WAVES AND WATER LEVELS IN THE BACKBARRIER SEAGRASS MEADOWS OF THE CHANDELEUR ISLANDS

Presented by: Francesca Messina (Ioannis Georgiou)

State of the Coast

Thursday, May 22

9:30 – 11:00 a.m.

Room 284

MOTIVATION

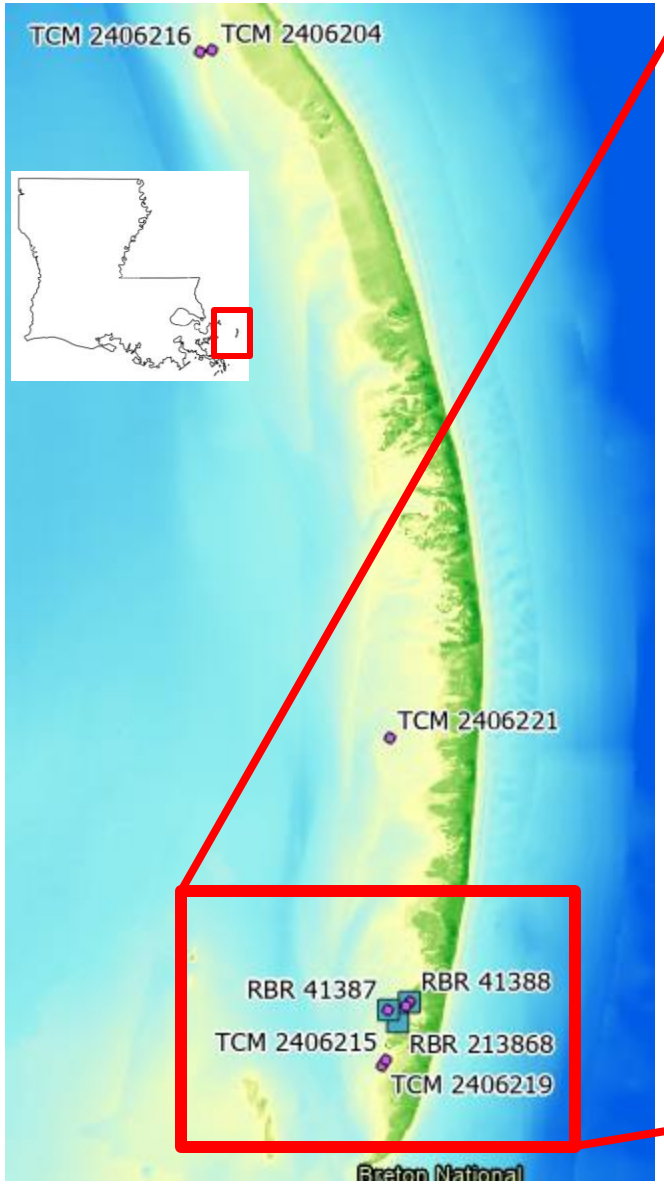
Seagrass(es) meadows attenuate waves and slow currents
(C_D drag coefficient, type, density, height, diameter, shape, bendiness…)

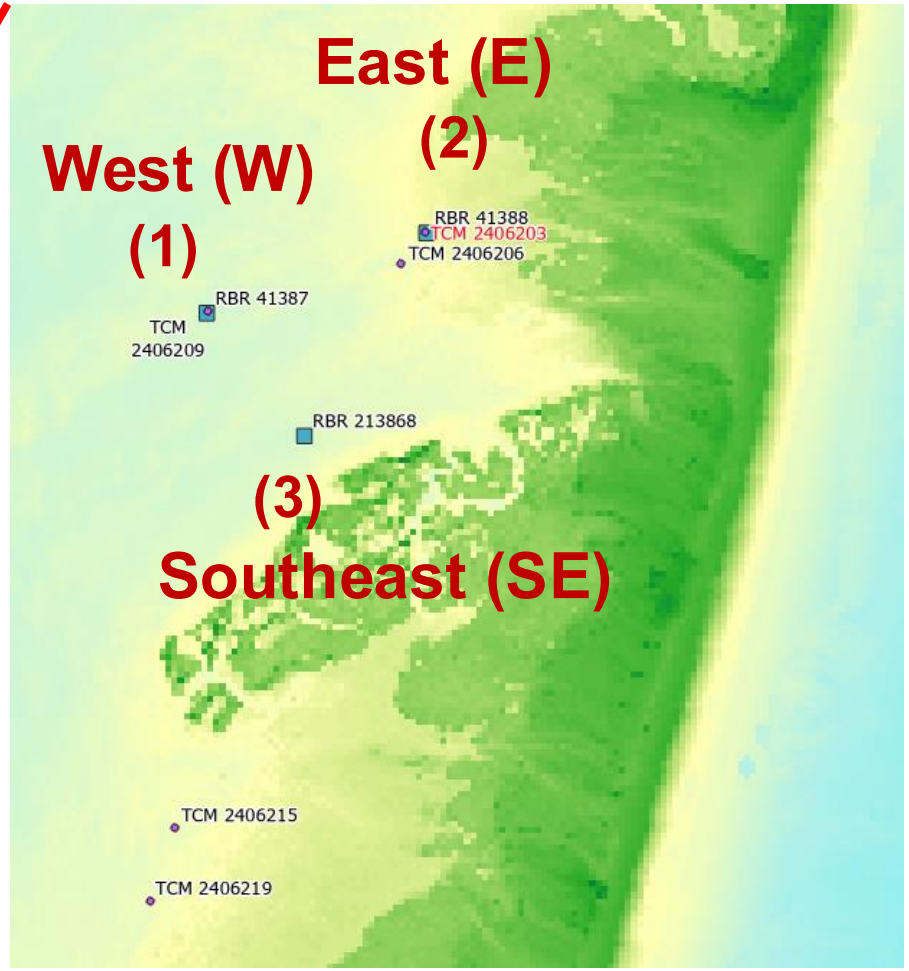
Research mostly theoretical, from flume studies, fewer field observations

Open questions and research gaps

- **Site specific** wave attenuation studies (*targeting species…*)
- Parameters influencing ***sediment mobility*** within meadows (e.g. ***shear stress; waves and currents***)
- **Physical thresholds** of establishment or mortality
- Local **subtidal water levels, waves**, and dataset used for **modeling**

EXPERIMENTAL DESIGN - DEPLOYMENTS



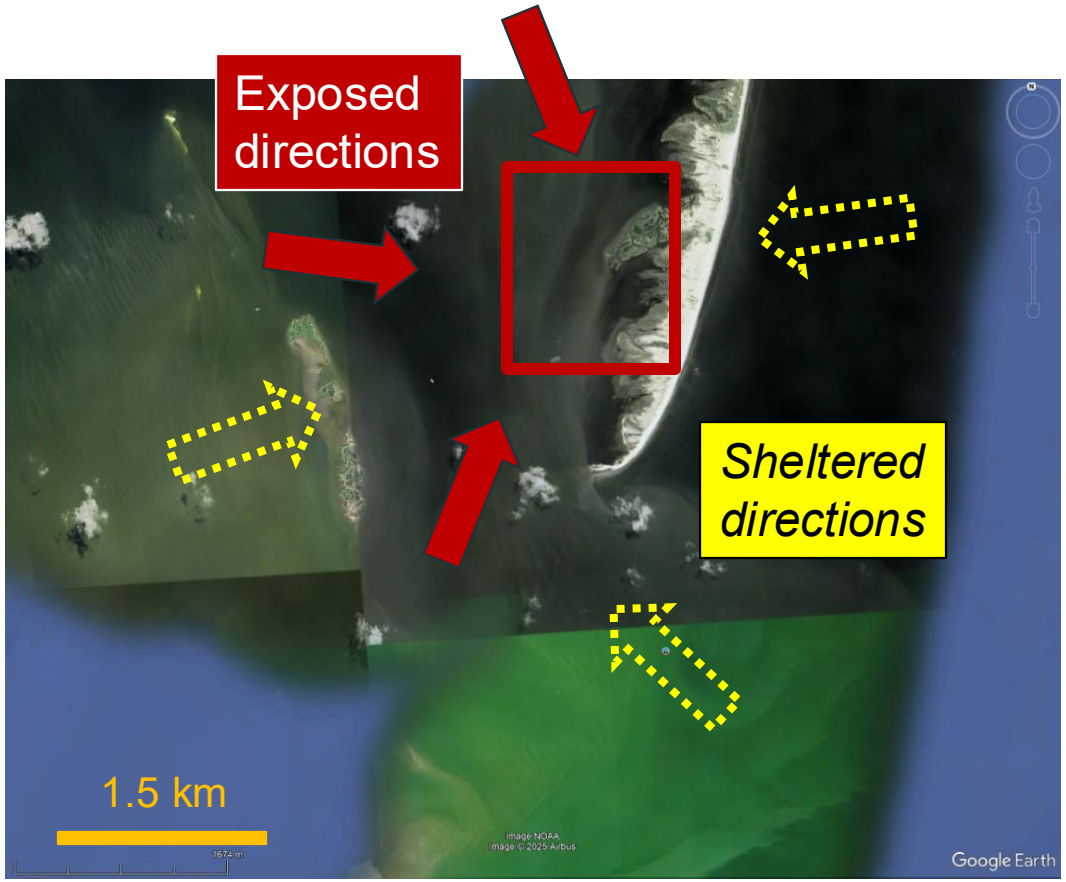


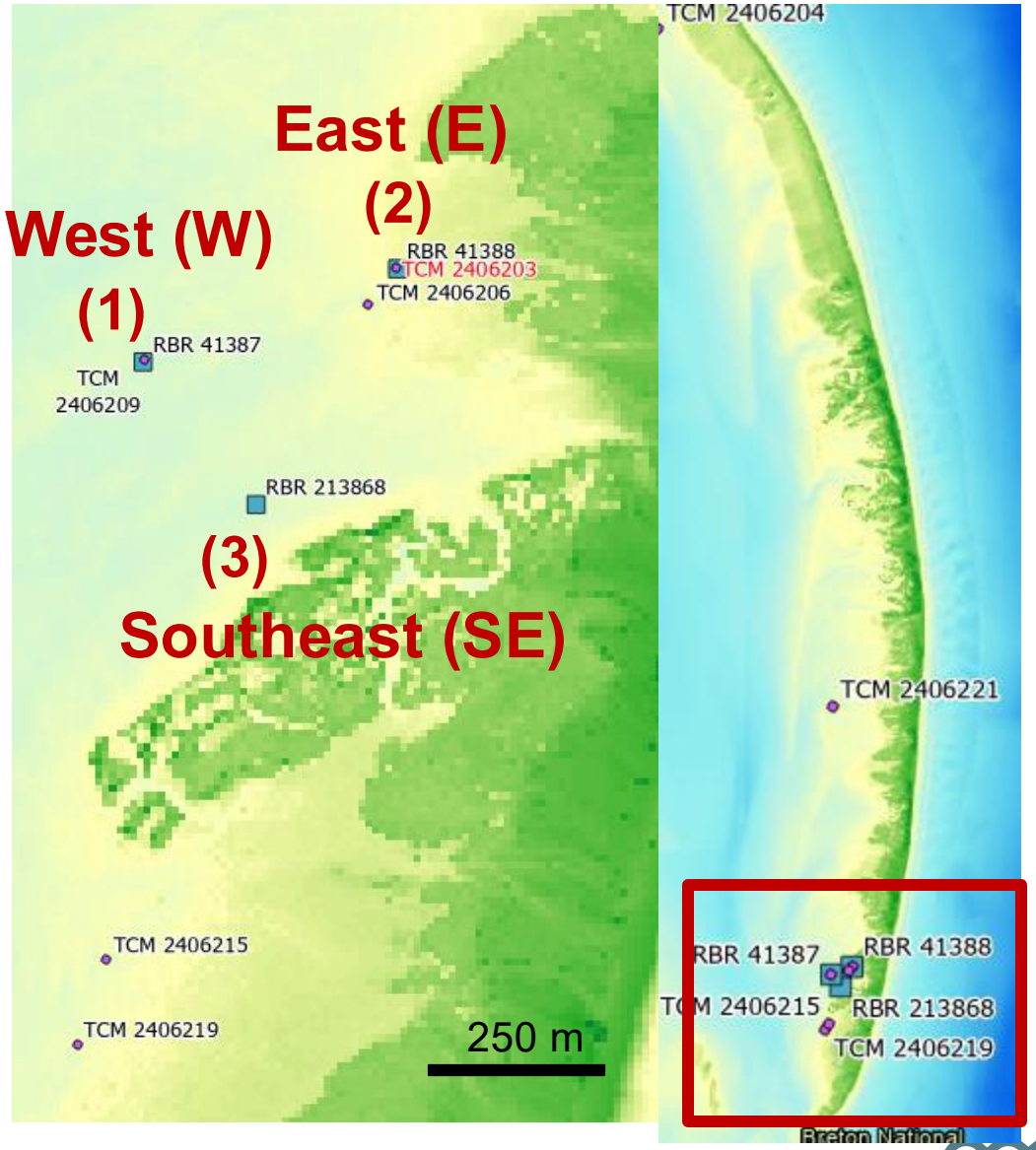
- Period Oct 2 – Dec 2, 2024
- RBRs recovered during the field visit on December 2, 2024
- Burst sampling, at 16 Hz, every 20 minutes, burst duration ~10 minutes (~8192 samples/burst)
- Wave statistics processing (*Wiberg and Sherwood, 2018*)

RBR are wave and water level loggers (Water Institute)
TCM are Tilt Current Meters (U. of Southern Mississippi)

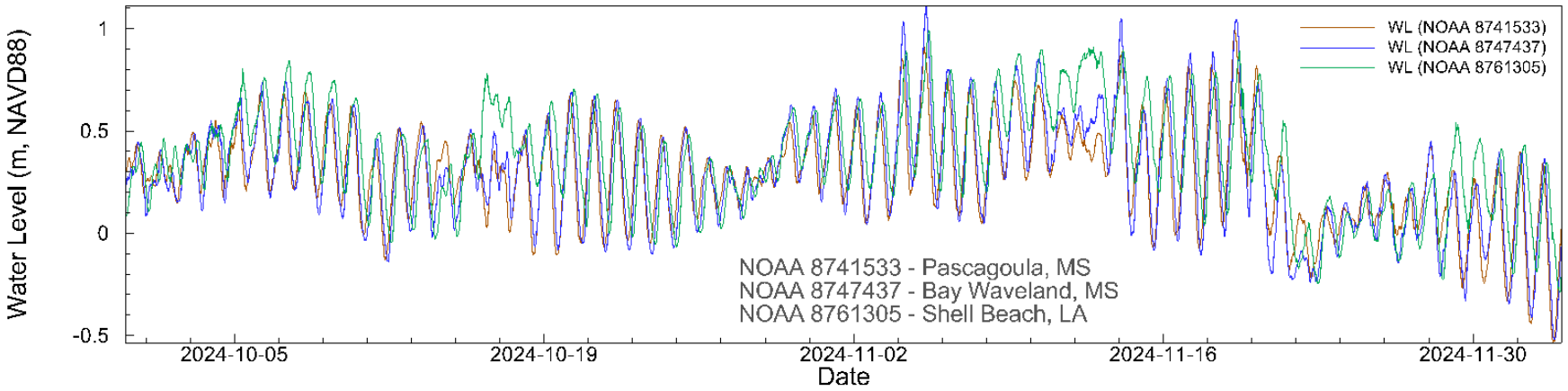
EXPERIMENTAL DESIGN - SITE SELECTION

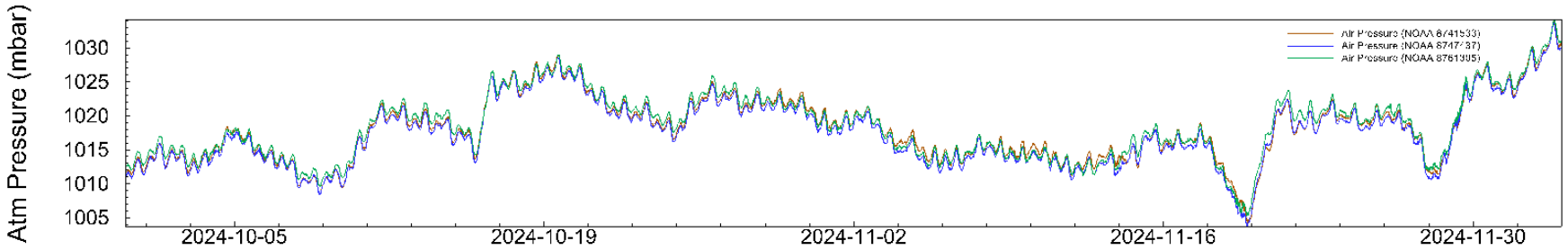
- Similar depth + seagrass (*1 to 3; W to SE*)
  - Approximate depth of ~1.6 m
- Decreasing depth + seagrass (*1 to 2; W to E*)
  - Approximate depth of ~1.6 m to 0.6 m

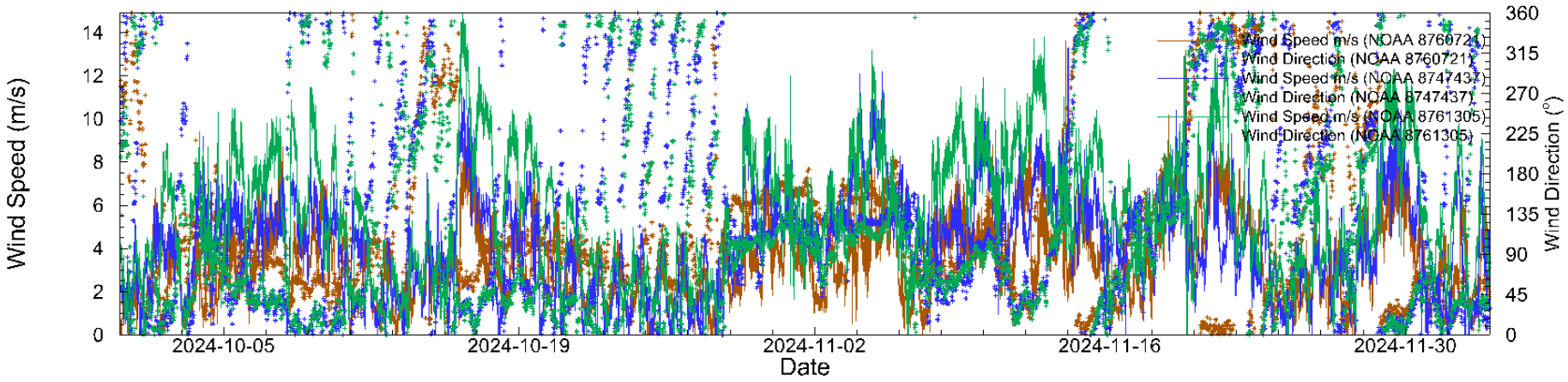


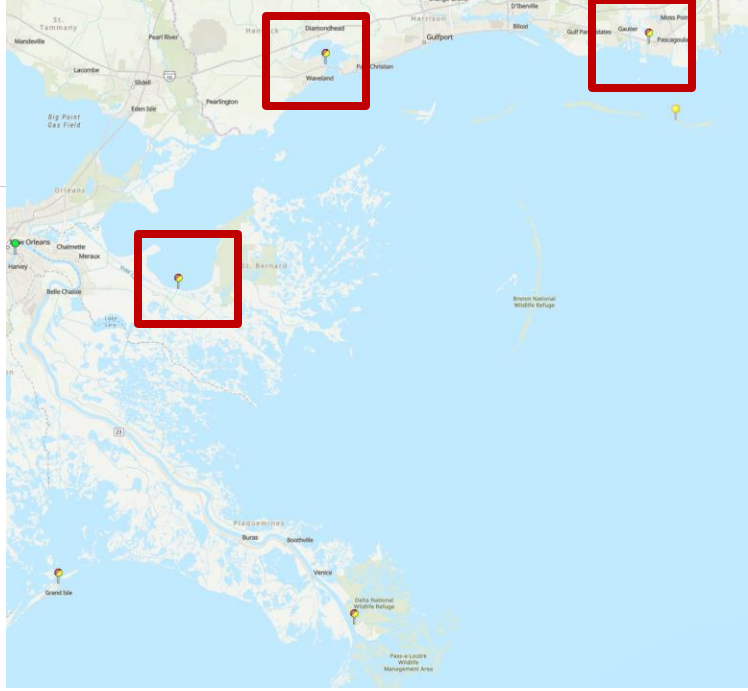


RESULTS – WATER LEVELS

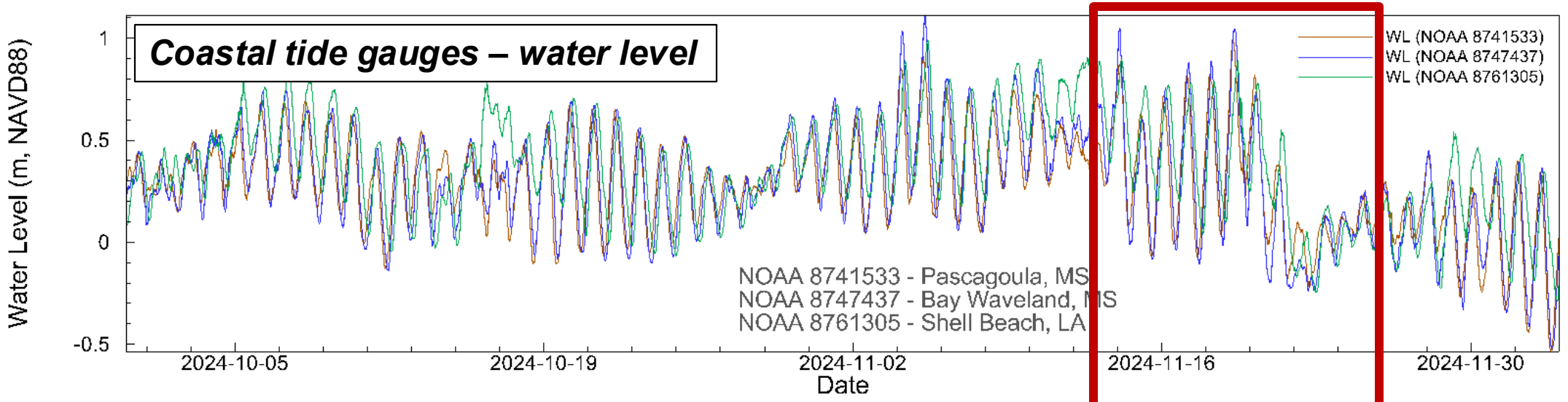


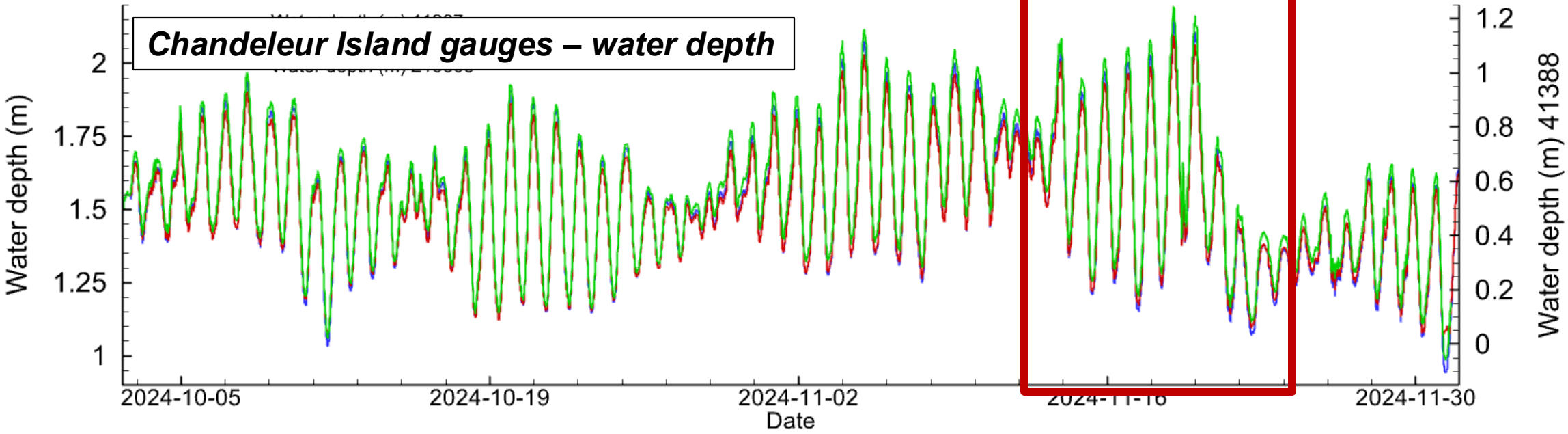




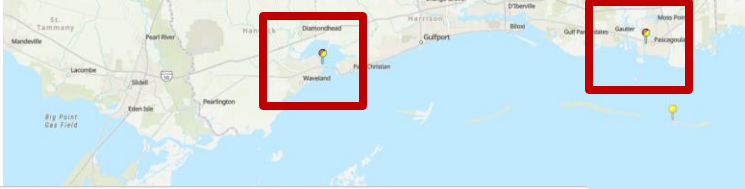


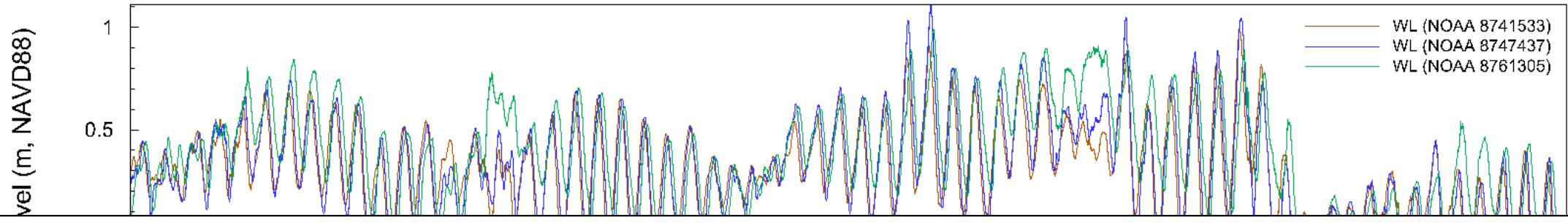
RESULTS – WATER LEVELS



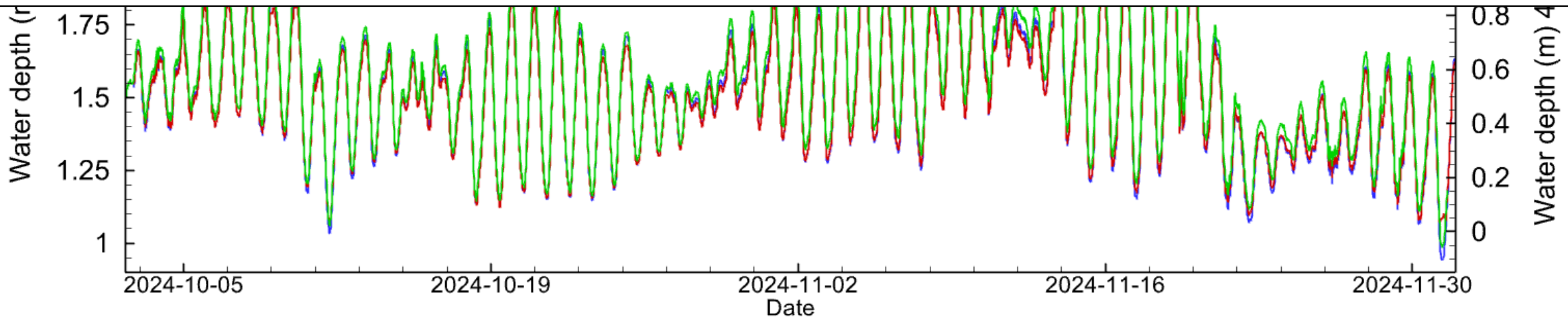


RESULTS – WATER LEVELS

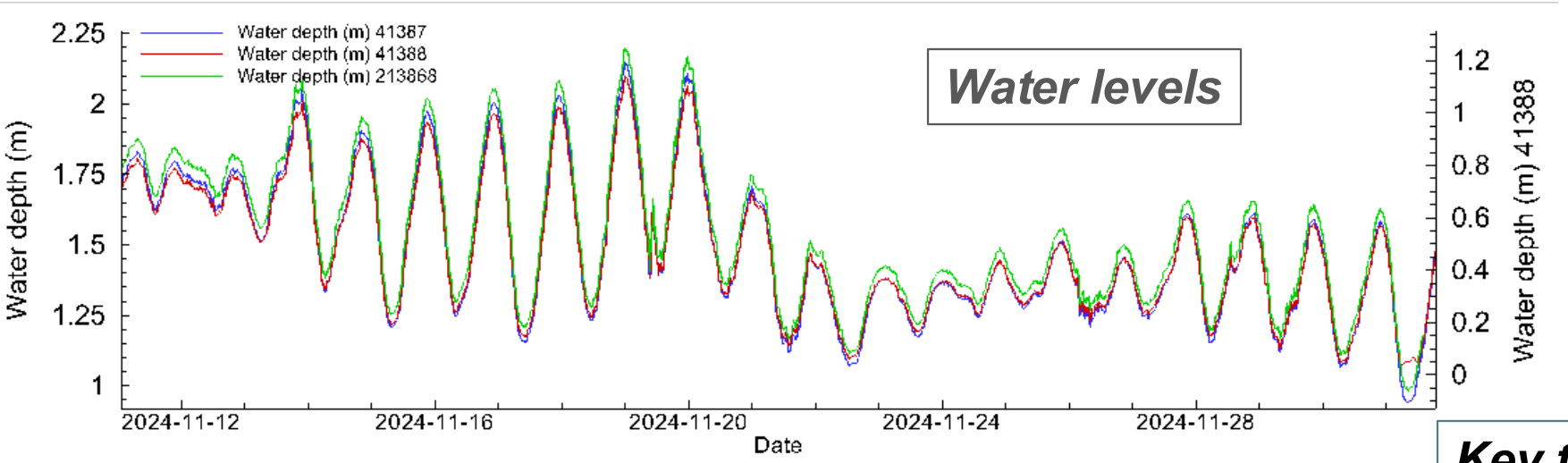


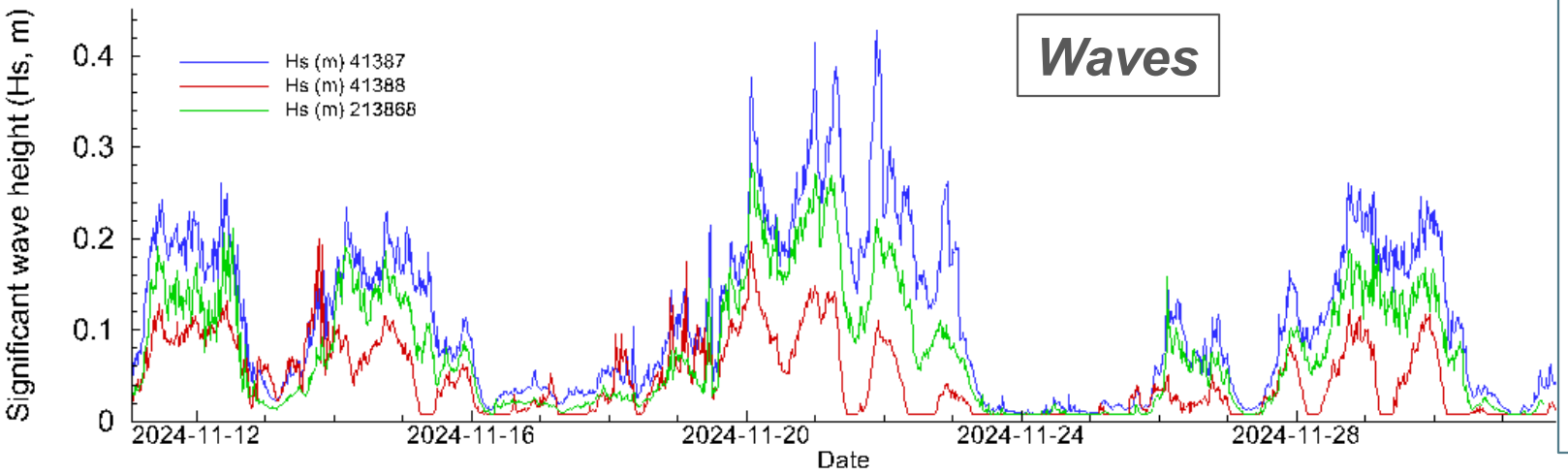


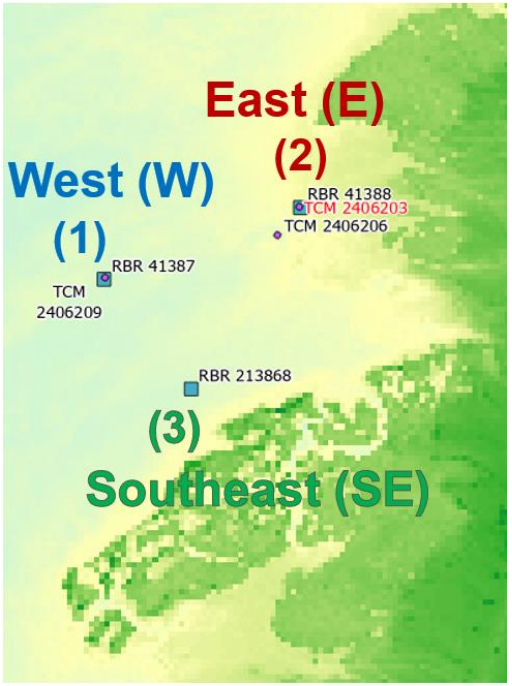
Key takeaway:
Water level excursions at the Chandeleurs are approximately half of those observed near the coast. An ***~60 cm setdown*** from a large event on the coast, produced a ***~30-35 cm setdown*** on the Island.



RESULTS – WAVES







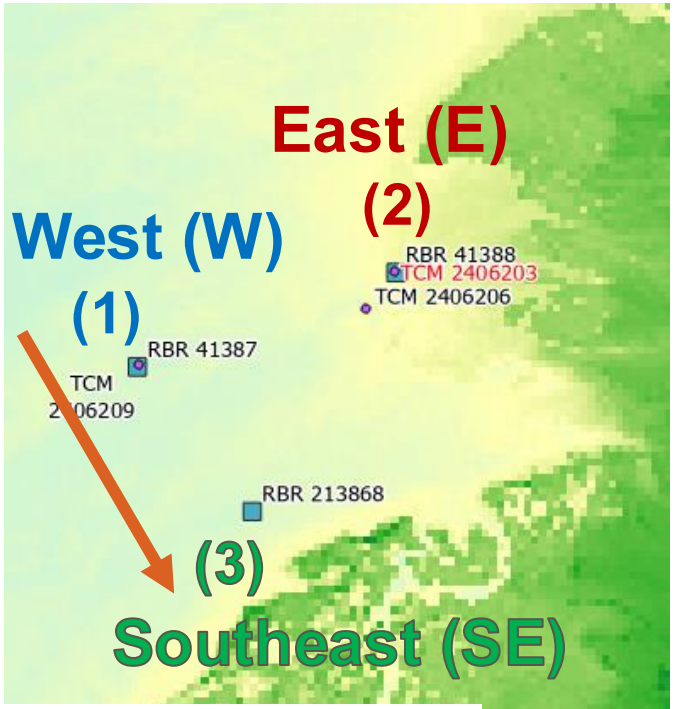
Key takeaway:

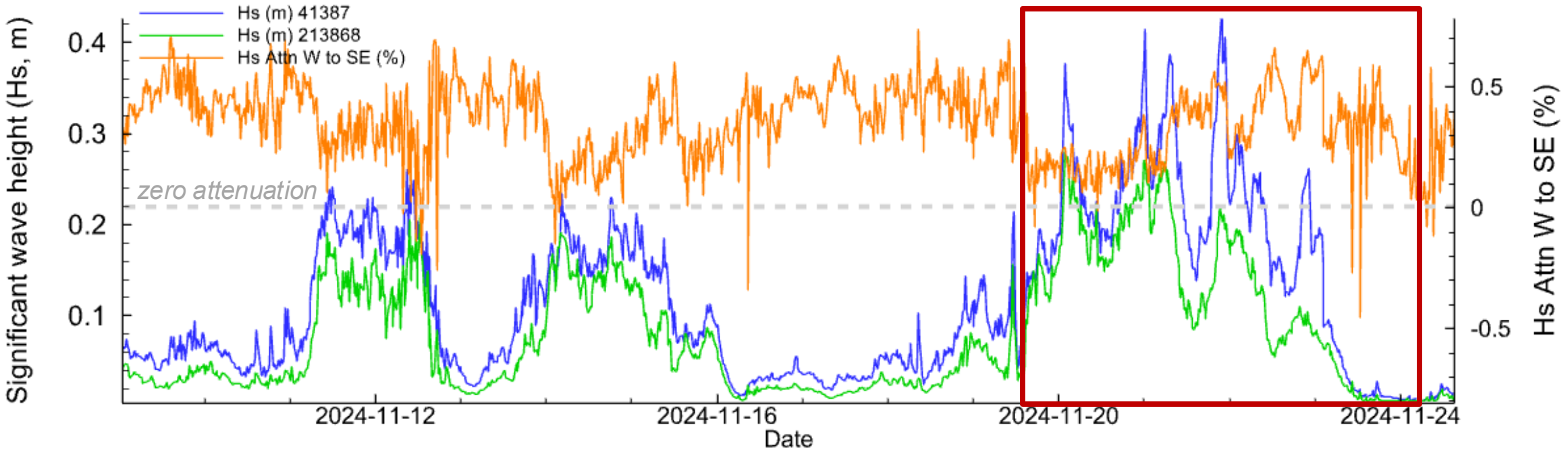
Waves at the outer station ***exceed 40 cm***, while waves inland reach ***20 – 25 cm***.

Waves vary with depth
(strong tidal and subtidal control)

WAVE ATTENUATION ACROSS MEADOWS

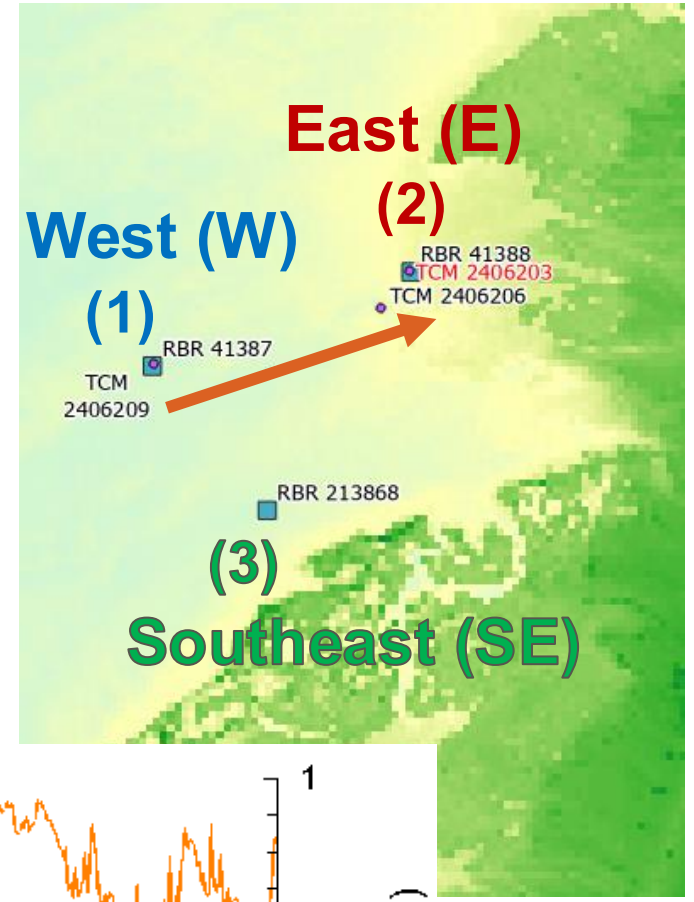
Wave attenuation by seagrasses alone during the larger storm event, when water levels declined swiftly ***varied from 30 - 60%***.

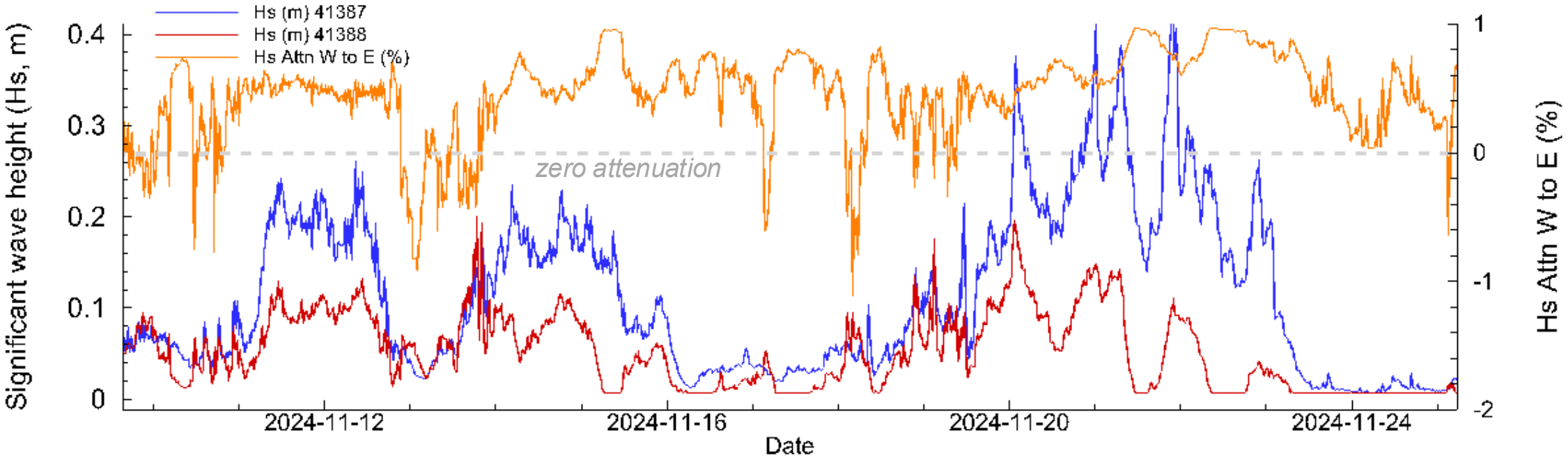




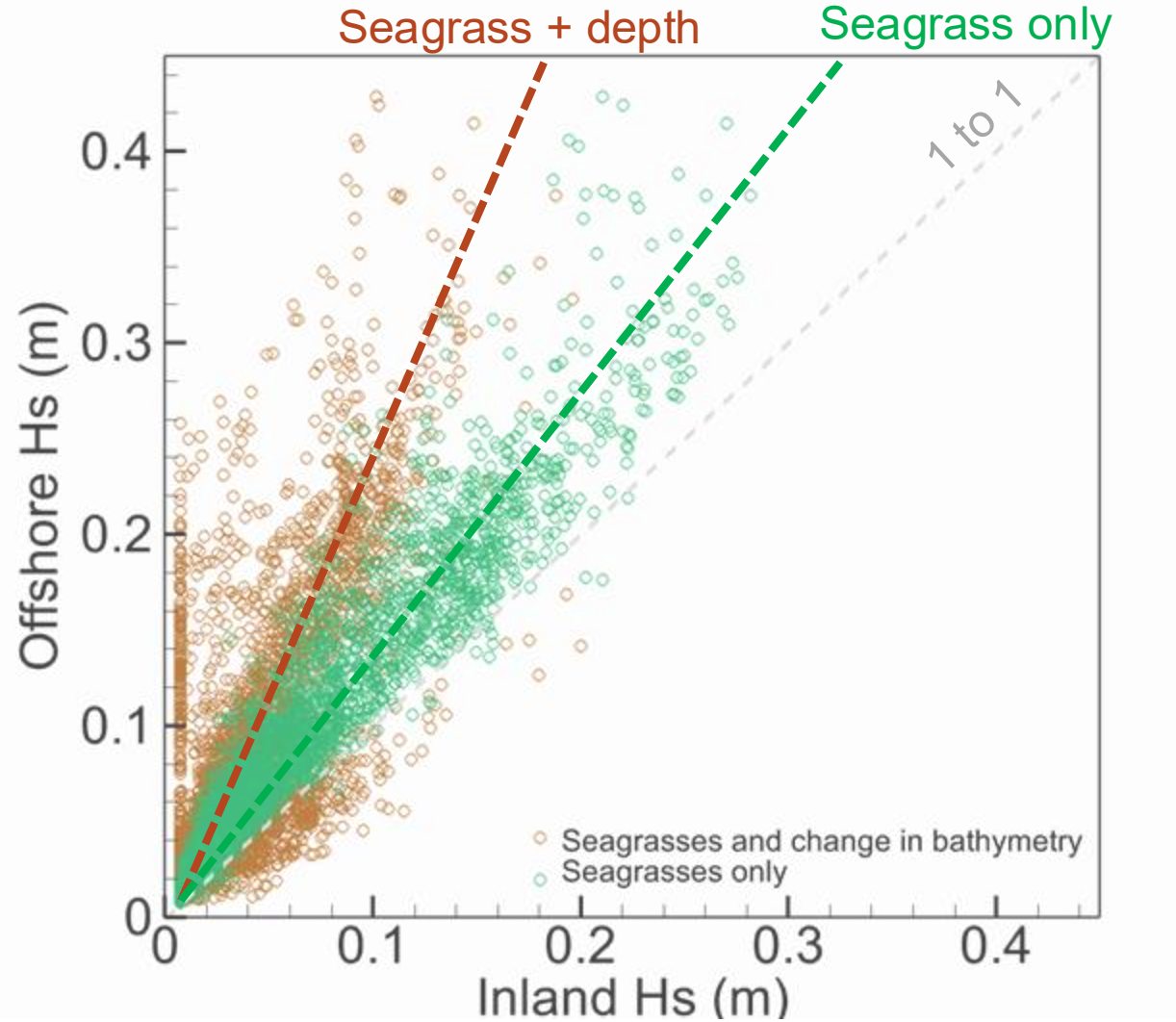
WAVE ATTENUATION ACROSS MEADOWS

Wave attenuation by seagrasses plus reduction in depth during the larger storm event, when water levels declined swiftly ***varied from 30 - 100%***.

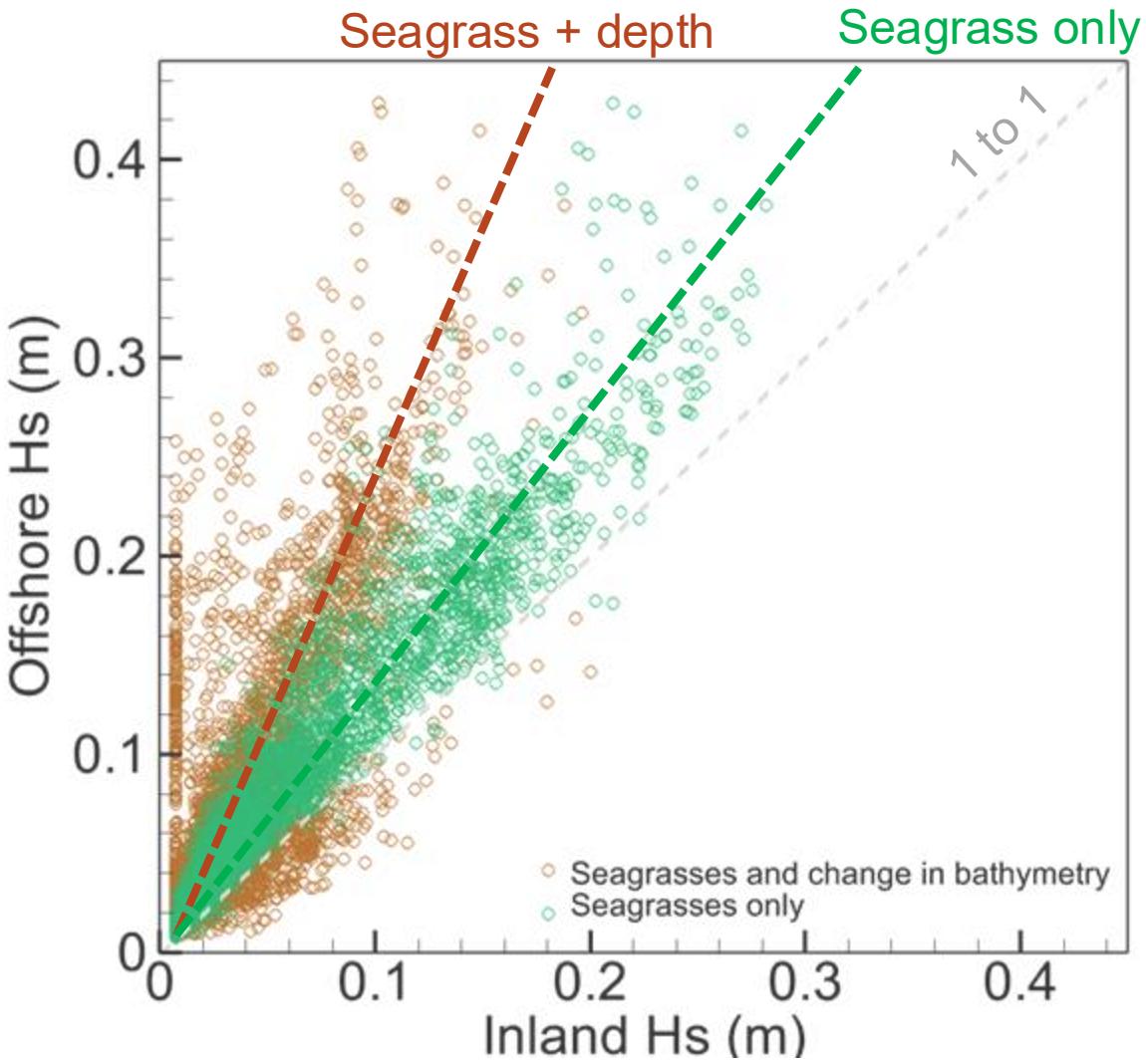


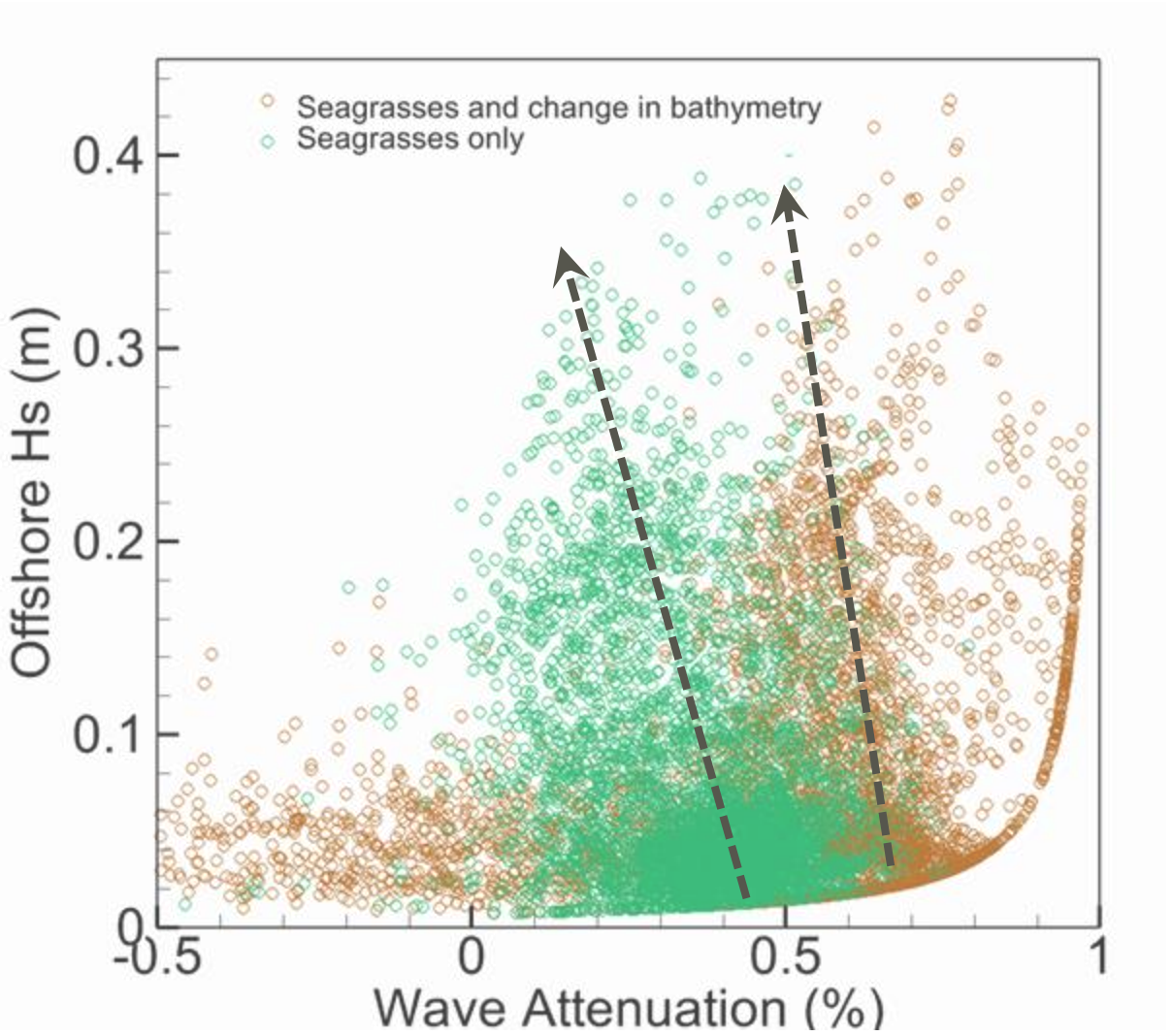


SUMMARY OF WAVE ATTENUATION



SUMMARY OF WAVE ATTENUATION





KEY TAKEAWAYS - WAVES

- Waves throughout the seagrass meadows are ***controlled by water depth, local wind speed, and incoming wave energy***.

- ***Locally generated waves are small (~10-15 cm) but can reach 20 cm***

- ***Incoming waves*** from the exposed directions can exceed ***~40 cm*** during these ***more energetic events***.

KEY TAKEAWAYS – WAVE ATTENUATION

- Wave attenuation is ***on average***
  - ***~ 35% (± 15%) over seagrasses alone***,
  - ***~ 46% (± 35%) both seagrasses and a change in water depth***.
- Smaller waves ***attenuate more compared to larger waves***
- ***The seagrass meadows exhibit dynamic behavior***
- ***Depth, in addition to the presence/absence of seagrasses***, can ***dynamically modulate waves in more sheltered and shallower regions*** of the meadows.

THE WATER INSTITUTE

THANK YOU

Ioannis Y. Georgiou

Baton Rouge
1110 RIVER ROAD SOUTH, SUITE 200
BATON ROUGE, LA 70802

WWW.THEWATERINSTITUTE.ORG
@THEH2OINSTITUTE

New Orleans
2021 LAKESHORE DRIVE, SUITE 310
NEW ORLEANS, LA 70122