2021

Characterizing Seagrass Effects on Hydrodynamics of Waves and Currents Through Field Measurements and Computational Modelling

Ramin Familkhalili
Old Dominion University, rfamilkh@odu.edu

Navid Tahvildari
Old Dominion University, ntahvild@odu.edu

Original Publication Citation

Familkhalili, R., & Tahvildari, N. (2021). C*haracterizing seagrass effects on hydrodynamics of waves and currents through field measurements and computational modelling.* AGU 2021 Fall Meeting, 13-17 December 2021, New Orleans, LA (Virtual). https://doi.org/10.1002/essoar.10509624.1

Characterizing Seagrass Effects on Hydrodynamics of Waves and Currents Through Field Measurements and Computational Modelling

Ramin Familkhalili, Navid Tahvildari

Department of Civil and Environmental Engineering, Old Dominion University, Norfolk, VA

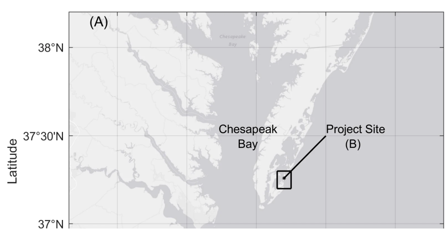
Abstract

Low-lying coastal and estuarine areas are among the most populated regions globally, have high economic significance, and are increasingly threatened by climate change, sea level rise, nuisance flooding, and extreme storms. Nature-based coastal protections are sustainable and sea-level resilient alternatives compared to traditional solutions such as dikes and seawalls. Submerged aquatic vegetation (SAV) or seagrasses can provide coastal flood and erosion protection by attenuating storm wave and current energy and stabilizing seabed sediments. However, more research is needed to understand the interactions between flow, SAVs, and

Project Site

This study was conducted in South Bay, a shallow coastal lagoon on the Eastern Shore of Virginia coast (Figure 1).

- Mean water depth in South Bay is ~1.5 m.
- The coastal system is strongly influenced by semidiurnal tidal variations with an average tidal amplitude of 0.5 m.



Instrument Setup and Data Collection

Hydrodynamics were measured at three sites (North, Mid, South; see Figure 1b). We deployed two Nortek AquaPro Acoustic Doppler Current Profiler (ADCP) and one Signature1000 current profiler to measure currents. In addition, three RBRsolo sensors were used to measure surface water waves at high temporal resolution.

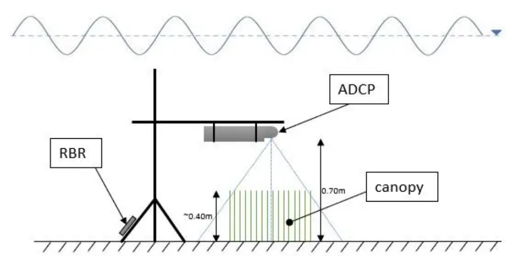


Figure 2: Instrument setup in the field.

Wave Measurements

Wind waves are high-frequency water surface motions and thus wave measurements are carried out by RBR sensors that can measure water level at high frequency.

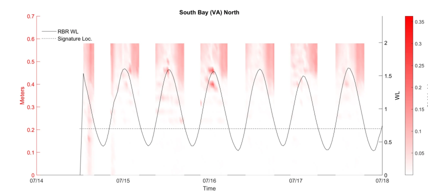
- RBRs were programmed to measure water pressure at 8 Hz.
- Mean tidal height and significant wave height (i.e., mean wave height of the highest third of waves) were determined from pressure data using spectral analysis.

Current Flow Measurements

Current velocity data were measured using two ADCPs and one

Data Analysis

The measurements over the first few hours of the records were used to calculate the atmospheric pressure and were then eliminated from the record.



Data Analysis

Spectral evolution over time at the southern location is shown below.

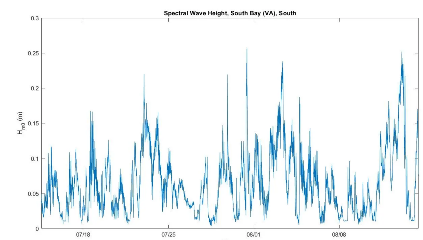


Figure 6 : Spectral significant wave heights.

ABSTRACT CONTACT AUTHOR GET POSTER