



In Situ Hydrodynamic and Morphodynamic Measurements DURING Extreme Storm Events

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Overview

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- ▶ **Motivation & Objectives**
- ▶ **Field Study**
- ▶ **Collected Data**
- ▶ **Lessons Learned**
- ▶ **Future Plans**



Motivation & Objectives

- ▶ **Extreme Storm Events (e.g. hurricanes and nor'easters) can cause:**
 - ▶ **property/infrastructure damage, affected ecosystems, and human casualties.**
- ▶ ***In situ* measurements of the beach face will help:**
 - ▶ **Quantify the impact of storms**
 - ▶ **Improve coastal management decisions**
 - ▶ **Improve numerical models (i.e. validation and calibration)**
- ▶ **Determine time-scale of berm and/or dune erosion**
 - ▶ **Any linkages between the hydro- and morphodynamics?**

Field Study

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▶ A field study was conducted during March 2-5, 2018 at Bethany Beach, Delaware

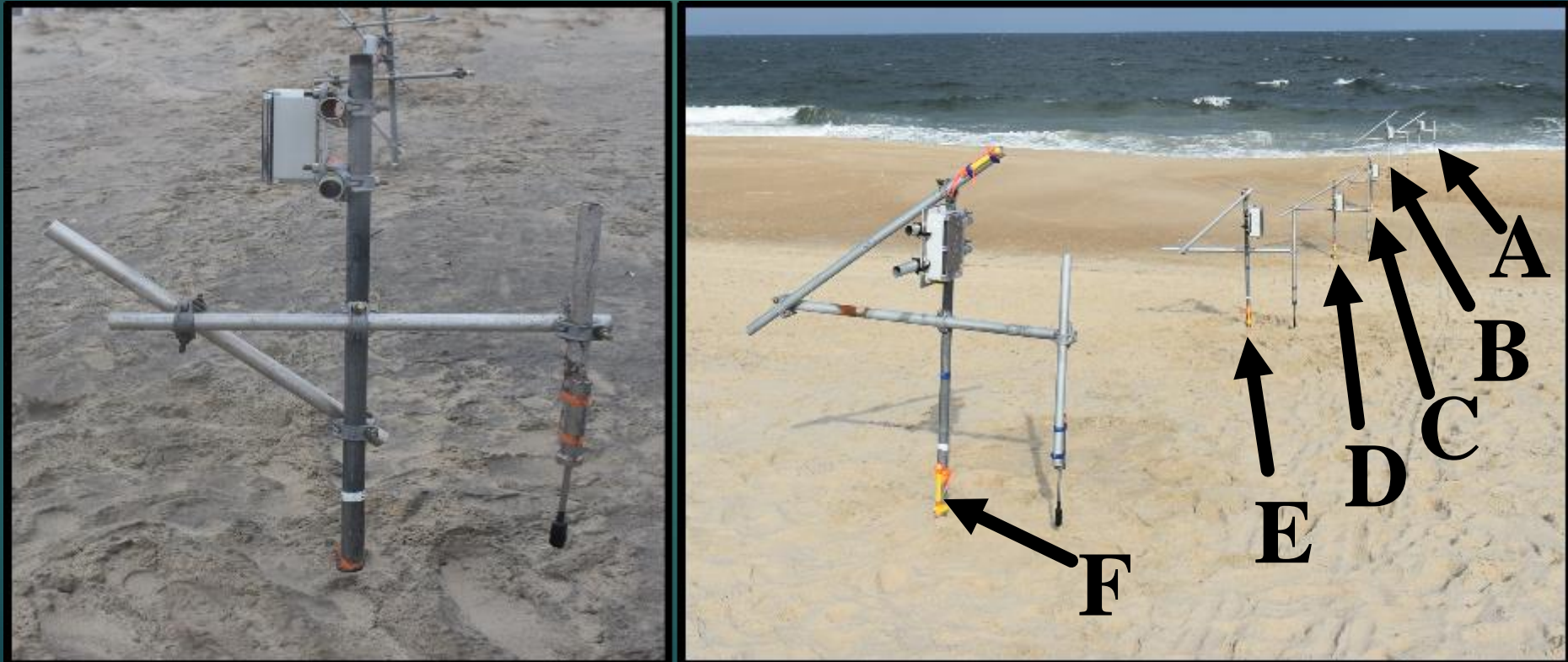
▶ Nor'easter Riley



Satellite image of Nor'easter Riley on March 2, 2018 from GOES-16 weather satellite.

Field Study

- ▶ Sensors and deployment technique were in a ‘rapid response’ fashion
 - ▶ Self-powered, self-logging, and self-contained
 - ▶ Single, cross-shore transect



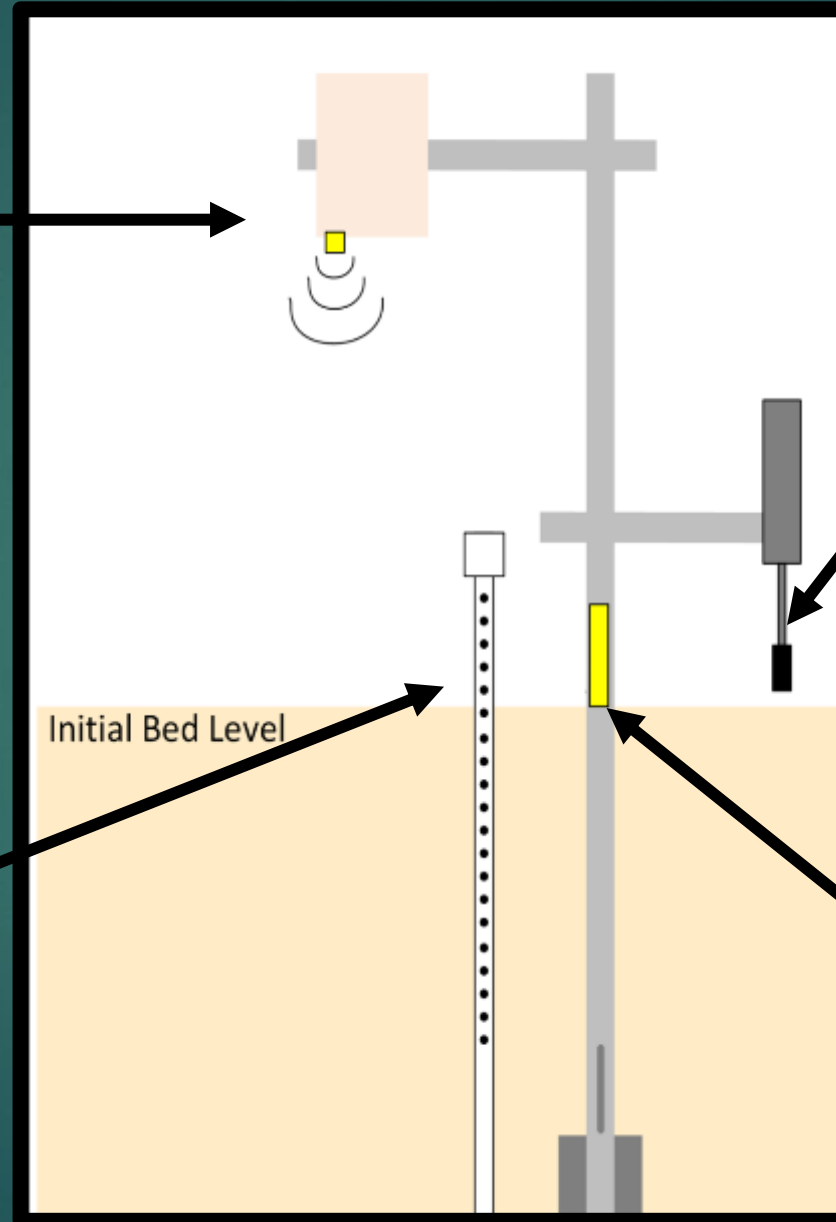
Sensors

Acoustic Distance Meter (ADM), 4 Hz

- Water Elevation
- Bed Elevation
- ~\$800

Photocell Array (in progress)

- Bed Elevation
- Drawback:
 - Will only measure during day-light hours
- ~\$1,800



Electro-magnetic Current Meter, 5 Hz

- Water velocity
- ~\$6,000

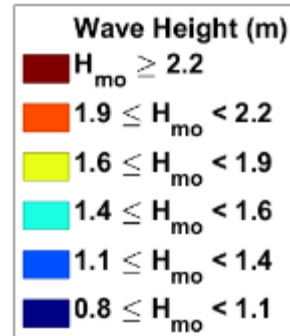
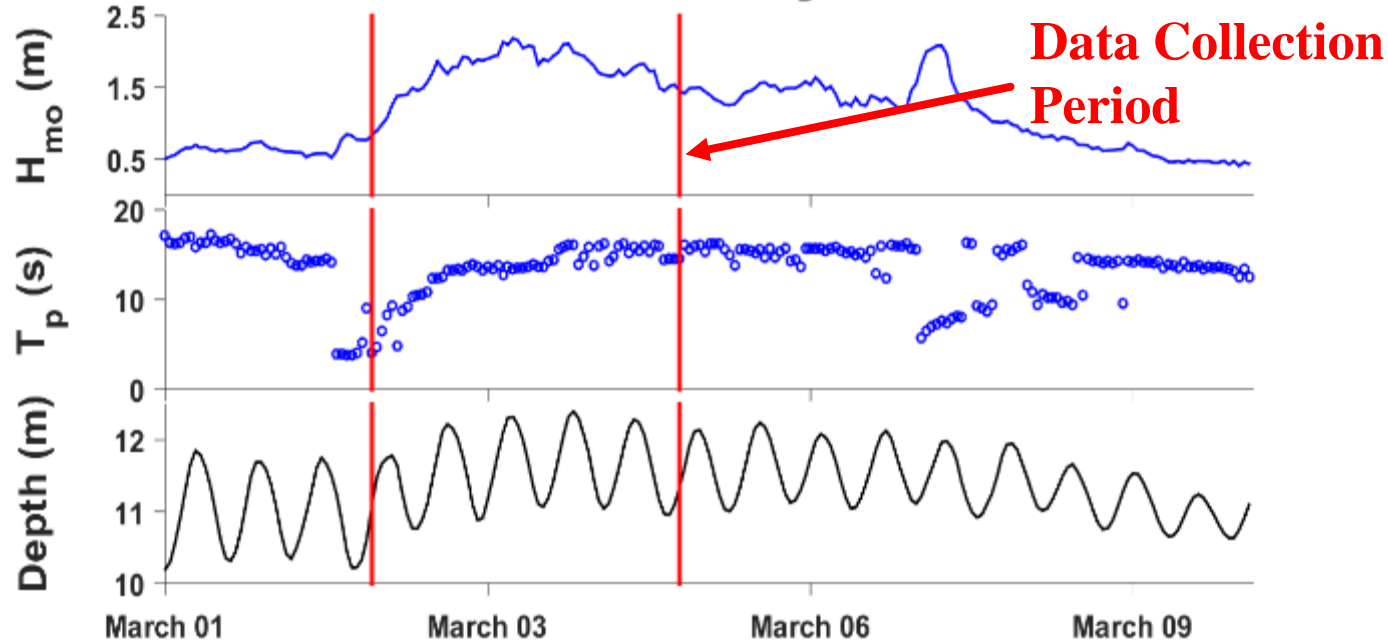
Pressure Sensor

16 Hz

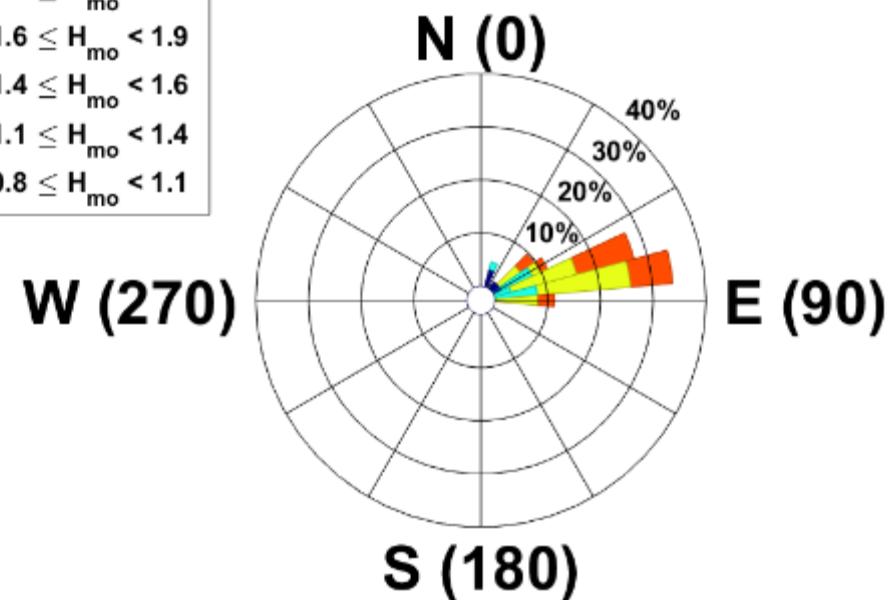
- Water elevation
- ~\$500

Nor'easter Riley Wave Climate

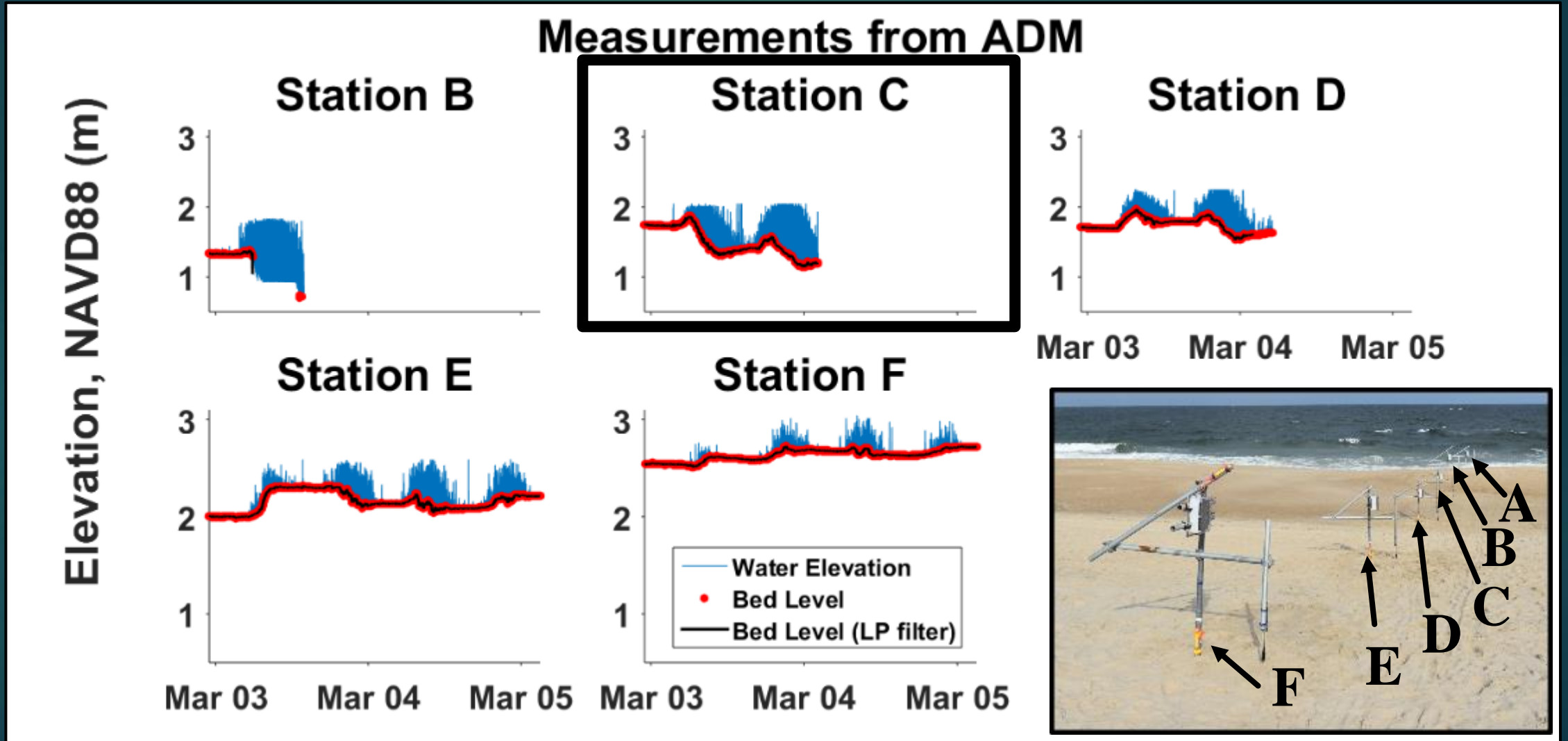
USACE DE003 Buoy, March 2018



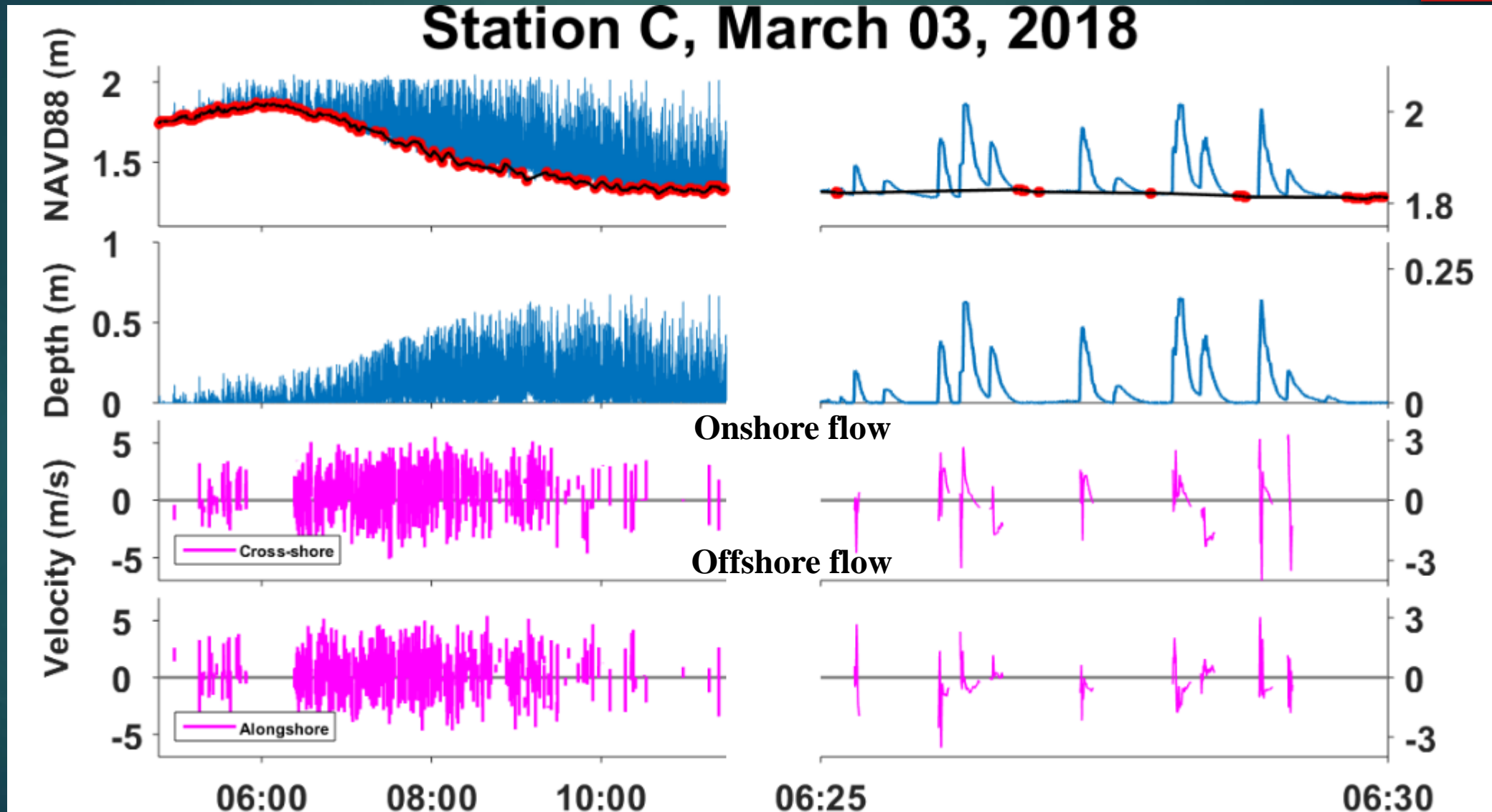
Wave Rose



Collected Data

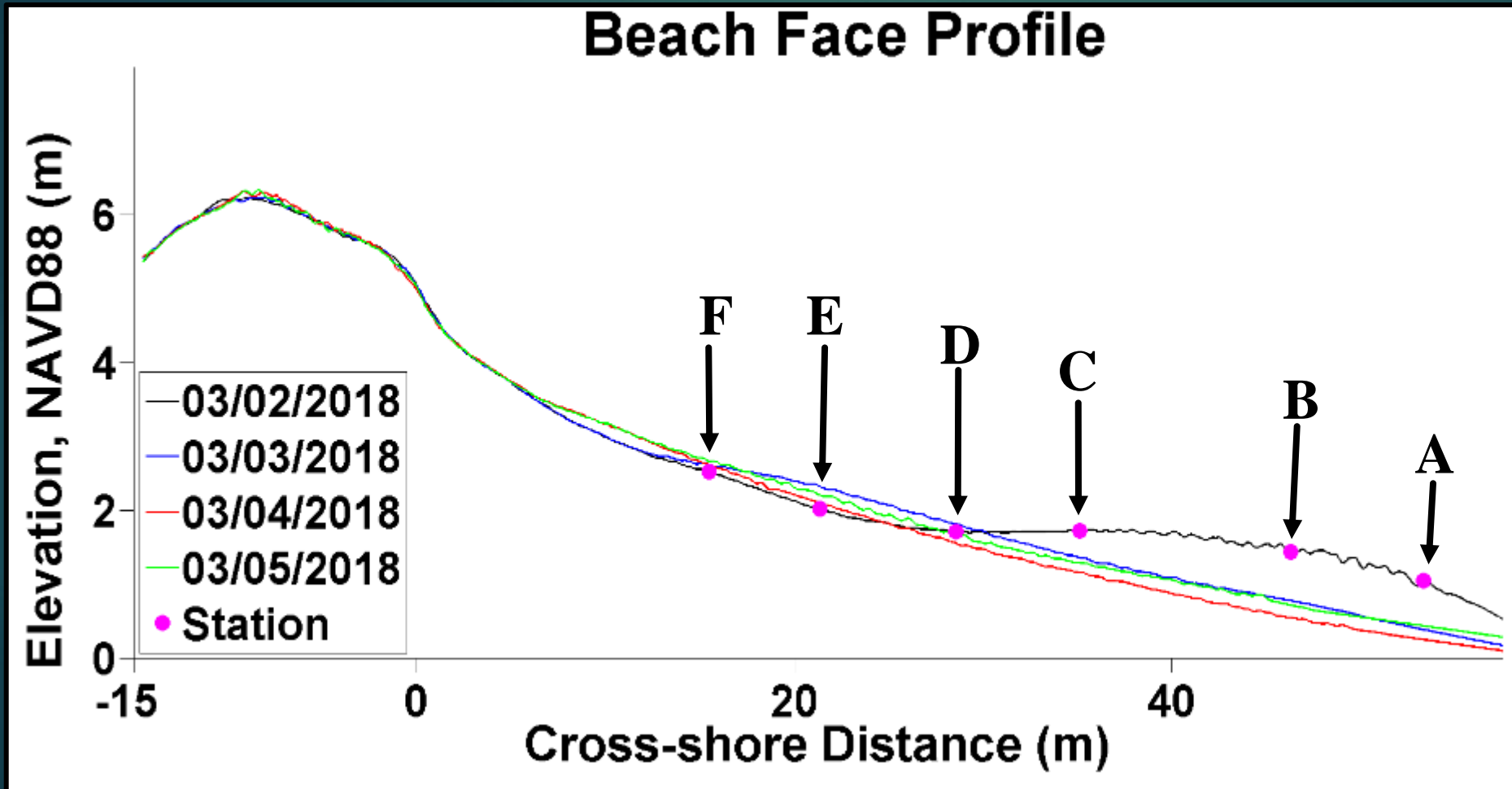


Collected Data



Cross-shore GPS Profile

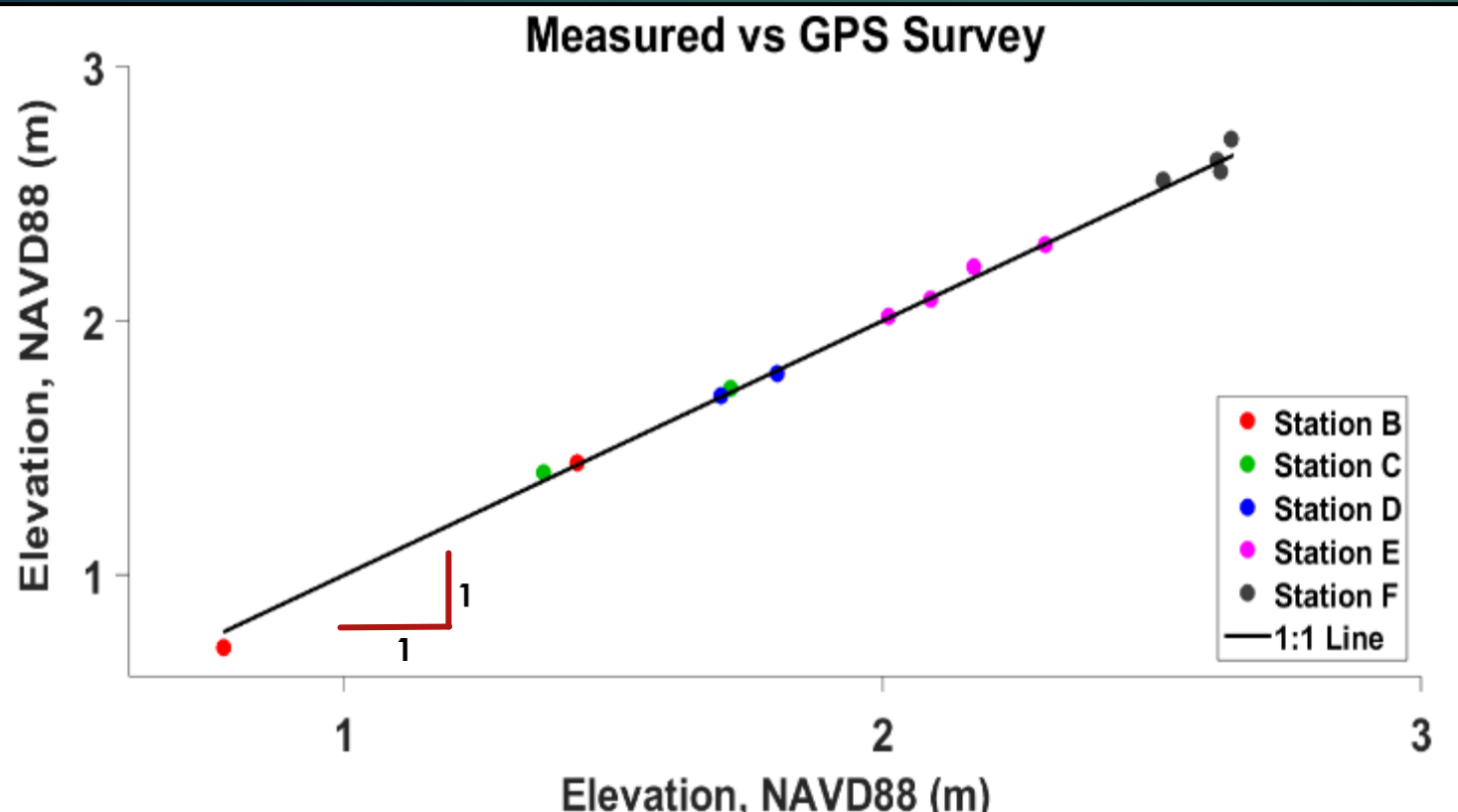
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Profiles measured
via GPS surveying

Measured during
day-time low tides

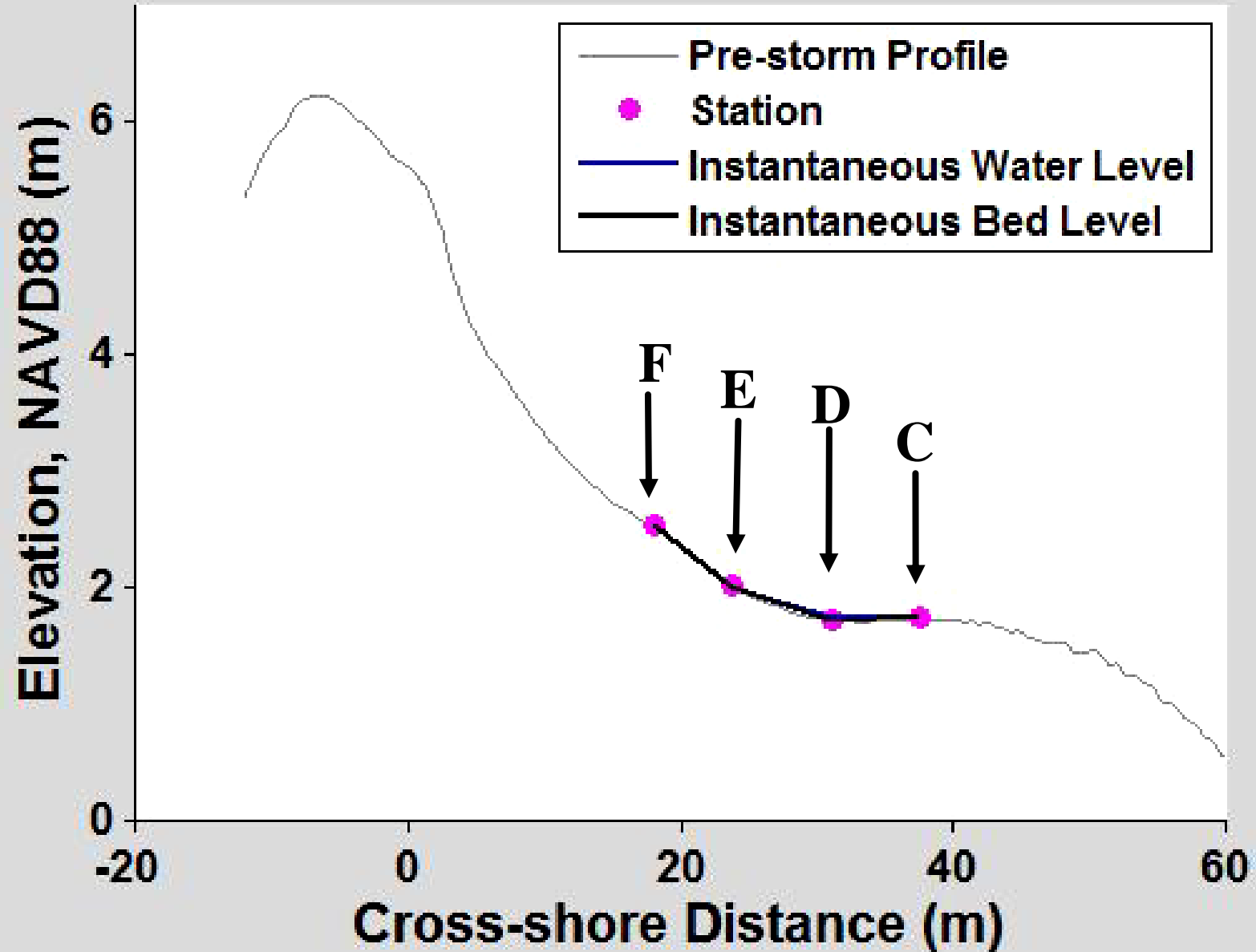
Sensor Measurements vs GPS Profiles



1:1 plot of measured bed level
vs GPS surveyed bed level

Date: Mar 03, 2018 05:00:00

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Lessons Learned

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Future Plans

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- ▶ More field deployments this winter/spring
- ▶ Numerical modeling with XBeach
- ▶ Investigate power spectrum of water and bed levels



Questions?

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