SUMMARY DATA REPORT

VESSEL WAKE IMPACT STUDY ST AUGUSTINE, FLORIDA

SEPTEMBER 2020

COASTAL & HYDRAULICS LABORATORY

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1 VESSELS/EQUIPMENT

- RV Parker and local recreational boaters
- 600 kHz Nortek Signature 1000 ADCP with tripod frame
- HRS submersible load cells
- Paros digiquartz pressure sensors

2 SCHEDULE OF WORK

Friday, 11 September	Depart ERDC; arrive at St Augustine; launch vessel and scout for suitable deployment locations NOTE: inclement weather and instrument issues delayed sampling until 24 September
Thursday, 24 September	Wave impact measurements Day1
Friday, 25 September	Wave impact measurements Day 2
Saturday, 26 September	Wave impact measurements Day 3

SUMMARY OF WORK

This field experiment was conducted along the Intracoastal Waterway (IWW) within the Mantanzas River estuary near Marineland, FL, Flagler County, which cuts through backbarrier and fringing marshlands of the Guana Tolomata Matanzas (GTM) Research Reserve (Figure 1) (29.6824N, 81.2241W). Channel margins of the IWW consist of saltmarsh, dredge spoil islands, uplands, and intertidal mud flats and shoals. Elevated shoreline margins will often have a scarped morphology, which are indicative as an erosive feature. At the study site, the marsh scarp height measured approximately 40 cm. The tidal regime is semidiurnal with mean neap and spring tide ranges of approximately 1.0 - 1.8 m near the Matanzas Inlet though they appear to be somewhat modulated near the study site based on water level measurements. The measured near-surface current velocities, regulated by tidal action, were nearly symmetrical with speeds of 0.4 – 0.5 m/s north and south.

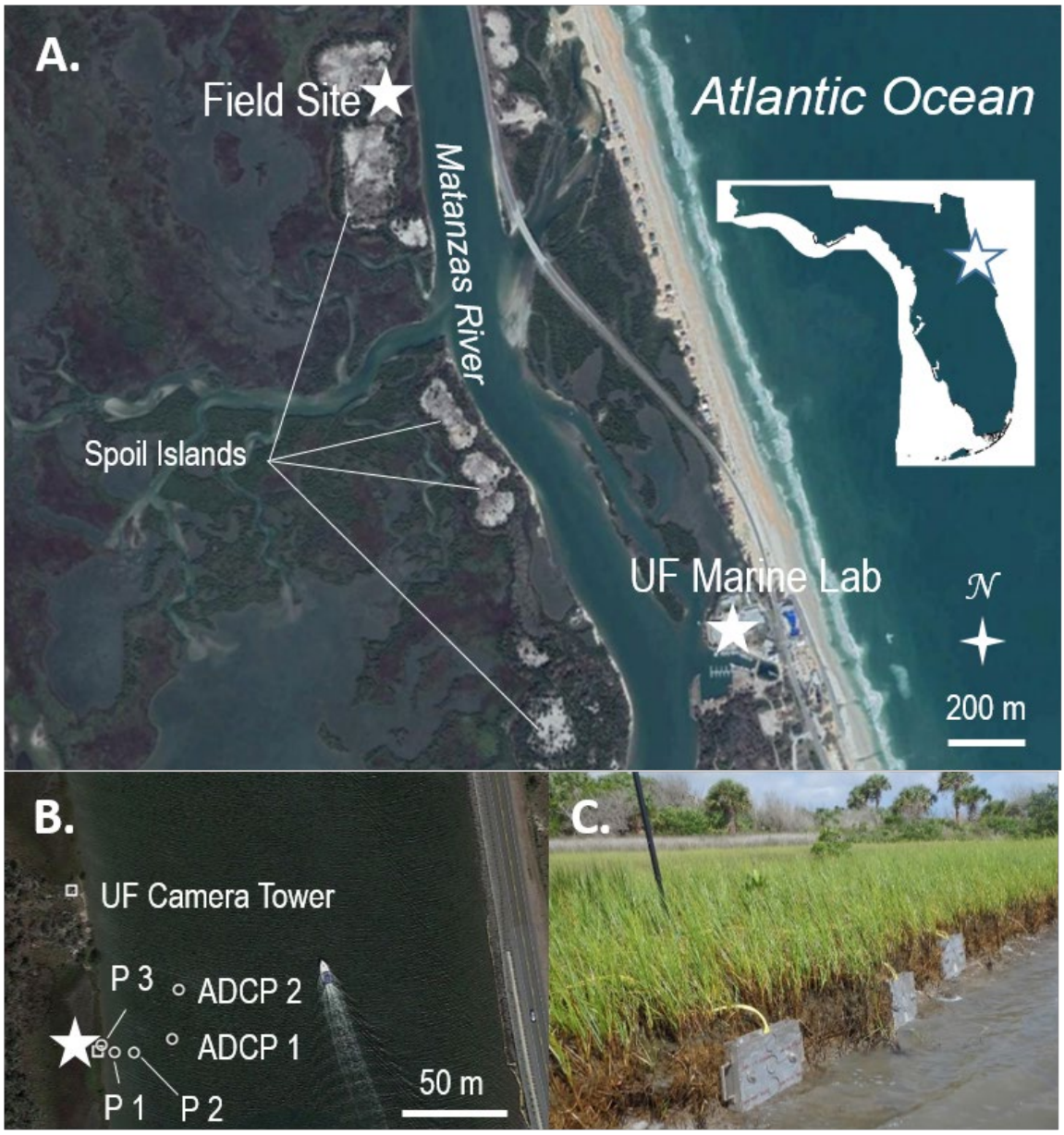

Figure 1.Location map of the study area (A), with instrument locations (B), and configuration of the load cell arrays (C). ADCP 1 was configured to measure waves only while ADCP 2 was configured to measure current profiles. Paros pressure sensors P1 and P2 were deployed offshore to measure wave attenuation, while P3 was installed on the marsh platform to capture wave propagation during high water levels.

ENVIRONMENTAL CONDITIONS

Inclement weather affected the area during some of the deployment period caused by remnants of tropical storm Sally (13 September) coupled with a strong Nor'Easter (17 – 20 September). The Nor'Easter generated a storm surge of approximately 0.3 – 0.6 m that coincided with unusually

high spring tides. This event caused marsh flooding even at low tides, which prohibited load cell data collection efforts. Additionally, the extensive days without adequate sunlight did not allow the solar panel to maintain battery voltage causing interruptions in data logging of the pressure sensors. The inclement weather also heavily reduced vessel traffic. A summary of the weather conditions is provided in Figure 2.

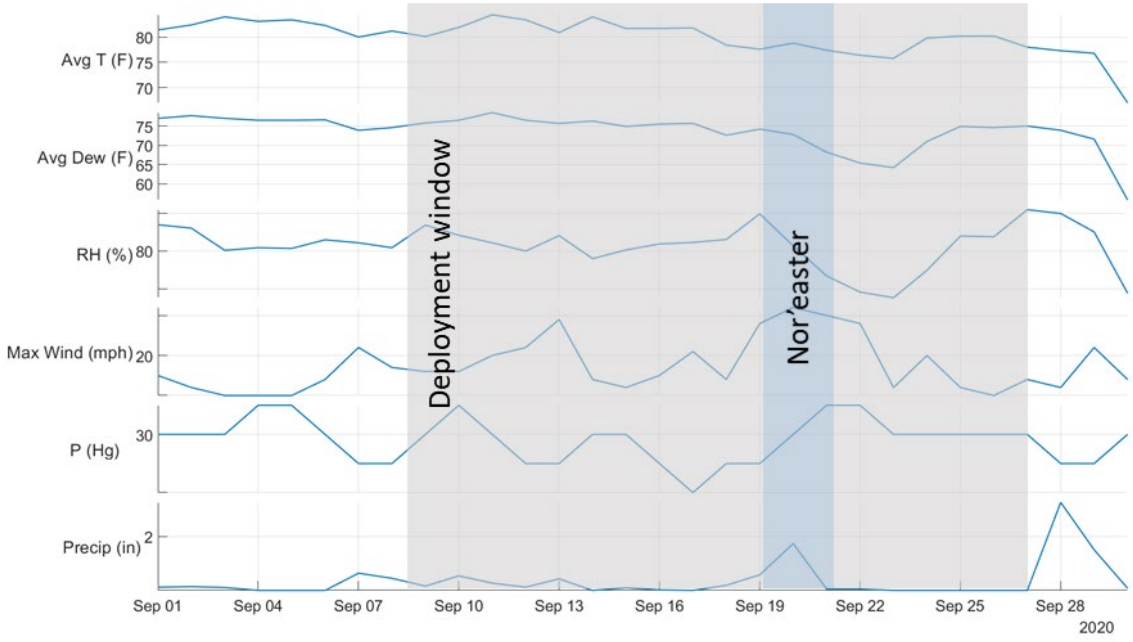

Figure 2. Time series plots of weather conditions during the St. Augustine deployment period.

WAVES AND HYDRODYNAMIC MEASUREMENTS

A schematic diagram of the instrument deployment is shown in Figure 3. The wave instrument array consisted of a Nortek Signature 1000 kHz ADCP (ADCP 1) with automatic surface tracking (AST) enabled, and three Paros (Series 8DP) Digiquartz pressure sensors (P1, P2, and P3) co-located in a shore-perpendicular transect. Additionally, a second ADCP (ADCP 2) was deployed to capture time-series current profiles. The ADCPs were deployed in approximately 3.0 – 3.5 m of water.

Paros sensors P2 (deep) and P1 (shallow) were each mounted with their transducers located approximately 25 cm above the channel bed; their elevations relative to the marsh platform were approximately -2.0 m and -0.8 m, respectively. Sensor P3 was mounted on the edge of the marsh platform adjacent to the DAQ system.

LOAD CELL ARRAYS

Three load cell arrays (A1, A2, A3) were mounted vertically into the face of the scarped shoreline, spaced approximately 1 m apart. Since the marsh scarp height was only 38 – 40 cm, only one panel was needed for each array. From this configuration, the spatial variability of forces along the vertical and horizontal dimensions of the scarp could be investigated.

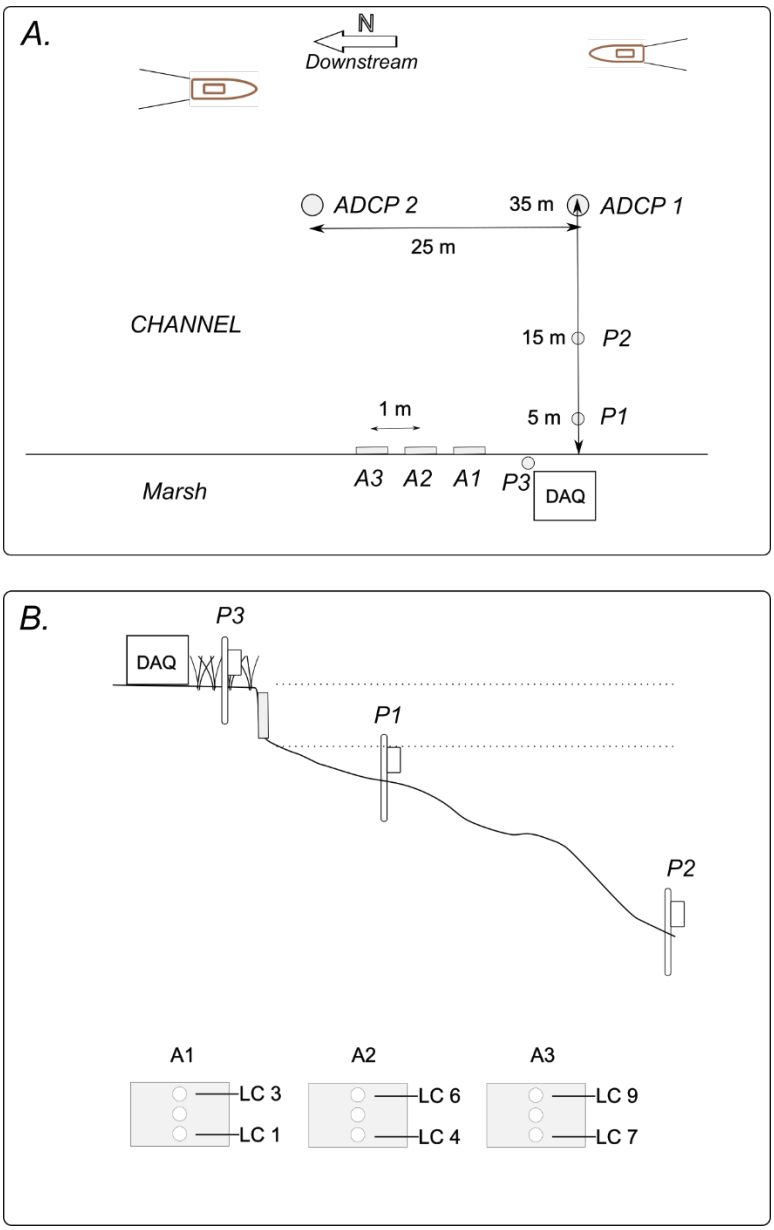

Figure 3. Plan view (A) and cross-section view (B) of the instrument deployment and their relative positions. Waves were measured at ADCP 1 and Paros sensors P1-P3. ADCP 2 measured current profiles.

DATA FILES

All data has been written to netcdf files.

Paros
ST_AUGUSTINE_Paros_2020092516_HYD1_min4Hz.nc
ST_AUGUSTINE_Paros_2020092516_HYD2_min4Hz.nc
ST_AUGUSTINE_Paros_2020092516_HYD3_min4Hz.nc
ST_AUGUSTINE_Paros_2020092600_HYD1_min4Hz.nc
ST_AUGUSTINE_Paros_2020092600_HYD2_min4Hz.nc
ST_AUGUSTINE_Paros_2020092600_HYD3_min4Hz.nc
ST_AUGUSTINE_Paros_2020092700_HYD1_min4Hz.nc
ST_AUGUSTINE_Paros_2020092700_HYD2_min4Hz.nc
ST_AUGUSTINE_Paros_2020092700_HYD3_min4Hz.nc

Load Cells
ST_AUGUSTINE_LoadCell_20200925_1.nc
ST_AUGUSTINE_LoadCell_20200925_2.nc
ST_AUGUSTINE_LoadCell_20200925_3.nc
ST_AUGUSTINE_LoadCell_20200926_1.nc
ST_AUGUSTINE_LoadCell_20200926_2.nc
ST_AUGUSTINE_LoadCell_20200926_3.nc
ST_AUGUSTINE_LoadCell_20200926_4.nc
ST_AUGUSTINE_LoadCell_20200926_5.nc
ST_AUGUSTINE_LoadCell_20200926_6.nc
ST_AUGUSTINE_LoadCell_20200927_1.nc
ST_AUGUSTINE_LoadCell_20200927_2.nc

ADCP
ST_AUGUSTINE_ADCP_20200923.nc – Nortek Signature pressure data for ADCP 1. Data from ADCP is not available and does not contain any vessel wake information.

Reference:

Priestas, A.M., R. Styles and R. Bain, (2023) “Vessel wake forces on marsh scarps”, J. Coastal Res., https://doi.org/10.2112/JCOASTRES-D-22-00056.1

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