Natural vs. Artificial Wave Creation Phenomena: Their Influence on Shoreline Erosion

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Introduction

This project focuses on the frequency and intensity of waves and their potential impact on shoreline erosion. Observing different wave forming factors, such as high natural fetch (the distance wind travels over an open body of water) and boat wakes, can show how both natural and artificial waves differ in their impact on shoreline erosion in Jamaica Bay, Queens.

Objectives

Observe the intensity and frequency of waves caused by the two wave phenomena and how these findings can influence shoreline erosion and health.

Study site: Dubos Point Wildlife Refuge at the entrance to Marina 59. Light blue arrow represents the movement of waves from the marina and the dark blue represents the movement of waves from the open bay.

Boat wakes (Artificial waves)

Waves caused by fetch (Natural Waves)

Methods

An RBR solo wave logger was deployed for a week on the eastern coast of the peninsula, then the same process was repeated at the western coast towards the open bay for another week. After each week has passed, we analyzed the wave frequencies and intensities using the RBR Ruskin Software, then compared the results.

The RBR solo wave logger deployed on the eastern coast of the peninsula.

The RBR solo wave logger deployed on the western coast of the peninsula.

RBR solo wave logger

Depth Significant wave height Anomalies/spikes

Figure 1: Data recorded on the eastern coast of the peninsula (sheltered side)

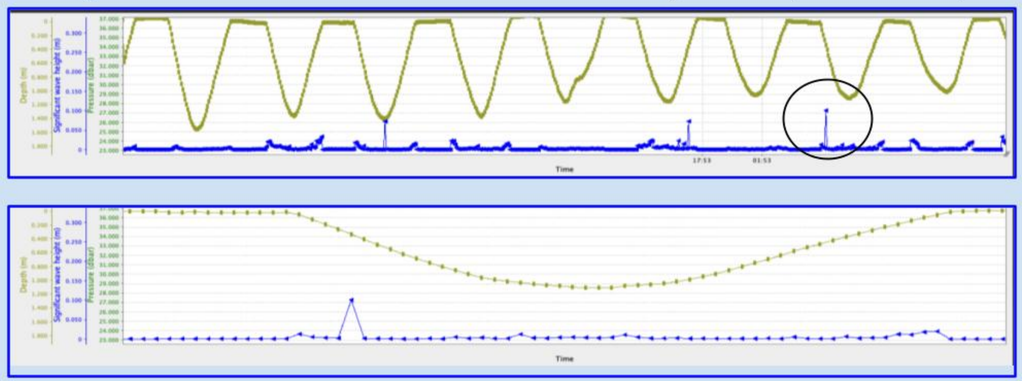
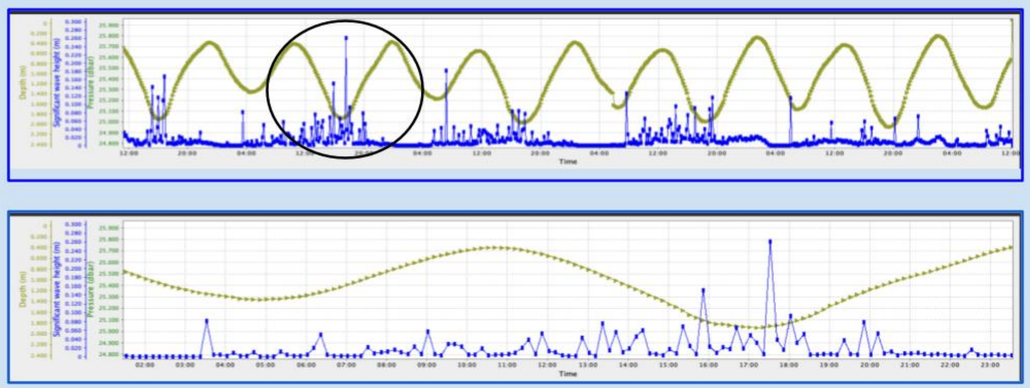


Figure 2: Data recorded on the western coast of the peninsula (unsheltered side)



Results

The data recorded on the eastern coast of the peninsula exhibits less frequent and smaller spikes and entropy in significant wave heights as opposed to the data recorded on the western coast where stronger and larger waves were recorded. This is most likely because the surrounding land attenuates waves at a greater extent than boats can generate waves.

Conclusion

While artificial waves caused by boat wakes increase the intensity and size of waves, our data demonstrates that a larger natural fetch correlates with greater wave intensity and size. Even though the Marina is home to a lot of active vessels, artificial waves are still produced on the unsheltered side of the peninsula along with a stronger natural fetch. In order to understand the impact that these stronger and larger waves have on shoreline erosion, a longer term study measuring shoreline elevation over time should be conducted.

Acknowledgements

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References

Bilkovic, D. M., Mitchell, M. M., Davis, J., Herman, J., Andrews, E., King, A., Mason, P., Tahvildari, N., Davis, J., & Dixon, R. L. (2019). Defining boat wake impacts on shoreline stability toward management and policy solutions. Ocean & Coastal Management, 182, 104945. https://doi.org/10.1016/j.ocecoaman.2019.104945
Ruskin Software