed data, to allow coastal areas to prepare for upcoming storms.
- When a new formulation is introduced, there is a need to test the accuracy.
- During this research project, a new physics formulation in a widely used wave model was tested for potential improved accuracy.

2. Methods

The accuracy of the new physics formula was determined using two main methods:

1. **Time Series Plots**
   - Three wave model simulations were run: two using the default physics formulation and one using the new formulation.
   - The three wave model simulations were plotted alongside observed data.
   - Observed data was collected from the NDBC website.

2. **RMS Errors**
   - RMS errors were calculated using the following formula:
     \[
     \text{RMSE} = \sqrt{\frac{1}{N} \sum_{i=1}^{N} (\text{Predicted}_i - \text{Actual}_i)^2}
     \]
   - “Predicted” values- wave heights predicted using the three simulations
   - “Actual” values- wave heights collected from NBDC.

3. Hurricane Florence

- Default physics formulation errors are shown in blue.
- New physics formulation errors are shown in red.
- Out of the ten test locations, seven show a lower RMS error for the new physics formulation.

4. Hurricane Gustav

- Default physics formulation errors are shown in blue.
- New physics formulation errors are shown in red.
- Out of the eleven test locations, nine show a lower RMS error for the new physics formulation.

5. Conclusion

- It was found that the new formulation consistently produced more accurate predictions than the default formulation for both hurricanes tested.
- We recommend that wave modelers use the new physics formulation for real-time forecasting of hurricane wave effects.