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JUST CERFING

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Christopher Makowski, Ph.D.
Editor-in-Chief

Dutch Coast near The Hague
The Netherlands

The Dutch North Sea coast (ca 350 km), from Germany in the northeast to Belgium in the southwest, is predominantly sandy with beaches and dunes. Sands are more or less calcareous, and fine to medium in particle size (300–200 µ). Tidal range varies between 2,5–1,5 m and the foreshore has a low slope. For centuries, structural erosion prevailed. The coast protects highly build up and industrialized hinterland. About half the country is estimated to be between 0–8 m below sea level. So, coastal defence traditionally is a national issue. In the past, the Dutch mainly used “hard” structures, like dams and groynes. Would it be sustainable to continue like this in the future? After many studies, the National Government decided to change the policy and move from “hard” towards “soft” stabilization of the shore. Since 1995, the new national policy is to stop overall erosion and “hold the line” in a dynamic way, using sand instead of hard, immobile dams and groynes (unless strictly needed). The coast is now regularly fed with sand taken from the nearby North Sea floor. First practice was placing it on the beach. But more and more foreshore nourishment became common practice.

The dunes seen here are very young (up to 15–20 years) and rise up to 7–10 m above the average flood tidal level. They are the result of the new coastal defence policy of dynamic preservation. These dunes are completely built up from nourished sands and appear as an additional foredune ridge in front of the existing one. (Photograph taken May 2025 by Frank van der Meulen.)

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Impacts of Three Consecutive Hurricanes in 2024 along Low-lying Heavily Developed Barrier Islands, West-Central Florida, U.S.A.

Impacts of Three Consecutive Hurricanes in 2024 along Low-lying Heavily Developed Barrier Islands, West-Central Florida, U.S.A.

Ping Wang, John E. Bishop, Zachary J. Westfall, Lara Novalvos Hernandez, Elizabeth L. Royer, and Kendal Jackson

The year 2024 was exceptional for the west-central Florida coast in terms of hurricane impacts. Three hurricanes, Debby, Helene, and Milton, impacted the coast within 65 days. Three heavily developed barrier islands were examined based on six repeated surveys of 121 beach profiles conducted before and after the passage of each hurricane. This provided a rare opportunity to quantify the impacts of consecutive hurricanes along a heavily developed coast. Beach-dune changes caused by each storm demonstrated substantial alongshore variation that was significantly controlled by prestorm conditions. The beach-dune changes caused by a subsequent storm are strongly influenced by the profile characteristics produced by the previous storm. Hurricane Helene generated the highest storm surge over the 78-year measurement period in the greater study area. Widespread flooding of the barrier-island interior was mostly from the bayside overtopping the seawall by up to 1.3 m. During Hurricane Helene, the beach and dunes were not able to sustain the prolonged (>5 h) wave attack. Some of the sand from the eroded dunes was deposited onto the beach. The storm surge also caused widespread washover distributing eroded beach and dune sand onto roads and infrastructures that were <150 m from the ocean. The few surviving dunes were protected by a wider than 50-m beach seaward of the dune field. Hurricane Milton deposited significant amounts of sand in deeper water as compared with Hurricanes Debby and Helene. The alongshore variation of the seaward limit of measurable elevation change was mainly controlled by prestorm bathymetry as opposed to alongshore variation of wave heights.

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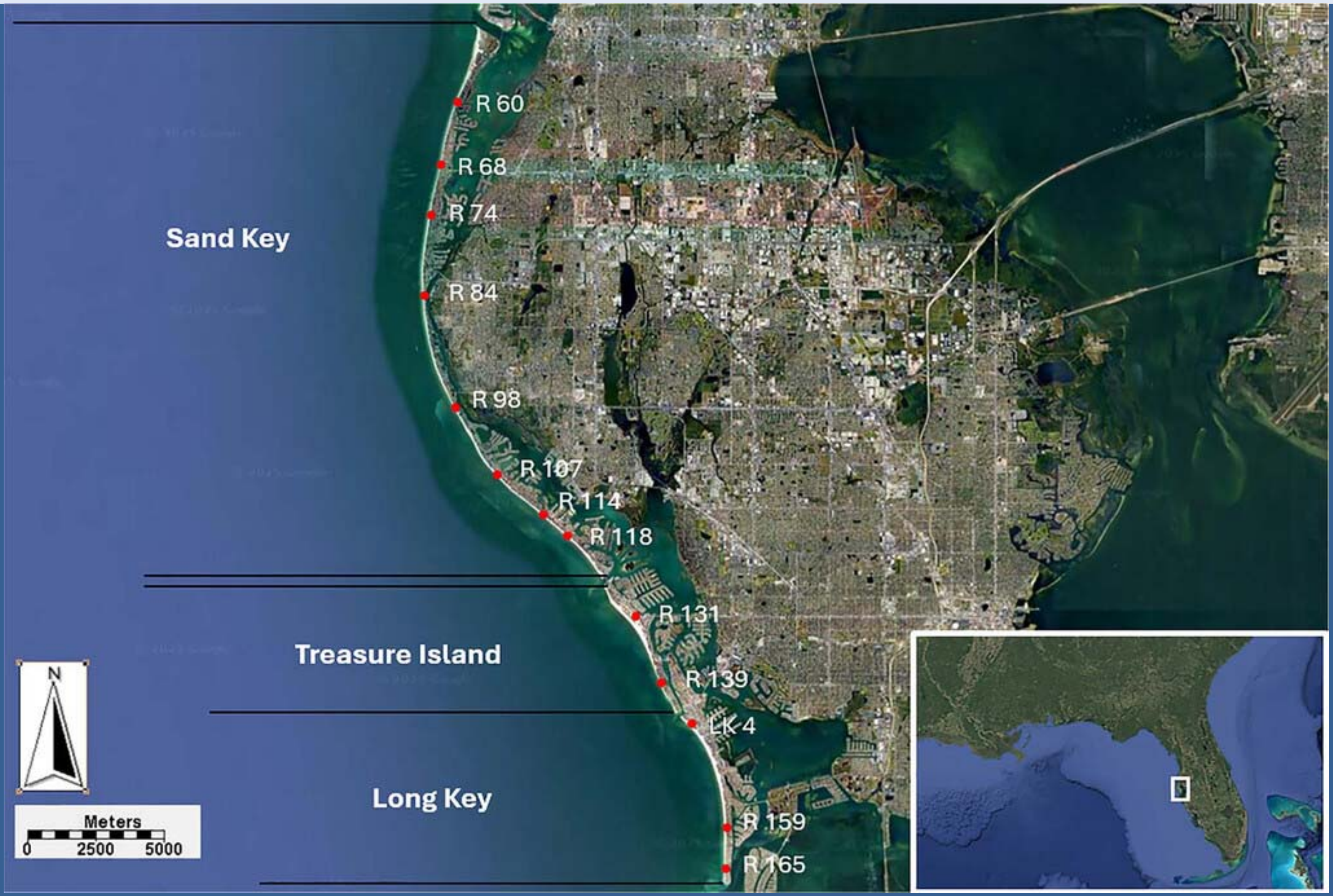

Figure 1. Study area located along the west-central Florida coast. Example profiles discussed in the paper are marked.

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Hurricanes generate extremely energetic conditions along the boundary between land and ocean and can cause drastic morphological changes, as well as economic losses and human deaths (Emanuel, 2003). Projected global climate change may increase the frequency and intensity of hurricanes and have been the topic of numerous studies (Emanuel, Sundararajan, and William, 2008; IPCC, 2022, 2023; Knutson et al., 2010). One clear and persistent trend is the rapidly increasing monetary cost associated with hurricane impacts to developed coastal areas, despite the well-documented and well-communicated hazards (AghaKouchak et al., 2020; Dawson et al., 2018; Gencer et al., 2018; McAlpine and Porter, 2018; Mendelsohn et al., 2012; Palm and Bolsen, 2023; Peduzzi et al., 2012; Pielke et al., 2008).

Low-lying (less than 10-m elevation) coastal zones represent only 2% of the earth's land surface but contain 10% of the world's population (Sweet et al., 2022). Barrier islands are among the most desirable places to live and visit, leading to often dense development on these dynamic thin strips of sand in the ocean, such as those in west-central Florida. Beaches on barrier islands are recreationally and ecologically valuable. In the United States, beach tourism contributes tremendously to the economy, even during the recent COVID pandemic (Houston, 2023, 2024). In Pinellas County particularly, 15.4 million tourists visited in 2024 and spent $11.2 billion dollars despite the impacts of the 2024 hurricane season (VSPC, 2024). Because of these economic effects, storm impacts must be accurately assessed, and lessons learned should be applied for optimal storm preparation and adaptation (Grafakos et al., 2018; McPhearson et al., 2018; Simpson et al., 2021).

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Storm-induced beach-dune erosion, overwash inundation, and infrastructural damage have been topics of many studies (Ciavola and Coco, 2017; Claudino-Sales, Wang, and Horwitz, 2008, 2010; Ellis and Sherman, 2015; Houser and Hamilton, 2009; Houser, Hapke, and Hamilton, 2008; Roberts, Wang, and Puleo, 2013; Wang and Horwitz, 2007; Wang et al., 2006, 2020; Wang, Royer, and Gutierrez, 2024; Wang et al., 2024). Sallenger (2000) developed a storm-impact scale to classify storm-induced beach-dune changes, overwash, and inundation based on the comparison between elevated water level by a storm and beach-dune elevation. The Sallenger (2000) scale has been routinely used by the U.S. Geological Survey to assess and predict storm impacts on barrier islands (Plant, Doran, and Stockdon, 2017; Plant and Stockdon, 2012; Stockdon et al., 2012). Miller and Livermont (2008) proposed a storm erosion index considering interactive storm and beach-dune parameters, as well as storm duration. The storm erosion index has been applied successfully to evaluate storm impact and to predict storm erosion potential along several U.S. Atlantic and Gulf of America (formerly Gulf of Mexico) coasts (Cheng, Toledo Cossu, and Wang, 2021; Janssen, Lemke, and Miller, 2019; Lemke and Miller 2020).

Energetic storms constitute a major mechanism that cause beach-dune erosion, sometimes in a catastrophic fashion. For developed barrier islands, obstructive interactions between human activities and natural processes can also lead to prolonged beach erosion (Wang and Beck, 2022). Over the last four decades, beach nourishment has become the dominant sandy shoreline mitigation method in the United States, overtaking the previous approach of hard engineering structures such as groins and breakwaters (Elko et al., 2021). Regarding the sediment budget, beach nourishment is the only method that directly addresses beach erosion by compensating for the sand deficit (Dean, 2002; NRC, 1995).

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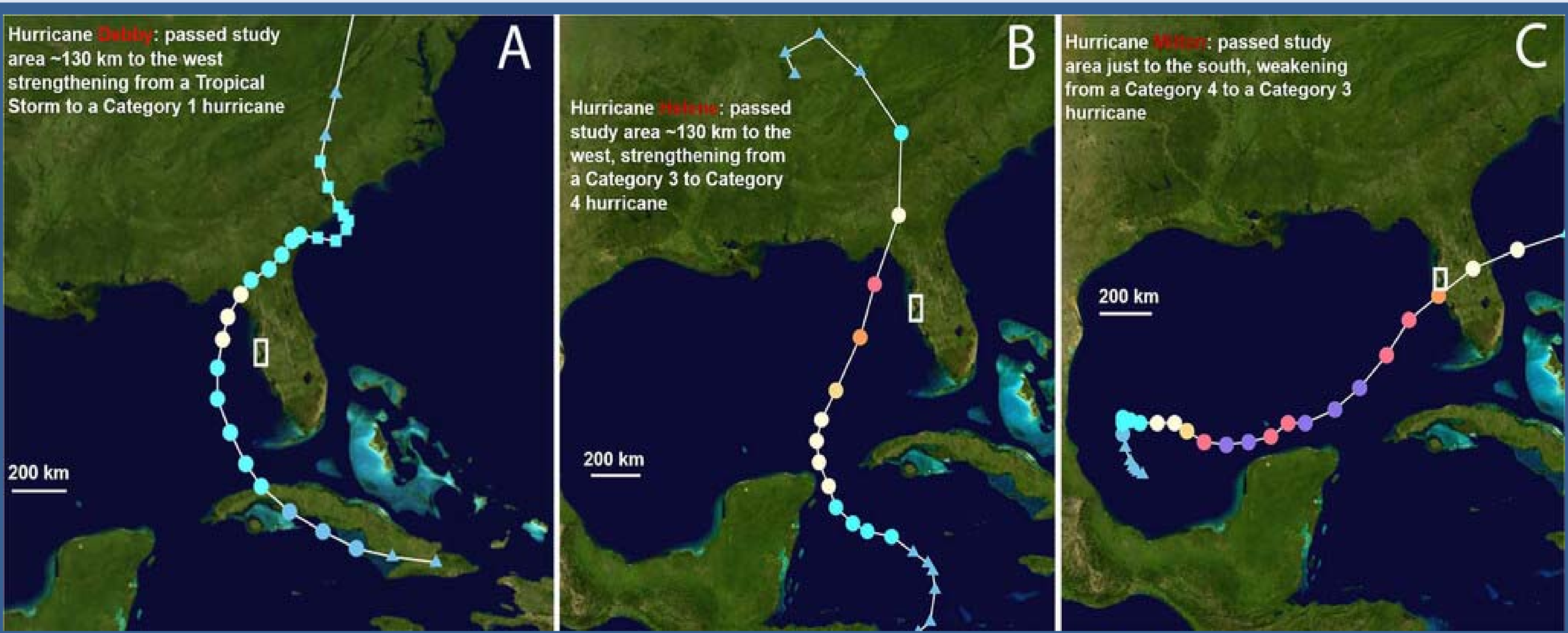

Figure 2. Tracks of the three hurricanes. The points show the location of the storm at 6-h intervals. Tracks of (A) Hurricane Debby, (B) Hurricane Helene, and (C) Hurricane Milton.

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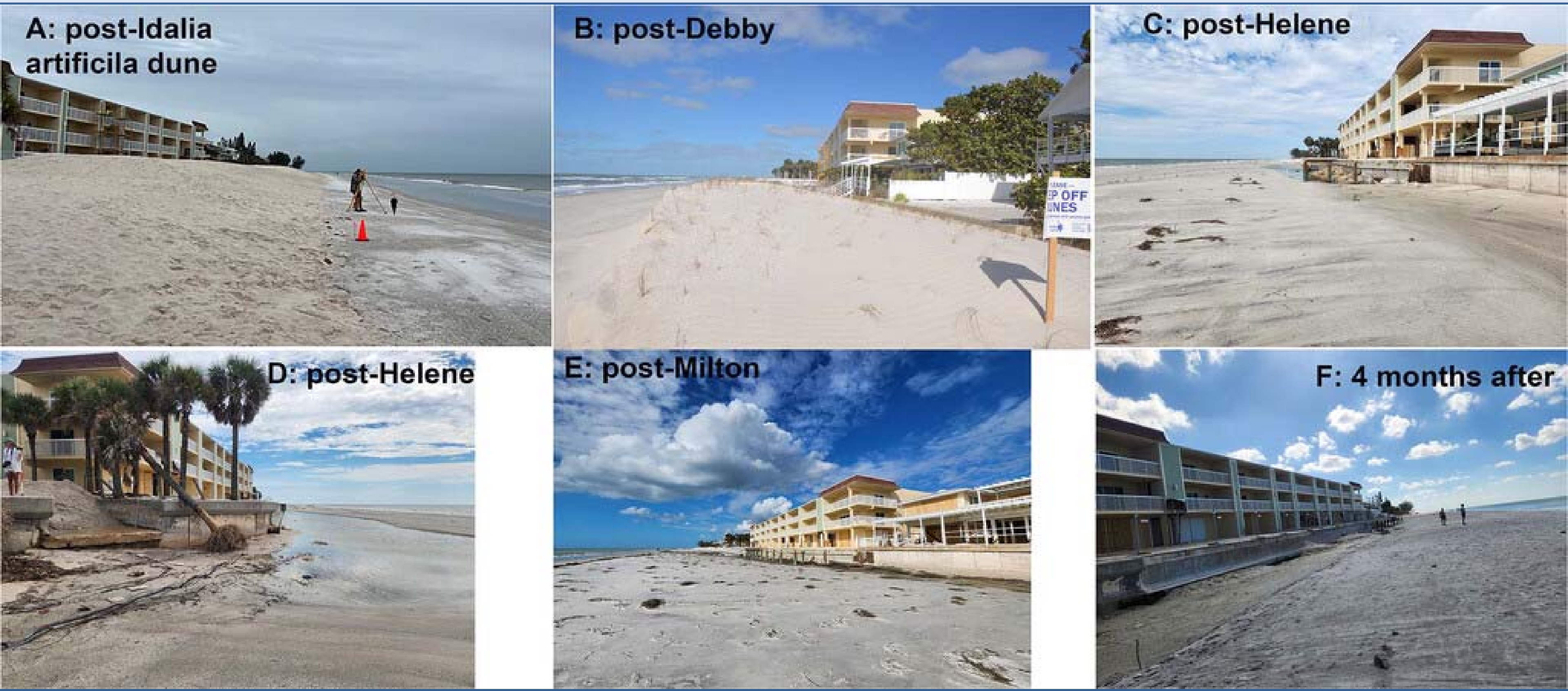

Figure 4. Beach and dune erosion caused by the hurricanes in 2024, at profile R84 (see Figure 1 for location). (A) Constructed dune after Idalia; (B) most of the post-Idalia dune was intact after Hurricane Debby; (C) dune was completely eroded by Hurricane Helene (photo looking north); (D) dune was completely eroded by Hurricane Helene (photo looking south); (E) slight beach gain after Hurricane Milton; (F) modest beach recovery 4 mo after.

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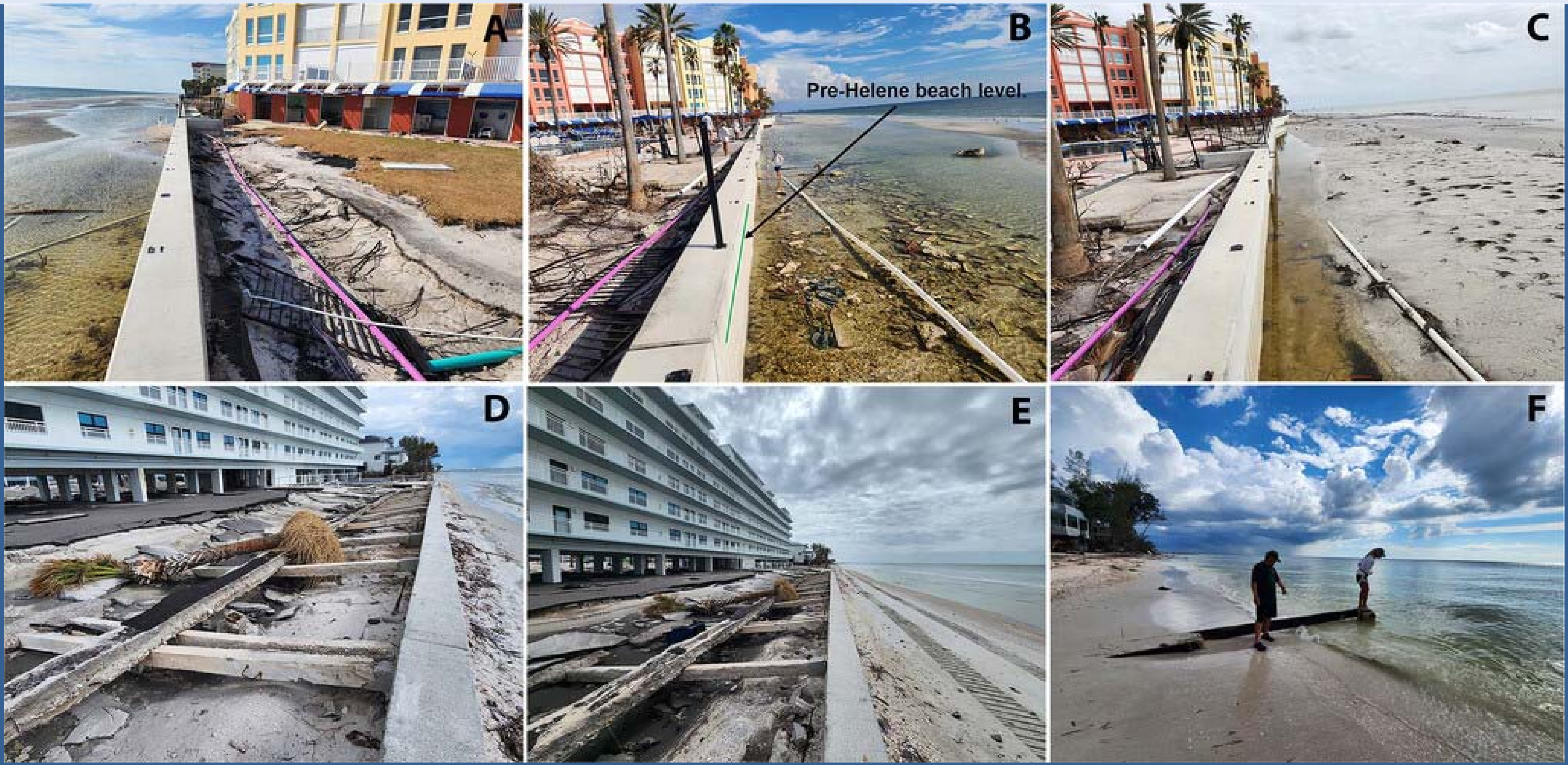

Figure 5. Infrastructure damage caused by Hurricanes Helene and Milton. (A) Scouring landward and seaward of the seawall caused by Helene at a location roughly 200 m south of profile R107 (see Figure 1 for location), looking north, note the exposed steel anchor rod; (B) same example in (A) but looking south; (C) same example looking south after Hurricane Milton, note the sand accumulation seaward of the seawall; (D) scouring landward and seaward of a seawall caused by Helene at profile R139 (see Figure 1 for location); (E) same example after Milton, note the slight sand accumulation seaward of the seawall; (F) exposed wooden groin commonly used in the 1950s before large-scale beach nourishment.

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Figure 6. Damage to dune overwalk by Hurricane Helene. (A) Severe beach and dune erosion at a overwalk, the part with the stairs could not be found in the nearby area; (B) part of a dune overwalk was washed over the seawall and crashed into a beach front building (red box).

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Figure 7. Sand overwashed into beach-front infrastructures. (A) Sand deposited outside a storage unit, north Sand Key; (B) sand deposited outside a hurricane glass door, north Sand Key; (C) sand deposited inside a beach-front house, north Sand Key; (D) sand was overwashed around and through beach-front buildings and deposited along a coastal road, Treasure Island; (E) sand deposited within a parking garage, south Sand Key; (F) up to 1-m-thick sand deposited along a coastal road, Treasure Island; (G) sand deposited in a hotel parking lot on the landward side of a coastal road, Treasure Island; (H) sand filled a swimming pool, south Sand Key.

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Figure 8. Strong wind associated with Hurricane Milton did not disperse the widespread debris piles from Helene cleanup efforts. (A) An example of debris piles along a street after Hurricane Helene; (B) an example of debris piles along a street (not the same street as in [A]) after Hurricane Milton.

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Coastal Sediments 2027

The International Conference on Coastal Sediments 2027, celebrating 50 years of the Coastal Sediments Conference Series, will be held in Charleston, South Carolina, May 3rd – 7th, 2027.

https://www.usf.edu/arts-sciences/departments/geosciences/research/coastal-sediments/index.aspx

SUBMIT YOUR ABSTRACT BY JULY 15TH

We are also planning regular and special sessions, short courses, and field trips. If you have any suggestions or interested in organizing special sessions, teaching short courses, or leading field trips, please contact Prof. Ping Wang at pwang@usf.edu

Shorebird Responses to Construction Disturbance during Restoration of Barrier Shorelines

Shorebird Responses to Construction Disturbance during Restoration of Barrier Shorelines

Paul L. Leberg, Darin M. Lee, and Delaina M. LeBlanc

Dredged materials are frequently used to restore beaches, but little information is available on how this activity might disturb foraging shorebirds. Bird proximity to sediment discharge sites during beach and dune construction was used to determine whether birds responded to this disturbance. The possible influences of bird abatement or pumping status on the relationship between bird locations and discharge sites were also examined. Data on bird positions was collected during restoration of both Caminada Headland and Whiskey Island in SE Louisiana. On the Caminada Headland, restored during 2013–17, three species were present in sufficient numbers to be used in the analysis: Piping Plover (*Charadrius melodus*), Red Knot (*Calidris canutus*), and Wilson's Plover (*Anarhynchus wilsonia*). On Whiskey Island, only Wilson's Plover was present during the active restoration (2017–18) in sufficient numbers on enough survey dates for analysis. Little evidence of Wilson's Plover or Red Knot avoiding discharge sites compared with controls was found, although sample sizes were small on the Caminada Headlands. However, the distance of the Piping Plover closest to the discharge site was significantly farther (about 200 m) than the distance to the control location. This effect was not found for the average distance of the closest three Piping Plovers to the discharge and control sites. No evidence that supported bird abatement or that the status of pumping activities influenced distance from discharge and control sites for any species was found, although sample sizes were small with these comparisons. The difference between the distributions of closest individual and closest three individuals suggests that most of the Piping Plovers on the shoreline were not responding strongly to construction activities. These results suggest that construction activities associated with shoreline restoration in the northern Gulf Coast have only minimal effects on the distributions of foraging shorebirds.

Shorebird Responses to Construction Disturbance during Restoration of Barrier Shorelines

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Figure 1. Locations of Whiskey Island and the Caminada Headland that were subject to the restoration projects examined for their effects on bird distributions.

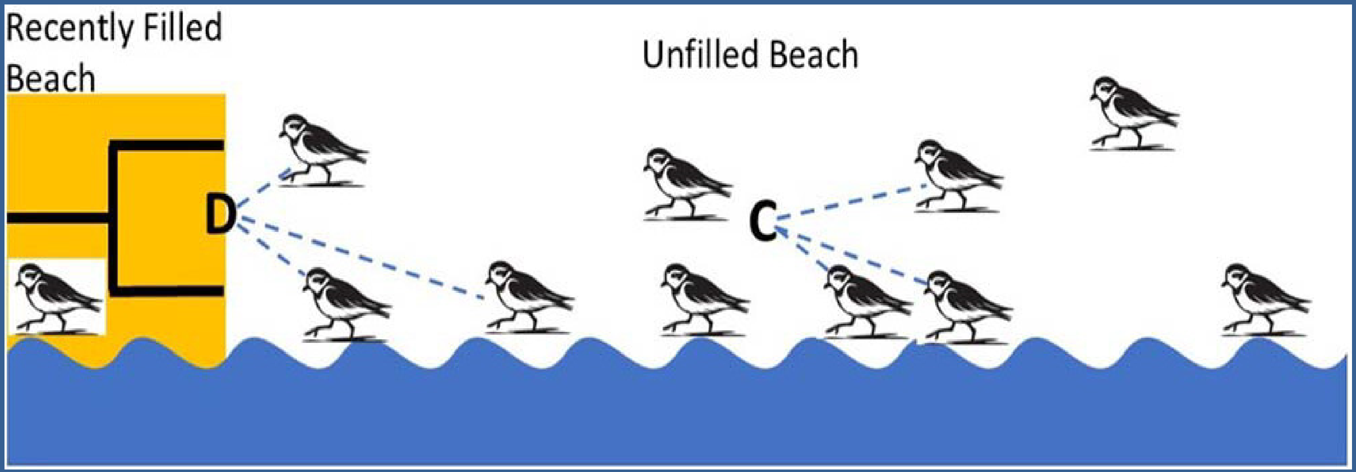

Figure 2. Approach used to assess bird position relative to discharge (D) and control (C) sites. The pipes carrying material to two sites is shown in black. The discharge site is located at the midpoint between the ends of discharge pipes on the day of the survey. The control site is located approximately halfway between the discharge site and the remaining unfilled portion of the beach at a discharge site that will be used in the future.

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Dredged sediments are often used to restore degrading barrier headlands and islands to provide storm-surge buffers and habitats for wildlife (Campbell, Benedet, and Finkl, 2005; Freeman et al., 2021). The restoration of these habitats requires a sediment source to rebuild and reshape the land; often the source is dredged from offshore or inshore deposits and channels and then pumped to the barrier shoreline (Campbell, Benedet, and Finkl, 2005; Finkl et al., 2006; Khalil, Finkl, and Raynie, 2013).

Although one goal of coastal shoreline restoration is to provide wildlife habitat, there is an information gap regarding how these construction activities might affect the distribution of avian species that use shorelines. One such group are the shorebirds (several families in the order Charadriiformes), which often forage along coastal shores. Most studies that have focused on the effect of dredged materials on avian species examined the use of restored shorelines following construction (McIntyre and Heath, 2011 Peterson et al., 2014; Peterson et al., 2006). Others have examined how prey resources used by shorebirds change following the construction period (Manning, Peterson, and Bishop, 2014; Peterson et al., 2014; Peterson, Hickerson, and Johnson, 2000; Wooldridge, Henter, and Kohn, 2016). However, the direct effects of construction activities, associated with the pumping of dredged materials to a site and the movement of these materials by heavy equipment, has received little attention.

There appears to be general acceptance that construction activities associated with shoreline restoration can disturb birds, but little detailed study or quantification of effects are available (Mengak and Dayer, 2020; Speybroeck et al., 2006). Burton, Evans, and Robinson (1996) found little evidence of direct construction effects on shorebirds. Burger (1988) found that construction-related activities caused gulls to move short

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distances, and Burton, Rehfisch, and Clark (2002) found that construction disturbance lowered densities and feeding activities of some species. However, in none of these examples was the construction disturbance directly related to beach nourishment with dredged sediments.

In addition to a general lack of information on how dredged material deposition affects birds, little information on how changes in the level of construction activity might affect avian behavior is available. For example, throughout a project, some days may pass when no dredged material is being actively pumped, but other potential human disturbance (e.g., bulldozing, moving of equipment) is ongoing. Some projects also include active bird abatement, which involves actions to prevent individual shorebirds from nesting in a place that will soon be altered by the placement of dredged materials (Norman, 2015, 2017; Seamans and Gosser, 2016). Just as little detailed evaluation of construction disturbance related to pumping of dredged materials is available, little is known regarding how different types of construction-related activities, including bird abatement, affect shorebird activity.

As part of two major restoration projects in coastal Louisiana, field surveys were conducted to assess shorebird use of project areas during the placement of dredge material. Data collected during these surveys were used to determine whether shorebirds avoided sediment discharge sites during the period of active sediment deposition. Effects of the status of pumping activities and the use of bird abatement activities on the relationship between the distances of shore birds to construction and control sites were also examined. This work provides a better understanding regarding how construction activities associated with dredged material placement affects shorebird species; the results should help inform future management of shoreline-restoration projects.

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Figure 3. Piping Plover (top, photo credit: Richard DeMay), Red Knot (middle, photo credit: Delaina LeBlanc), and Wilson's Plover (bottom, photo credit: Delaina LeBlanc) were studied to examine whether construction disturbance affected bird distributions.

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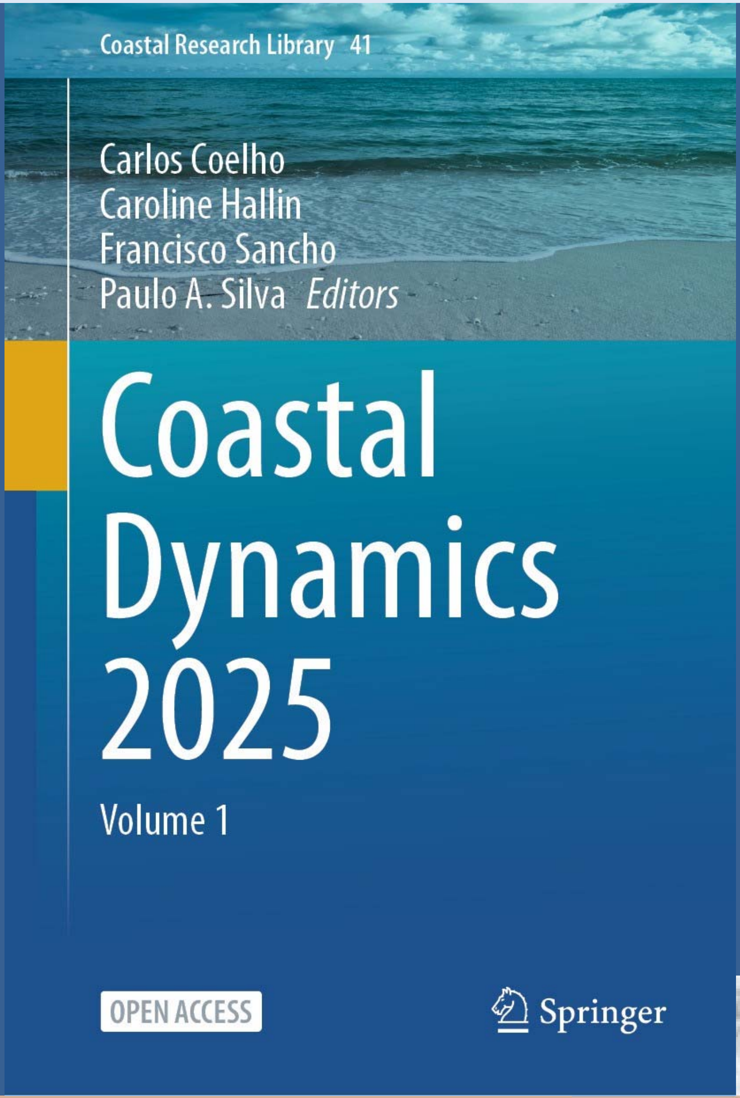
Coastal Dynamics 2025 Proceedings

Editors: Carlos Coelho, Caroline Hallin, Francisco Sancho, and Paulo A. Silva

This two volume set is open access, which means that you have free and unlimited access.



This open-access proceedings of Coastal Dynamics 2025 compile 231 manuscripts of the communications presented at the University of Aveiro, Portugal, between 7th and 11th April 2025. The works are divided in 15 chapters (two volumes), in accordance with the topic of the sessions where they were presented. The conference theme was “Living with a Dynamic Coast”. Most updated research on the dynamics and changes of the coastal systems include field (remote and in-situ) observations, laboratory experiments, theoretical formulations, and numerical simulations. Recent research and applications concerning coastal waves and currents, interactions between wind, water, sediments and eco-systems, and morphology changes in different morphological environments (with and without structures) such as sandy, rocky, and muddy coasts, inlets, and estuaries are described in this compilation.

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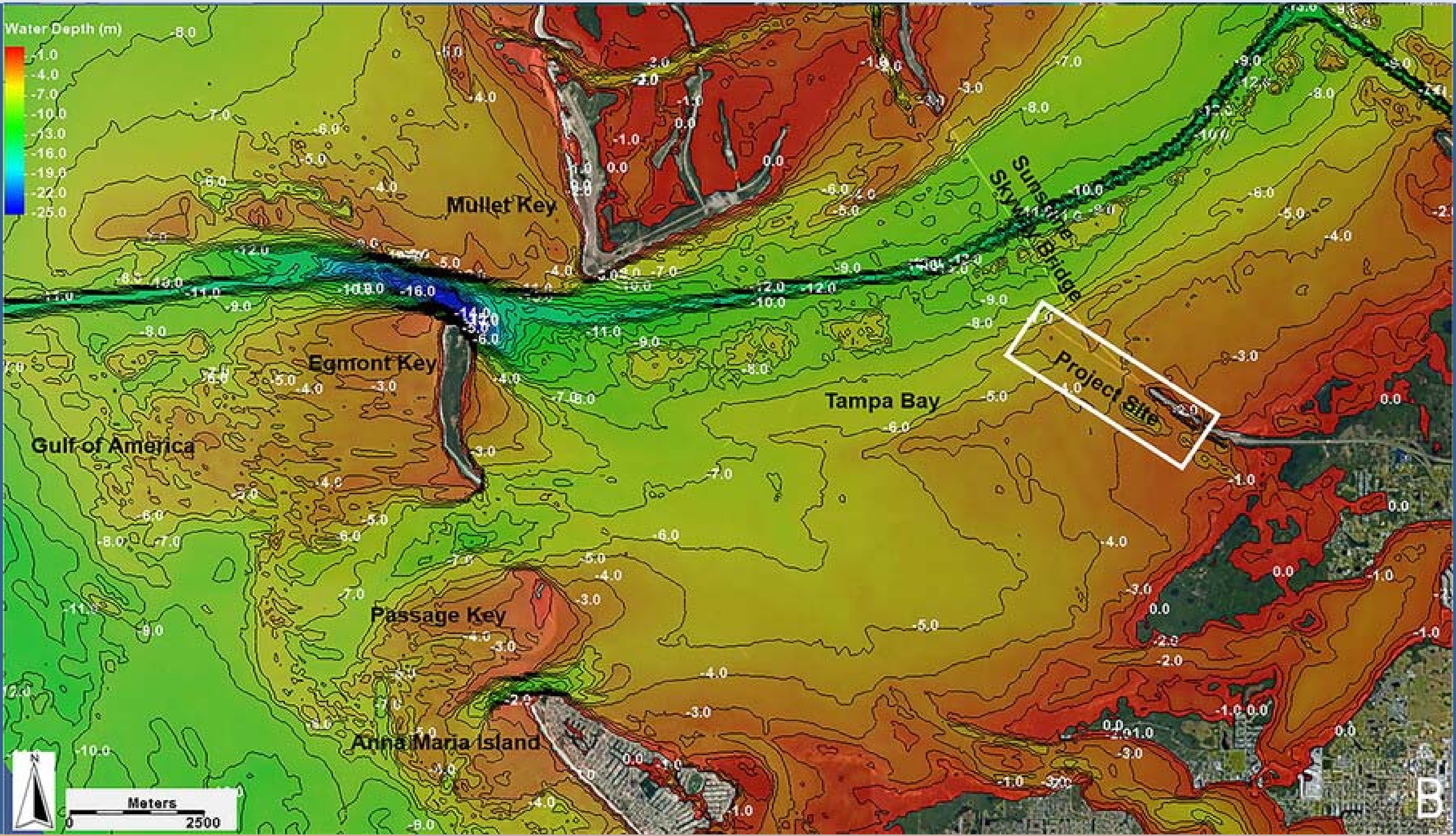
Stability and Wave-Energy Reduction Efficiency of a Popular Artificial Reef System: The Wave Attenuation Device



Stability and Wave-Energy Reduction Efficiency of a Popular Artificial Reef System: The Wave Attenuation Device

Elizabeth L. Royer and Ping Wang

Sunshine Skyway, a symbol of the greater Tampa Bay area, is a suspension bridge crossing 12-km landward of the mouth of Tampa Bay and is part of Interstate Highway 275. A section of the causeway leading to the elevated bridge is experiencing damaging wave impact. Wave protection, in addition to the existing riprap along the causeway, has become necessary. A detached breakwater made of the innovative Wave Attenuation Device (WAD) artificial reef system was installed. As the use of artificial reefs for shore protection becomes more popular, quantitative data at a prototype scale are crucial. The WAD artificial reef system was installed in August 2023, right before Hurricane Idalia impacted the Gulf coast of Florida. The project was composed of two segments ~480 m (1580 ft) and ~375 m (1230 ft) long. This paper examines the stability of the WAD artificial reef units and their efficiency in wave-energy reduction. Two topobathy surveys were conducted 5 months apart. Little subsidence of the units was measured even under energetic conditions associated with proximal passages of strong hurricanes. Two wave gauges were deployed for 1 month, one on the outside of the artificial reef and one on the inside, with the goal of quantifying the wave-energy reduction. The percentage of wave-energy reduction followed a logarithmic function of incident wave height, increasing from roughly 50% for waves lower than 0.1 m to more than 85% for waves higher than 0.5 m. Tidal water-level fluctuation had minor influence on wave-energy reduction on these emerged pyramid-shaped units. Overall, the WAD artificial reef system was both stable and effective in wave-energy reduction within a large estuary, while also increasing oyster recruitment and promoting seagrass recovery within the project area. The findings from this study should be applicable to other artificial reef systems in an estuary environment.

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Figure 1. Study area. Upper panel: aerial photo from Google Earth of the greater study area.

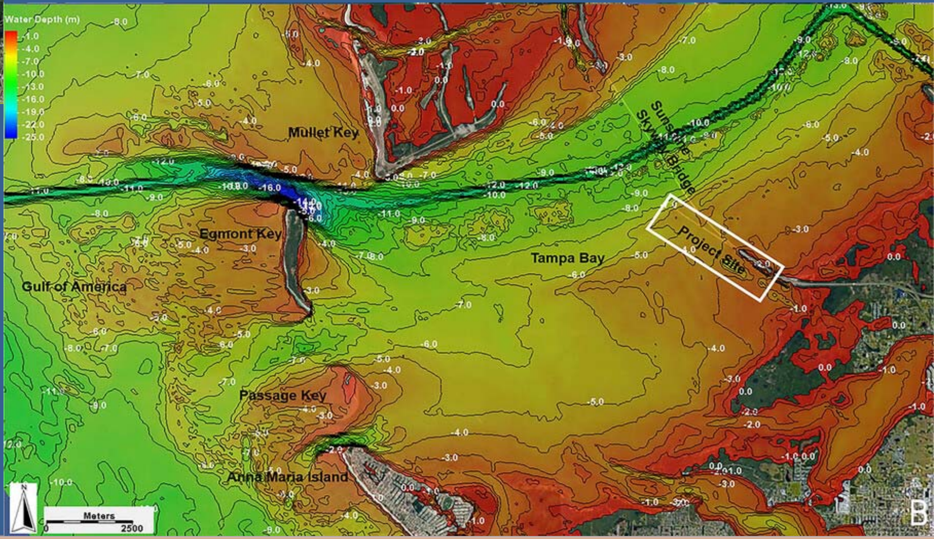

Figure 1. Study area. Lower panel: bathymetry of lower Tampa Bay and the wide bay entrance.

Stability and Wave-Energy Reduction Efficiency of a Popular Artificial Reef System: The Wave Attenuation Device

Elizabeth L. Royer and Ping Wang

Artificial reefs are increasingly applied as multipurpose and ecofriendly alternatives to traditional rubble mound structures (Bridges et al., 2014a,b; Lokesha and Sannasiraj, 2013). For example, artificial reefs can be designed and installed to restore crucial habitat and for shore protection by reducing wave energy arriving at the shoreline. A major advantage of many artificial reef systems is the smaller footprint and therefore reduced impact to submerged aquatic vegetation and benthic communities compared with traditional rubble mound structures. When properly designed, artificial reef systems can provide more ecofriendly space for diverse biomass than that provided by rock structures (Harris and Woodring, 2001; Jones et al., 2020; Lee et al., 2008; Narayan et al., 2016; Reguero et al., 2018). In recent years, artificial reefs have been increasingly viewed as more aesthetically pleasing and more natural even though they are made of concrete. The perception of being more natural often occurs because artificial reefs can be designed and fabricated to mimic or enhance the establishment of natural features, such as coral reefs and oyster reefs.

One of the major functions of artificial reef systems is to reduce incident wave energy arriving at the target shoreline and subsequently provide protection against erosion along various coasts, such as sandy beaches, as well as marsh and mangrove coasts. For crucial coastal infrastructures, such as roadways and bridges, artificial reefs can be used to protect against wave impact and enhance the ecosystem. Despite rapidly increasing applications of artificial reef systems, their effectiveness in reducing incident wave energy is poorly documented in peer-reviewed literature.

Stability and Wave-Energy Reduction Efficiency of a Popular Artificial Reef System: The Wave Attenuation Device

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The most commonly used and likely the oldest artificial reef system worldwide is the Reef Ball, operated mainly by the Reef Ball Foundation (2020; Harris, 2006). According to the foundation, as of 2025, more than 1 million Reef Balls were installed with more than 8000 projects in more than 80 countries. Another increasingly popular artificial reef system is the Wave Attenuation Device (WAD), focusing mostly on reducing wave energy arriving at the shoreline. Different from rubble mound structures, artificial reefs typically have holes within the units and gaps between units at the top as controlled by their shapes. This design allows water to move through the holes and the gaps between units, as opposed to mostly through the gaps between segments for largely impermeable rubble mound structures. The typical segment to gap ratio (Burcharth and Hughes, 2006a,b), e.g., 1:1, for the rubble mound breakwater design does not quite apply and has not been used in the artificial reef design. Typically, the gaps between artificial reef arrays are designed for ecological purposes, e.g., providing passages for manatees and/or dolphins.

The efficiency of wave-energy reduction, or wave transmission, by artificial reefs is poorly known largely because of a lack of field measurements. Reef Balls have been the subject of several physical and statistical modeling experiments, and it has been determined that on average, submerged Reef Balls can dissipate about 60% of incoming wave energy (Armono and Hall, 2002; Buccino, Del Vita, and Calabrese, 2013). Kim et al. (2021) conducted a laboratory experiment using an artificial coral reef to dissipate wave energy and found that the degree of wave attenuation had the greatest dependence on the submergence of the reef and that the wave transmission rate decreased as the wave period increased. Hong et al. (2019) also determined that

Stability and Wave-Energy Reduction Efficiency of a Popular Artificial Reef System: The Wave Attenuation Device

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artificial coral reef structures show more effective reduction of significant wave height than a natural seabed and tetrapod artificial reef structure. Seadomes are another form of artificial reef and have been tested in laboratory experiments (Srisuwan and Rattanamanee, 2015). Laboratory experiments have measured wave-height reduction between 20 and 80% using five shore-parallel rows of Seadomes, with the structure performance increasing almost linearly with the structure height/water depth ratio and incident wave steepness (Srisuwan and Rattanamanee, 2015). Overall, various artificial reefs have been the subject of laboratory experiments; however, there are little data on their effectiveness at a prototype scale.

This study quantified the wave-energy reduction of a large 3.2-m-high (10.5-ft-high) WAD artificial reef system by measuring wave conditions directly seaward and landward of the reefs. In addition, the structural integrity, including settlement, scour at the bottom, and tilting of the units, was examined through time-series topographic surveys.

Stability and Wave-Energy Reduction Efficiency of a Popular Artificial Reef System: The Wave Attenuation Device

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Figure 2. Seawall and riprap at the project site. New rocks were added to reinforce the deteriorating riprap. Rocks were also added to prevent scouring along the landward side of the seawall.

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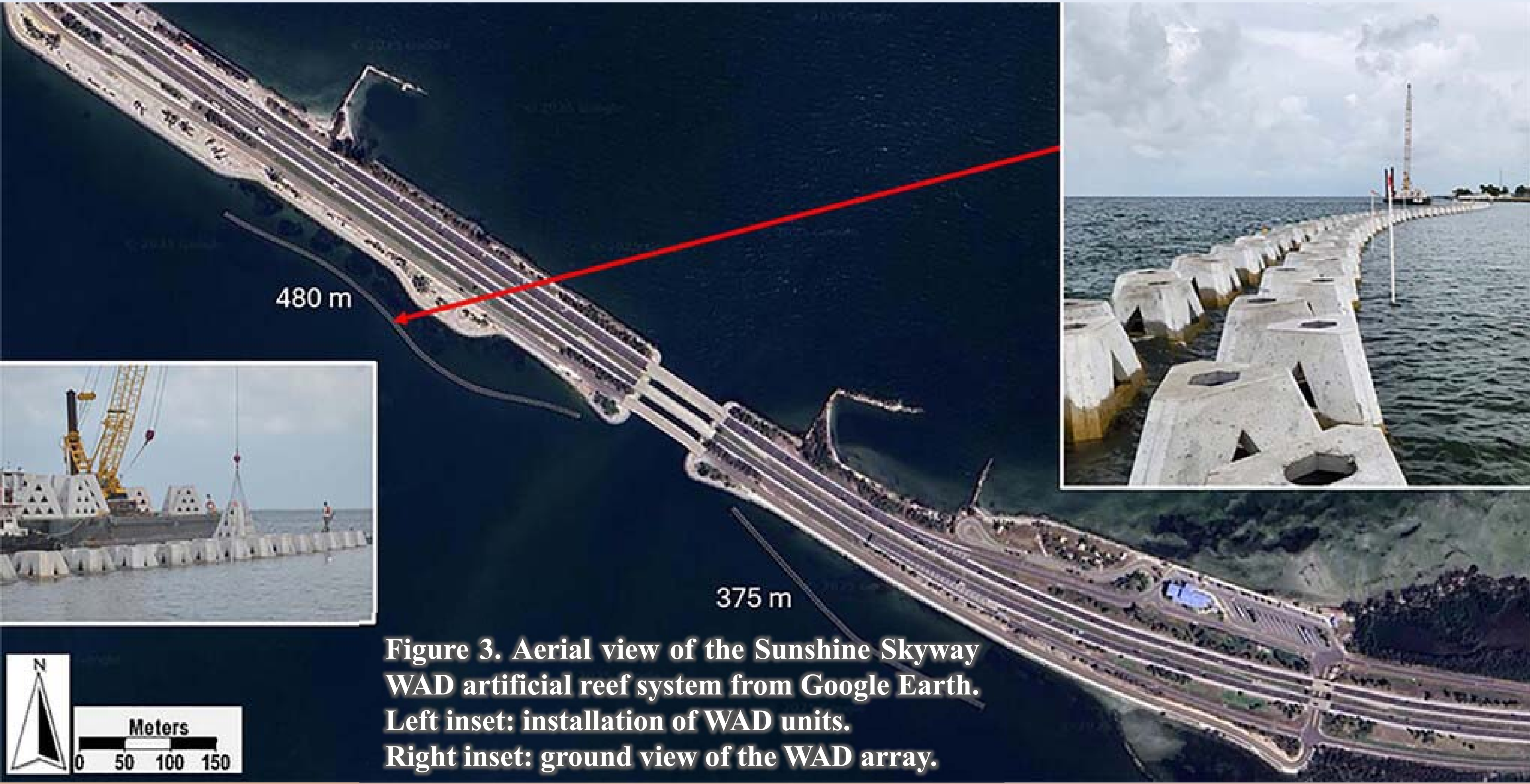

Figure 3. Aerial view of the Sunshine Skyway WAD artificial reef system from Google Earth. Left inset: installation of WAD units. Right inset: ground view of the WAD array.

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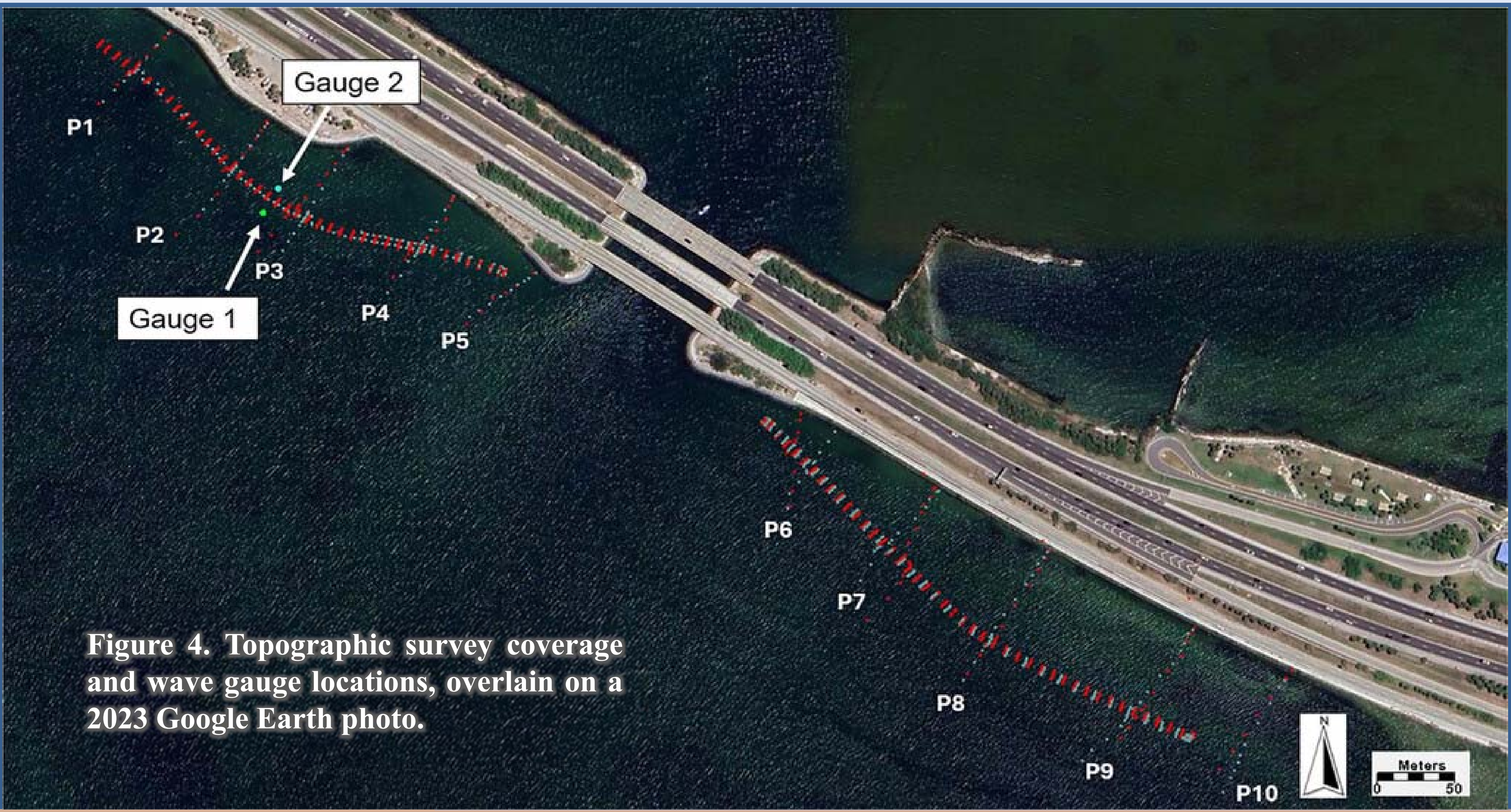

Figure 4. Topographic survey coverage and wave gauge locations, overlain on a 2023 Google Earth photo.

Stability and Wave-Energy Reduction Efficiency of a Popular Artificial Reef System: The Wave Attenuation Device

Elizabeth L. Royer and Ping Wang

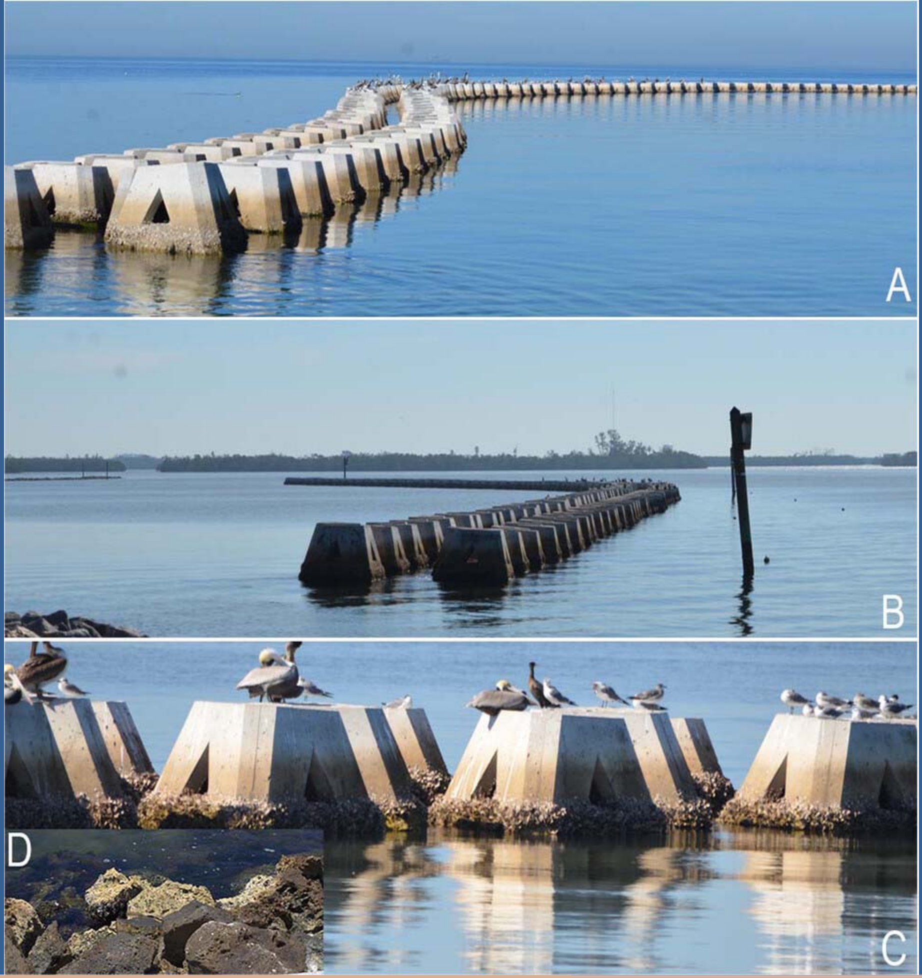

Figure 8. Photos of the Sunshine Skywave WAD array taken on 31 January 2025. (A) North segment. (B) South segment. (C) Close-up view showing the oyster growth over 1.5 years. (D) Close-up of the riprap along the shoreline (photo taken on 31 July 2025).

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3D Recording and Interpretation for Maritime Archaeology

Editors: John K. McCarthy, Jonathan Benjamin, Trevor Winton, and Wendy van Duivenvoorde

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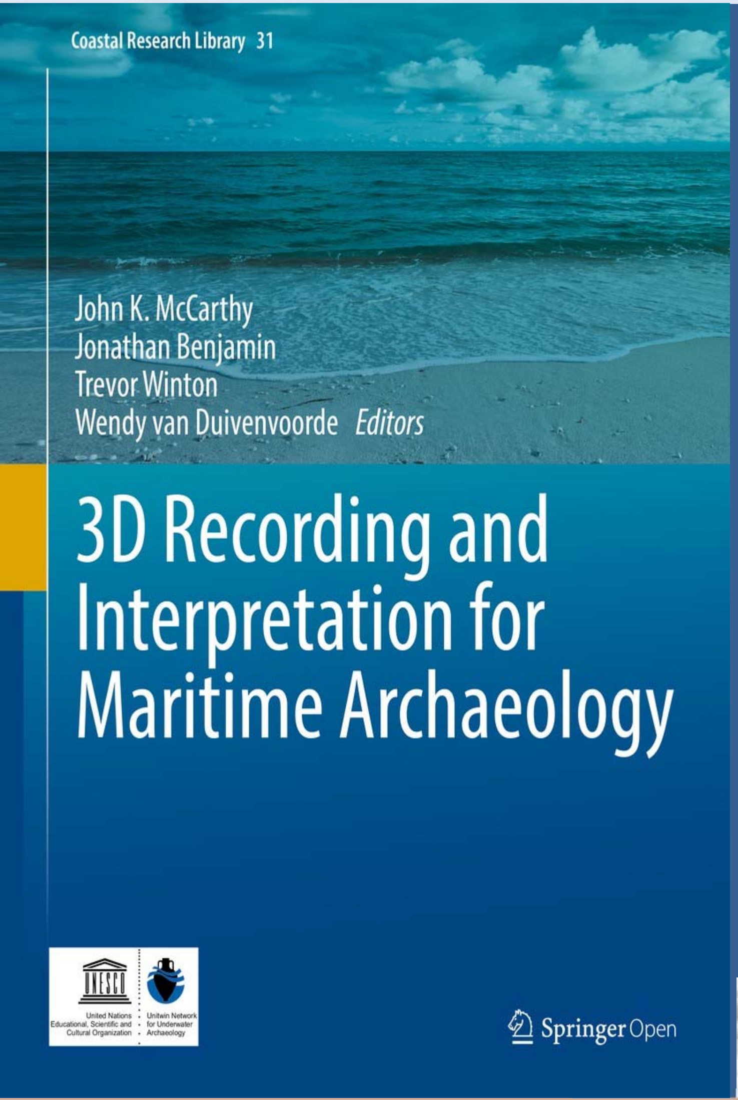

Coastal Research Library 31

John K. McCarthy
Jonathan Benjamin
Trevor Winton
Wendy van Duivenvoorde *Editors*

3D Recording and Interpretation for Maritime Archaeology

United Nations Educational, Scientific and Cultural Organization
Unitwin Network for Underwater Archaeology

Springer Open

This open access peer-reviewed volume was inspired by the UNESCO UNITWIN Network for Underwater Archaeology International Workshop held at Flinders University, Adelaide, Australia in November 2016. Content is based on, but not limited to, the work presented at the workshop which was dedicated to 3D recording and interpretation for maritime archaeology. The volume consists of contributions from leading international experts as well as up-and-coming early career researchers from around the globe.

The content of the book includes recording and analysis of maritime archaeology through emerging technologies, including both practical and theoretical contributions. Topics include photogrammetric recording, laser scanning, marine geophysical 3D survey techniques, virtual reality, 3D modelling and reconstruction, data integration and Geographic Information Systems. The principal incentive for this publication is the ongoing rapid shift in the methodologies of maritime archaeology within recent years and a marked increase in the use of 3D and digital approaches. This convergence of digital technologies such as underwater photography and photogrammetry, 3D sonar, 3D virtual reality, and 3D printing has highlighted a pressing need for these new methodologies to be considered together, both in terms of defining the state-of-the-art and for consideration of future directions.

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A dynamic space in the Venetian Lagoon co-designed by the Intergovernmental Oceanographic Commission of UNESCO (UNESCO-IOC) and CRA - Carlo Ratti Associati. Inaugurated in 2025 by the Prada Group and UNESCO-IOC, the centre is dedicated to fostering knowledge and understanding of the ocean, raising awareness of its fundamental role for life on Earth.

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Optimizing Beach Nourishment Design for Sea Turtle Nesting

Optimizing Beach Nourishment Design for Sea Turtle Nesting

Lara Novalvos Hernandez, Robbin N. Trindell, and Ping Wang

Different beach-nourishment designs and subsequent postnourishment profile adjustments can influence loggerhead (*Caretta caretta*) and green (*Chelonia mydas*) sea turtle nest survival and reproductive success. The goals of this study were to document turtle nesting on nourished beaches and improve nourishment design to optimize turtle nesting. Five high-density nesting beaches along Florida’s Atlantic coast were investigated. Field data were collected in 2018, 2019, 2021, and 2022, including postnourishment beach-profile adjustment measured bimonthly during nesting season, turtle tracks across nesting beach, nest/false-crawl decision-point positions and elevations, and sea turtle nest hatch/emergence success. Four of the five studied beaches were nourished with a turtle-friendly design containing a slope break on the back beach, while one followed a traditional design with a flat back beach and steep foreshore. Three beach morphological zones were distinguished for turtle nesting: an active berm that interacts constantly with the ocean and changes regularly, a back beach that only changes during storm conditions, and a dune field that is stable except during extreme storms. For the 490 measured loggerhead nests, 65.9% were in the active berm, 23.2% were in the back beach, and 10.8% were in the dune field. For the 205 green turtle nests, 36.1% were in the active berm, 23.9% were in the back beach, and 40% were in the dunes. Turtle nests in the active berm have a higher flooding risk, are subject to more morphological changes than nests in other zones, and are influenced by beach-nourishment design. Loggerhead nesting and hatching success were higher at beaches with turtle-friendly nourishment design, although with considerable spatial and temporal variations.

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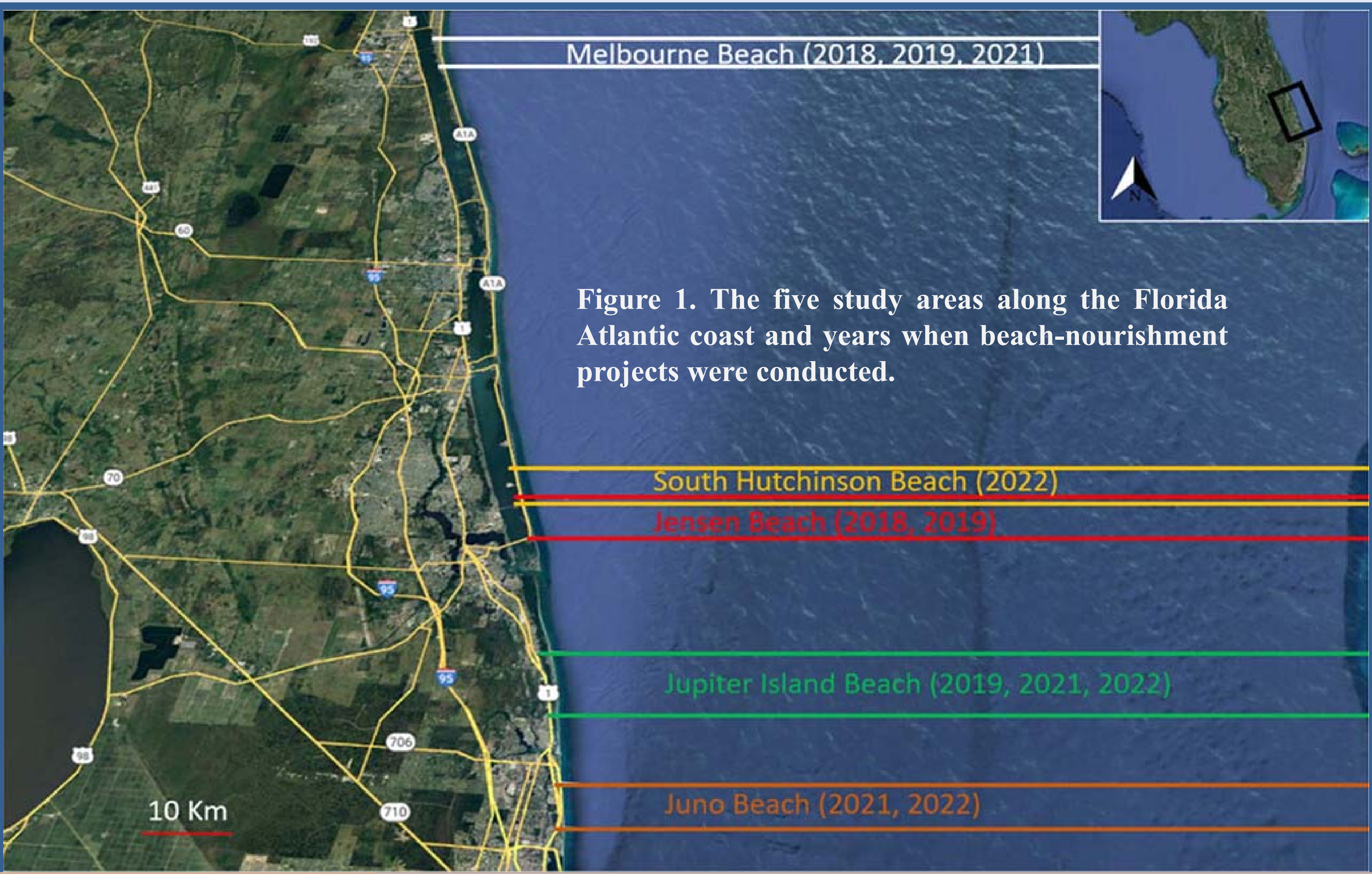

Figure 1. The five study areas along the Florida Atlantic coast and years when beach-nourishment projects were conducted.

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The seven extant species of sea turtles lay their eggs on sandy beaches (Pritchard, 2017) and have specific feeding, mating, and breeding grounds. They nest on their natal beach, guided by the magnetic field signal of the area they imprinted on as hatchlings (Brothers and Lohmann, 2015; Lohmann et al., 2017). The natal beach-homing hypothesis complicates the process of colonization of new areas (Tomillo et al., 2022), and therefore, it is important to conserve and protect the existing nesting beaches.

The southeastern United States is a major center for sea turtle diversity in the world, with the majority of sea turtles nesting along Florida's Atlantic coast (Ceriani and Meylan, 2015; Meylan, Schroeder, and Mosier, 1995) during April through October. The NW Atlantic Distinct Population Segment of loggerhead sea turtles (*Caretta caretta*), the most common sea turtle nesting in Florida (Meylan, Schroeder, and Mosier, 1995), is listed as threatened under the Endangered Species Act, 2011 (76 FR 58868) and Florida Statute 379.2291, 2022 (Endangered and Threatened Species Act). Similarly, green sea turtles (*Chelonia mydas*), the second most common species nesting in Florida, are listed as threatened. Both loggerhead and green sea turtles face threats such as fisheries bycatch, beach armoring, and beach nourishment in their in-water and on-beach habitats (Ernest et al., 2024; Witherington, Herren, and Bresette, 2006).

Exact nest location will affect the hatchlings' fate and performance (Stokes, Esteban, and Hays, 2024; Wood and Bjorndal, 2000). Nests located further landward on a beach are at less risk of inundations and washouts than those closer to the water, but they may have a higher predation risk (Ernest et al., 2024; Wood and Bjorndal, 2000). Generally, nests are found between the littoral vegetation, which offers a landward constraint, and the water line. Although there is no broadly accepted theory of nest-site selection, an ideal nesting environment should have high humidity, low salinity, good ventilation, protection from flooding, and

Optimizing Beach Nourishment Design for Sea Turtle Nesting

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insulation to maintain suitable temperatures for hatchling development (Miller, Limpus, and Godfrey, 2003).

Beach erosion represents the net loss of sand and is defined as the landward retreat of the shoreline. High wave-energy events coupled with sea-level rise (Cheng and Wang, 2022; Zhang and Leatherman, 2011) pose a threat to coastal communities as well as turtle nesting, causing coastal environments to become narrower in a process known as coastal squeeze (Elko et al., 2021). Hard engineering shore-protection measures, typically rock or concrete structures, can armor the beach with the goal of holding the shoreline position and prevent sand movement along the coast. This was the traditional method of protecting upland property before the broad implementation of beach nourishment, but it has ecological risks (Bouchard et al., 1998; Montague, 1993) and does not address the fundamental cause of erosion—a sand deficit (Greene, 2002; Wang and Beck, 2022).

In recent decades, coastal management has shifted to beach nourishment, which is the addition of sand onto the beach to advance the shoreline seaward (Dean, 2002). It is the only method that compensates for the sand deficit that causes erosion (Elko et al., 2021; Gutierrez et al., 2025; NRC, 1995). The duration of a renourishment cycle is linked to the fill volume, the background erosion rate, and storm frequency during the cycle (Dean, 2002). Two essential parameters for beach nourishment are the borrow area (where the sediment is extracted) and beach-profile design (USACE, 2008). In general, the sediment used must be compatible with the native sediment in terms of sand-mud content, grain size, color, and composition. Sediment grain size and composition can affect compaction, gas exchange, and sand temperature, subsequently influencing nest excavation and hatchling emergence (Milton, Schulman, and Lutz, 1997). Altered beaches may have

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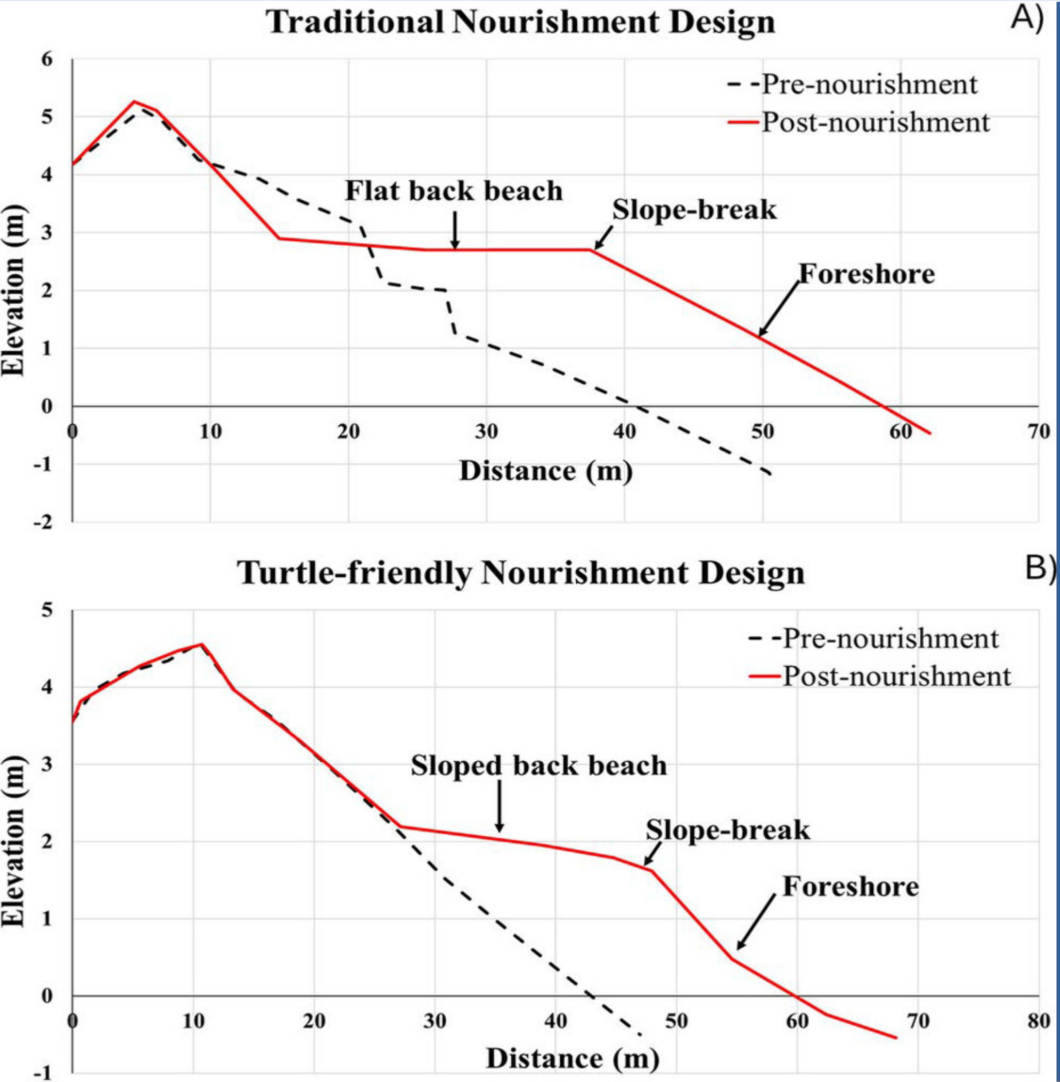

Figure 2. Beach-nourishment designs. (A) Traditional nourishment design exemplified at Jupiter Island Beach. (B) Turtle-friendly design exemplified at Jensen Beach. All elevations are referred to NAVD88 (0.30 m above mean sea level [MSL]).

Optimizing Beach Nourishment Design for Sea Turtle Nesting

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higher water retention, which could drown eggs or increase heat capacity (Grain, Bolten, and Bjorndal, 1995). In recent years, many beach-nourishment projects also included dune restoration as an additional measure to protect against storm overtopping and to counter sea-level rise.

Ideally, the postnourishment beach profile after equilibration should resemble an average profile measured in the project or adjacent area (USACE, 2008). Equilibration is the adjustment of the constructed profile by the site-specific wave conditions. The first storm after sand placement can play an essential role in equilibration (Elko and Wang, 2007; Roberts and Wang, 2012). This study focused on equilibration of the subaerial turtle-nesting portion of the beach.

Extensive field data collections were conducted at five nourished beaches in southeast Florida with high sea turtle nesting density in 2018, 2019, 2021, and 2022, with data collection interruption in 2020 as a result of the coronavirus-2019 pandemic. Field data collection included time-series beach-profile surveys, topographic surveys of turtle tracks, and documentation of the decision point (DP), i.e. the landward location where the sea turtle either nested or returned to the water without depositing a nest (nonnesting emergence or false crawl). Additional information on turtle nesting, hatching, and emergence of hatchlings was collated from the Florida Fish and Wildlife Conservation Commission Post-Construction Monitoring Program (FWC PCMP).

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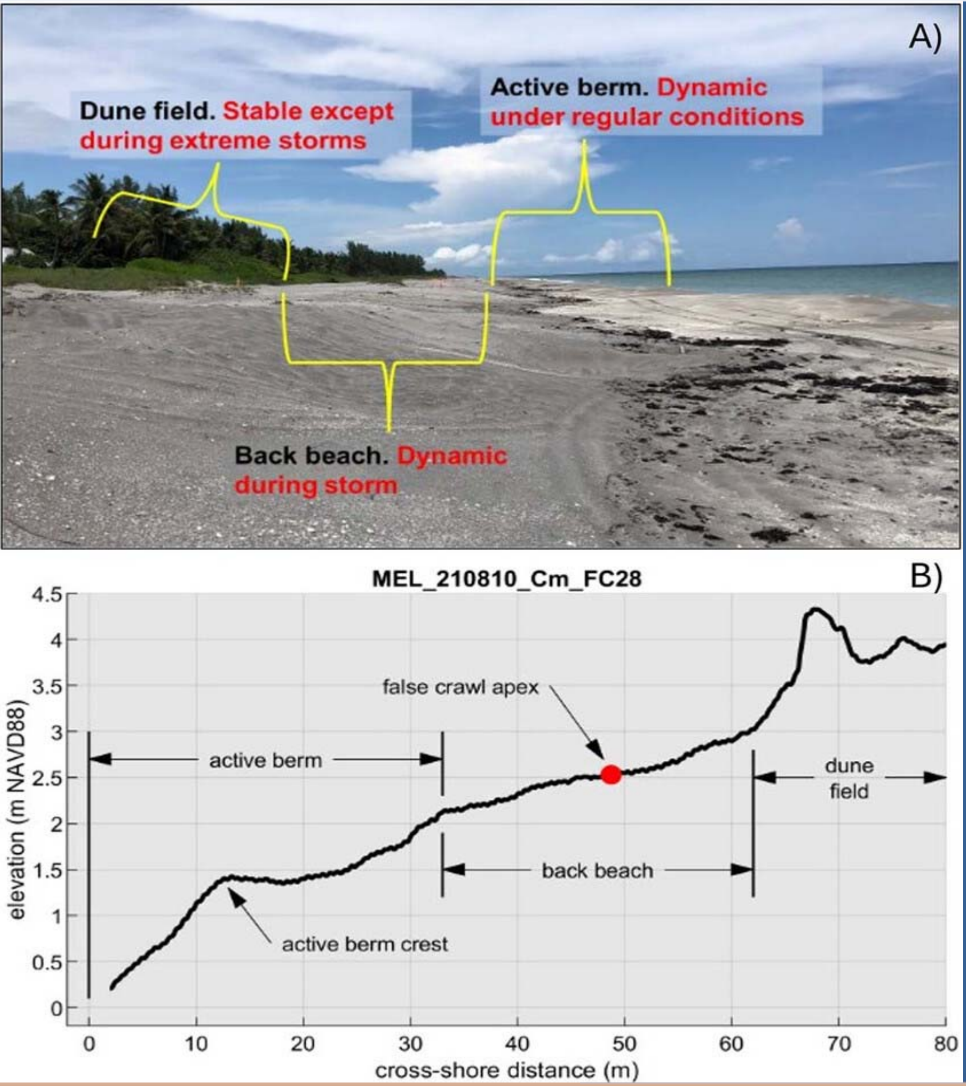

Figure 3. Defining the turtle-nesting portion of the beach. (A) Beach partitioning based on morphology illustrated with a ground photo. (B) Beach zonation of a surveyed green turtle-track profile with the DP (apex) identified.

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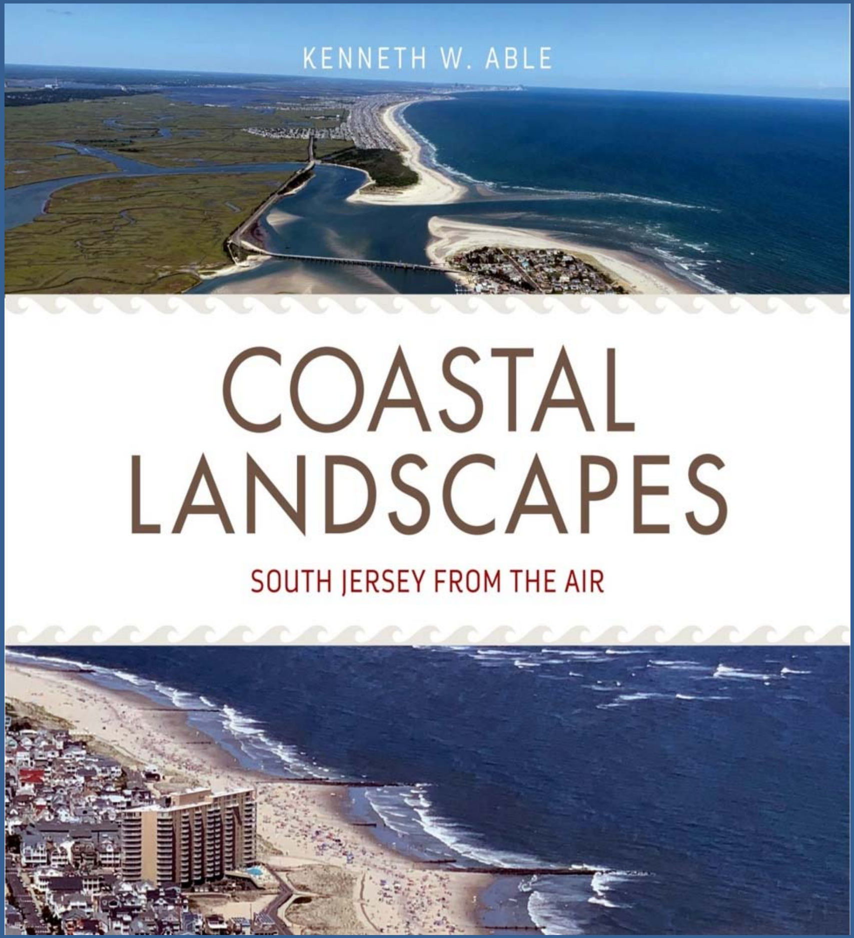
BOOK REVIEW

COASTAL LANDSCAPES: South Jersey from the Air

by Kenneth W. Able



Being a native of the state of New Jersey (mid-Atlantic region of the United States), I was already familiar with the beautiful, diverse landscapes found along that coast. Unfortunately, New Jersey, although called the Garden State, is often a victim of being a misnomer by having the reputation of being completely industrialized and polluted. However, the almost 210 km of New Jersey coastline provides a unique coalescence of ecosystems that range from pine barren bogs and marshes to ocean bays and beaches. It is, in fact, a treasure trove of habitats that any coastal scientist would appreciate and admire from afar, and Distinguished Professor Emeritus Kenneth W. Able's new book allows one to do just that.

Coastal Landscapes: South Jersey from the Air **transports the reader to both iconic and remote sites along New Jersey's coastline by featuring wonderful aerial imagery that was captured from drone and helicopter flights between 2013 and 2021. Professor Able provides an extended caption for each image that details the key natural features, as well as any historical background or anthropogenic context of that particular site. His 42+ years as a professor in the Department of Marine and Coastal Sciences (Rutgers University, New Jersey) and his 32+ years of directing the Rutgers University Marine Field Station (Little Egg Inlet, Southern New Jersey) qualify Prof. Able as the perfect author for such a collection of information.**

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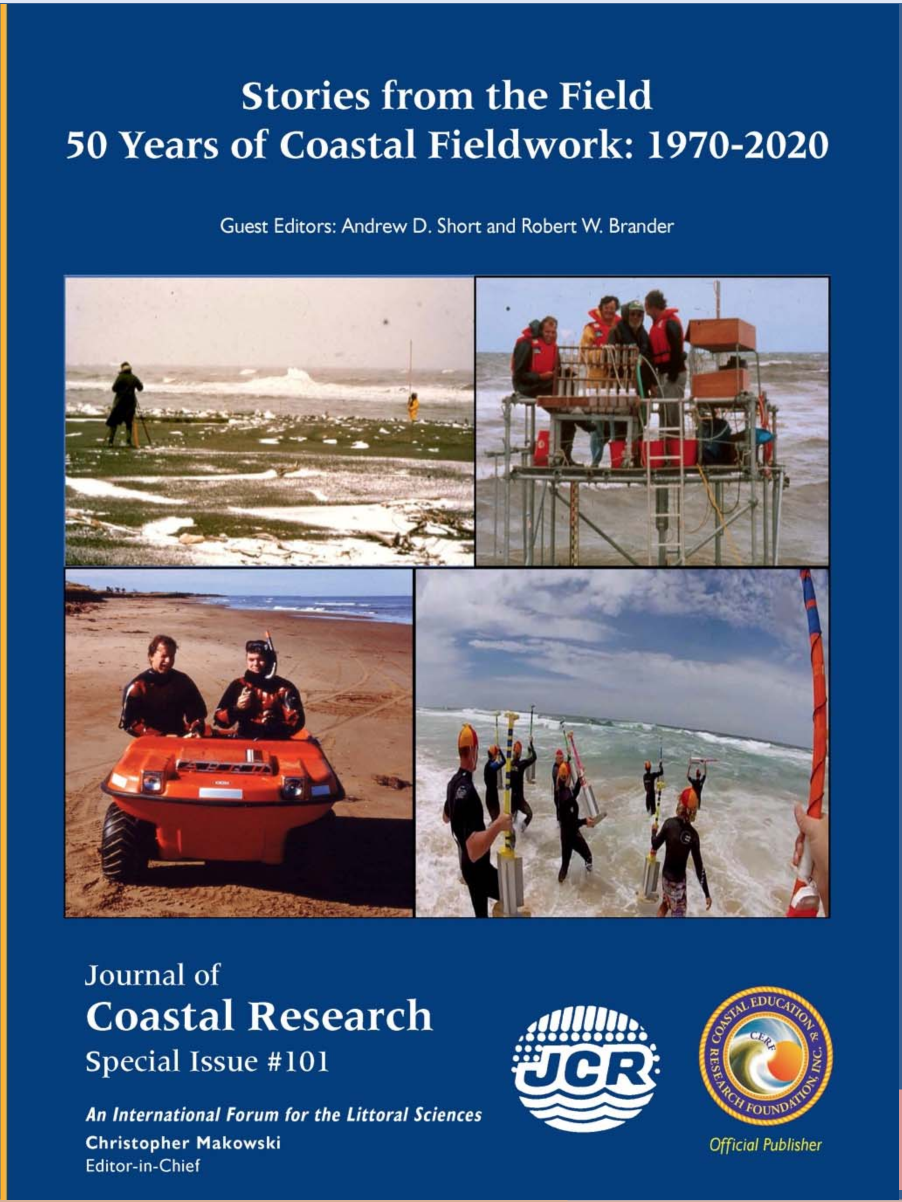

Stories from the Field
50 Years of Coastal Fieldwork: 1970-2020

Guest Editors: Andrew D. Short and Robert W. Brander

Journal of
Coastal Research
Special Issue #101

An International Forum for the Littoral Sciences
Christopher Makowski
Editor-in-Chief

JCR SPECIAL ISSUE #101
Stories from the Field:
50 Years of Coastal Fieldwork (1970-2020)

Many of us like to relate interesting field stories when we get together with colleagues, particularly when back out in the field. It's a tradition going back as far as the first researchers who ventured to the coast to try and fathom just what was going on and returned to tell the tale – both good news and bad. Field trips are usually a combination of both because, as the sayings go, '*Anything deployed in the surf or over the side of a boat should be considered expendable*' and '*Anything that can go wrong in the field usually will.*' Add to this crashing waves, changing tides, strong currents, howling wind, saltwater and sea spray, soft sediments, the hard and jagged surfaces of rock platforms and coral reefs, dangerous fauna (including people) and the seemingly always unpredictable and uncontrollable weather and you have the perfect recipe for various issues to arise. With these words of encouragement, it's a wonder any coastal fieldwork has been successful. However, successful it has been and fieldwork has formed the core of our ability to increasingly understand the nature and dynamics of coastal environments. The idea for this collection of coastal field stories derived from our own enjoyment of coastal fieldwork and involvement in numerous field trips and experiments during our careers, some of which are related in this JCR Special Issue, and our realisation that if they are not recorded they will be eventually lost forever.

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Evaluation of Inlet Bypassing on the Atlantic Coast of Florida, U.S.A.

Evaluation of Inlet Bypassing on the Atlantic Coast of Florida, U.S.A.

James R. Houston

The Atlantic coast of Florida in the United States stretches nearly 600 km. It features 18 inlets, 16 of which have been modified to benefit navigation. Eleven of the 16 were created by cutting through barrier islands. From as early as the late 1800s at a few locations and as late as the early 1970s, these inlets caused an average shoreline recession of 67 m on adjacent shorelines by removing sand from the littoral system through impounding it on updrift shorelines or depositing it in ebb and flood shoals or navigation channels. From the 1970s/1980s to the 2020s, averaging about 43 years, the erosive effects of the inlets on adjacent shorelines were largely mitigated by placing sand on affected shores, resulting in an average shoreline advance of 32 m. The mitigation involved traditional inlet sand bypassing, where sand is dredged from updrift shorelines, shoals, or navigation channels and moved past the inlet to affected shores. Mitigation also included the placement of sand from offshore or inland sources to move shorelines seaward and enhance storm protection and recreation. Although often called beach nourishment, if sand is placed specifically to counteract shoreline recession caused by inlets, it qualifies as a form of sand bypassing. Approximately halfway through this 40-year mitigation period, Florida established a formal program that used only traditional inlet sand bypassing to address shoreline recession caused by inlets. The effectiveness of various methods to mitigate the erosive effects of modified inlets on adjacent shorelines is assessed. Most inlets in the United States, including those along the Florida Atlantic coast, have been modified for navigation, so Florida's experiences in managing inlet effects may be broadly applicable.

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Florida is in the SE United States, with its sandy beaches on the Atlantic Ocean extending almost 600 km (Clark, 1993). The continental shelf is about 130 km wide at St. Marys Inlet on the northern end of Florida's Atlantic coast and narrows to about 3 km at Bakers Haulover Inlet to the south. Mean tide range decreases from north to south, measuring 1.8 m at St. Marys Inlet and 0.6 m at Bakers Haulover Inlet. Net longshore sand transport is generally to the south; however, insufficient northerly transport occurs at St. Augustine, Ponce de Leon, St. Lucie, and Bakers Haulover Inlets, and shorelines north of these inlets are affected and considered in this analysis. Estimated net transport volumes differ significantly, with estimates just south of St. Marys Inlet varying from approximately 70,000 to 460,000 m^3/y (Johnston, Kraus, and Brown, 2002). Dean and O'Brien (1987) report that the longshore transport decreases from north to south along Florida's Atlantic coast, with a transport of only about 8000 m^3/y at Bakers Haulover Inlet, whereas Van Rijn et al. (2025) estimate the transport as 50,000 m^3/y at the inlet.

Most Florida inlets and many U.S. inlets are no longer natural. Of the 18 inlets on Florida's east coast, 11 have been cut through barrier islands, and jetties have been built at most, with channels modified to improve and maintain navigation. The erosional effects of modified inlets on adjacent shorelines are well recognized and documented in the literature (e.g., Bodge, 1999; Bruun, 1995; Dean, 1996; Dean and O'Brien, 1987; Galgano, 2007). Dean and O'Brien (1987, p. 9) note that "the deepening of these channels, the construction of jetties for reduced channel maintenance, and the dredging to maintain channel depth and alignment have caused severe deleterious effects on the adjacent shorelines." Jetties typically starve downdrift shorelines, removing sand from the active littoral system by impounding it on updrift shorelines or depositing it in shoals or navigation channels. Dredging channels deeper interrupts the natural bypassing of sand around

Evaluation of Inlet Bypassing on the Atlantic Coast of Florida, U.S.A.

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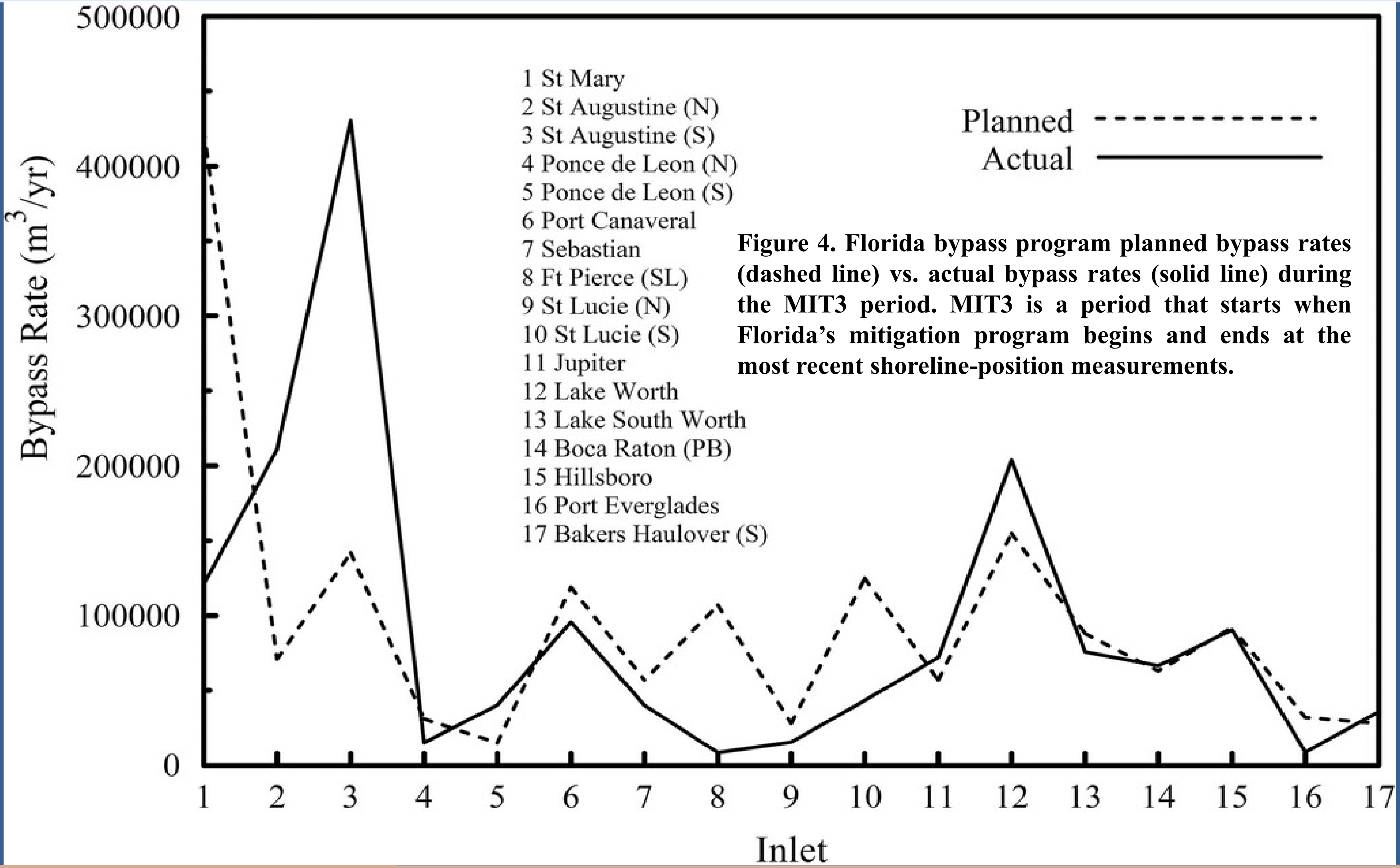

Figure 4. Florida bypass program planned bypass rates (dashed line) vs. actual bypass rates (solid line) during the MIT3 period. MIT3 is a period that starts when Florida's mitigation program begins and ends at the most recent shoreline-position measurements.

Evaluation of Inlet Bypassing on the Atlantic Coast of Florida, U.S.A.

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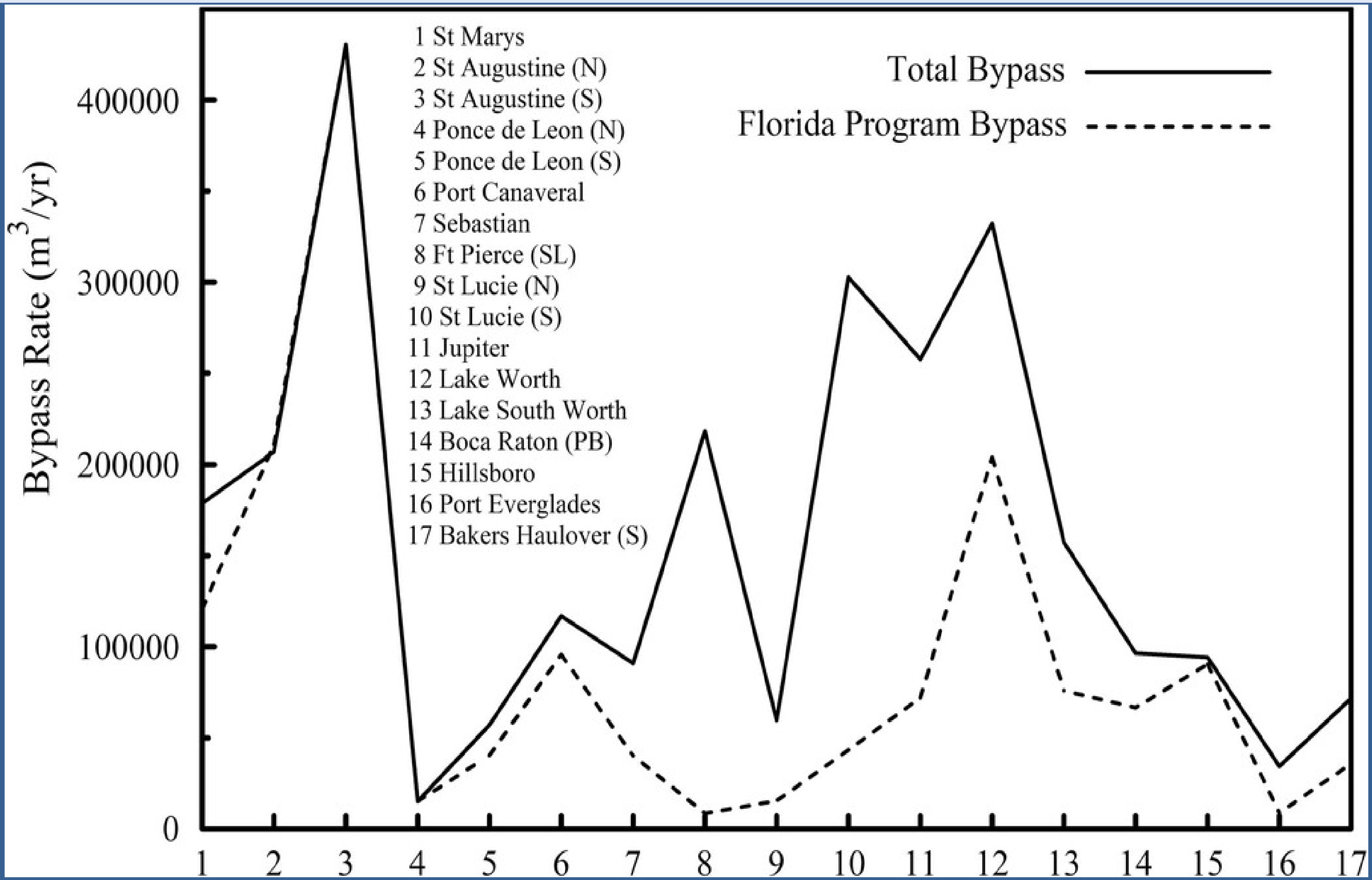

Figure 5. The total bypassing rate compared with the bypassing rate in the Florida bypass program during the MIT3 period. MIT3 is a period that starts when Florida's mitigation program begins and ends at the most recent shoreline-position measurements.

Evaluation of Inlet Bypassing on the Atlantic Coast of Florida, U.S.A.

James R. Houston

inlets and affects the formation of flood and ebb shoals. Sand dredged from channels has also, at times, been disposed of offshore outside the littoral zone, although this practice is no longer used. Dean and O'Brien (1987, p. 12) note that before inlets on the Florida Atlantic coast were modified, "the broad shallow ocean bars functioned as 'sand bridges' across which the sediment transport occurred from the updrift (north) to downdrift (south)." From 1869 to 1971, before widespread beach nourishment, these inlets caused 75% to 85% of shoreline recession in counties with inlets, whereas shorelines beyond the influence of the inlets accreted slightly on average (Houston and Dean, 2016).

There are 18 inlets along the Florida Atlantic coast, from St. Mary's Inlet in the north to Bakers Haulover Inlet, which is about 5 km north of Miami Beach. Nassau Sound and St. George Inlet are natural inlets that have not been modified and are not considered further here. The 11 inlets that were created by cutting through barrier islands led to the development of ebb and flood shoals that removed approximately 130 million m^3 from the littoral system, causing severe recession of adjacent shorelines (Marino, 1986).

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Beach-Inlet Interaction and Sediment Management

Authors: Ping Wang and Tanya M. Beck

Beaches, barrier islands and tidal inlets are valuable coastal resources and provide desirable environments that are often densely populated. They are dynamic landforms that change constantly, driven by both normal processes and energetic storms. They behave as one interconnected system and must be understood and managed as such. This book discusses their various morphologic features, as well as the processes that shape them and future challenges due to environmental change. A major focus is placed on the interaction between sandy beaches and tidal inlets, and the sediment exchange among various morphologic features. Balancing these valuable sediment resources while maintaining the natural sediment exchange constitutes a major goal of modern shore protection and coastal management. Illustrated with numerous aerial photographs to demonstrate how beaches and tidal inlets interact, this book provides a valuable reference for graduate students, researchers and professionals working in coastal management and geomorphology.

https://www.cambridge.org/us/universitypress/subjects/earth-and-environmental-science/sedimentology-and-stratigraphy/beach-inlet-interaction-and-sediment-management?format=HB

Storm Deposits in Context of Seasonal through Decadal Water-Level Variances and Beach Geomorphic Change, Southwestern Lake Michigan

Storm Deposits in Context of Seasonal through Decadal Water-Level Variances and Beach Geomorphic Change, Southwestern Lake Michigan

C.R. Mattheus, E. Spitzer, L. Rosario, and K. Pearce

Decadal changes in base water level, which are up to 2 m in magnitude, and storms capable of generating waves >3 m in height affect many beach shorelines of the North American Great Lakes. Still, few geomorphic studies have addressed coastal morphodynamics under such complex and ever-changing lake hydrodynamic conditions. With extensive topographic monitoring activities underway since 2018 along Illinois's portion of Lake Michigan coast, new avenues to systematically categorize and contextualize geomorphic change dynamics are available. This study offers a detailed assessment of beach topographic evolution along a historically progradational section of unobstructed shoreline along Illinois Beach State Park, located along the downdrift portion of a migrating ridge-plain promontory. Insights from pre- and poststorm topographic and colocational subsurface geophysical assessments are evaluated in context of seasonal through decadal patterns of geomorphic change. Study insights provide context for the effects of storms on beach-profile evolution over various lake-level positions, providing an architectural blueprint for subsurface depositional structures. This serves as a prerequisite for late Holocene paleo-reconstructions. lake-level rise-induced backshore accretion by way of shoreline-overwash processes occurred with minor changes to the shoreline position, with sand influx–facilitating profile aggradation in response to >1.5 m of lake-level rise between 2012 and 2020. Subsequent beach-profile adjustments, from 2020 to 2023, occurred only along the foreshore during rising and peak water levels, in response to ~1 m fall in lake level. Pre- and poststorm subsurface reflection geophysical records, from the ~3 m wave event in October 2023, resolve an ~0.5 m thick storm deposit atop a ravinement surface, only a part of which is accounted for by topographic profile comparisons. Paleo-tempestite preservation potentials are reduced with post-2020 lowering of lake level by ~1 m; nonetheless, the addition of ground-penetrating radar in monitoring provides a more thorough assessment of event-based geomorphic change.

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C.R. Mattheus, E. Spitzer, L. Rosario, and K. Pearce

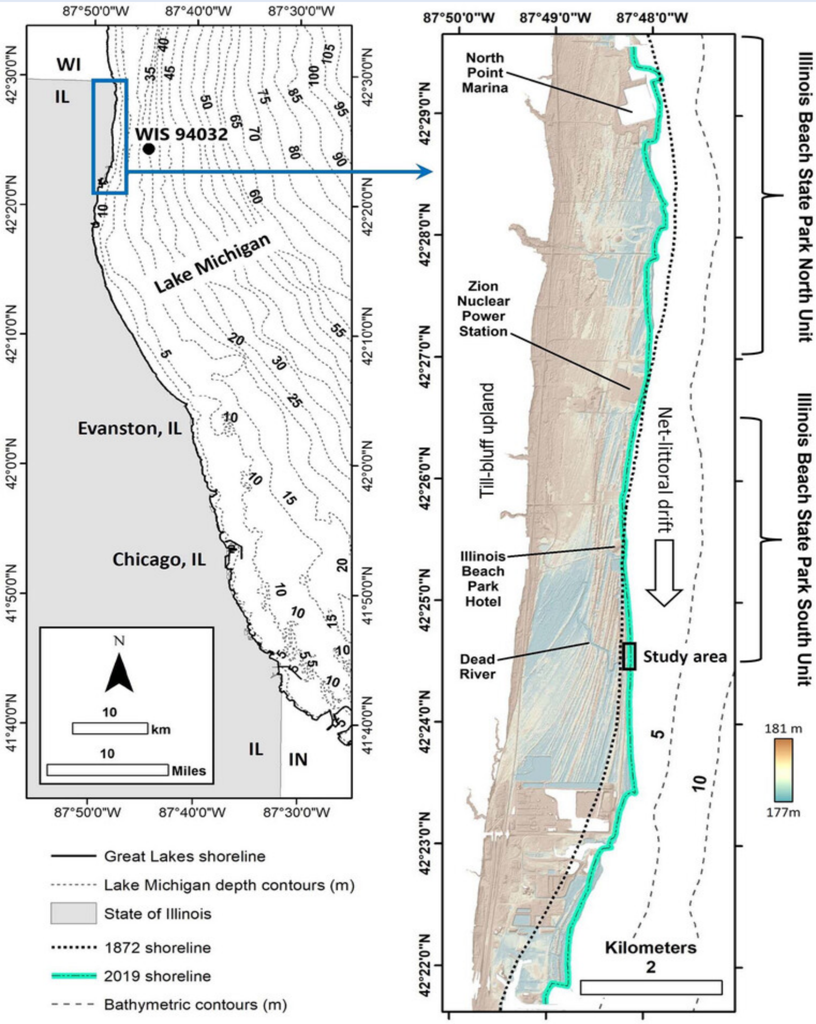

Figure 1. Study area maps showing the location of the Zion Beach-ridge Plain (ZBRP) in context of the SW Lake Michigan shoreline and bathymetry (at 5 m contours) and a USGS-derived 3 m topographic digital elevation model of the ZBRP, with 1872 and 2019 shorelines traced. Elevations are in North American Vertical Datum of 1988 meters. Locations of reference are labeled and the alongshore extents of the Illinois Beach State Park North, and South Units are marked. The net-annual littoral transport direction along the ZBRP is marked; Chrzastowksi and Frankie (2000) report an annual southward littoral transport of ~62,000 m^3.

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From a coastal geomorphologic perspective, the Great Lakes of North America remain understudied in comparison with most oceanic margins (i.e. saltwater analogs). Past studies have evaluated how erosion of beach and bluff shorelines are affected by changes in base water-level position, storm climate, winter ice–related modifications of fetch conditions (i.e. wave-generation potentials), and shore-ice developments (Abdelhady et al., 2025; Angel, 1995; BaMasoud and Byrne, 2012; Barnes et al., 1994; Barnes et al., 1993; Krueger, Zoet, and Rawling, 2020; Meadows et al., 1997; Roland et al., 2021; Theuerkauf and Braun, 2021; Theuerkauf et al., 2019; Theuerkauf et al., 2023; Theuerkauf et al., 2024; Volpano et al., 2020). The role of alongshore sediment transport as a valuable consideration for shoreline response to imposed hydrodynamic forces, including base-level adjustments that force profile re-equilibration, is inferred from conceptual models of beach geomorphic evolution, which broadly frame shoreline geomorphic behaviors as a function of rates of sand supply and directions and rates of lake-level change (Hands, 1984; Johnston, Thompson, and Baedke, 2007; Stockberger and Wood, 1991; Thompson and Baedke, 1995; Wood, Stockberger, and Madalon, 1994).

Reconstructions of geomorphic change patterns at major littoral obstructions corroborate the implied significance of sand supply in shaping shoreline evolutionary trajectories, which can oppose regional trends. Although more often linked to enhanced rates of coastal erosion along Great Lakes coastlines, lake-level rise may thereby increase alongshore sand delivery to some parts of the coast that then benefit from these hydrodynamic conditions and are capable of progradation (Mattheus, 2014; Mattheus et al., 2019; Mattheus, Fowler, and Diggins, 2017; Theuerkauf and Braun, 2021; Mattheus, Theuerkauf, and Braun, 2022;

Storm Deposits in Context of Seasonal through Decadal Water-Level Variances and Beach Geomorphic Change, Southwestern Lake Michigan

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Mattheus, Theuerkauf, and Braun, 2022; Theuerkauf et al., 2019). Still, despite conceptual understanding of such process dynamics (i.e. the significance of sand supply in shaping profile response to base-level changes), process-based studies that offer a stratigraphic blueprint for recognizing certain hydrodynamic and sand-supply conditions in the paleo-record are lacking.

Most assessments of relict depositional architectures within ridge plains have focused mainly on paleo-hydrographic reconstructions. These investigations have favored coastal embayments, which are sheltered from extensive littoral reworking and tend to provide the most continuous record for reconstruction of former water-level variances (e.g., Argyilan, Forman, and Thompson, 2010; Baedke et al., 2004; Johnston, Thompson, and Wilcox, 2014; Johnston et al., 2007; Larsen, 1994; Wilcox, Johnston, and Thompson, 2014). Littoral dynamics driving sand-supply variances are also not as readily reflected by stratigraphic architectures within these settings. Along open-margin, wave-dominated coastlines, more process-oriented investigations are needed to better frame prior conceptual models of profile adjustment in response to lake-level and sediment-supply variances. Such blueprints would aid study of paleo-storm and littoral patterns from relict deposits within ridge-plain promontories of the region (Mattheus et al., 2024; Mattheus, Braun, and Theuerkauf, 2023).

Storm Deposits in Context of Seasonal through Decadal Water-Level Variances and Beach Geomorphic Change, Southwestern Lake Michigan

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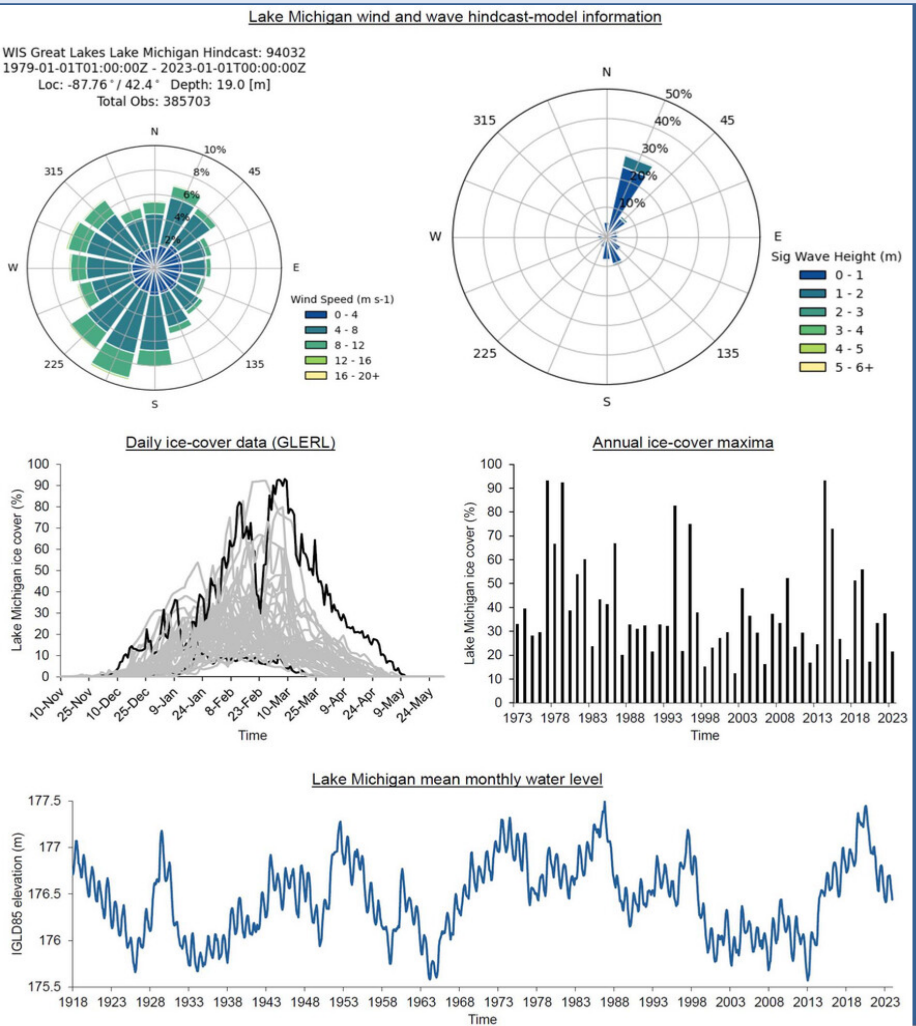

Figure 2. Collage of Lake Michigan hydrodynamic data graphs, including (1) wind and wave-rose diagrams generated for U.S. Army Corps of Engineers (USACE) Wave Information Studies (WIS) hindcast modeling at Station 94032; (2) daily ice-cover data, derived from the National Oceanic and Atmospheric Administration's Great Lakes Research Laboratory; and (3) mean monthly lake-wide averaged water level (based on USACE gauges). Graphs of lake-level and ice-cover data were plotted from federally derived information using Excel (Microsoft Corporation, 2025). Wind and wave roses were generated through the USACE WIS data portal.

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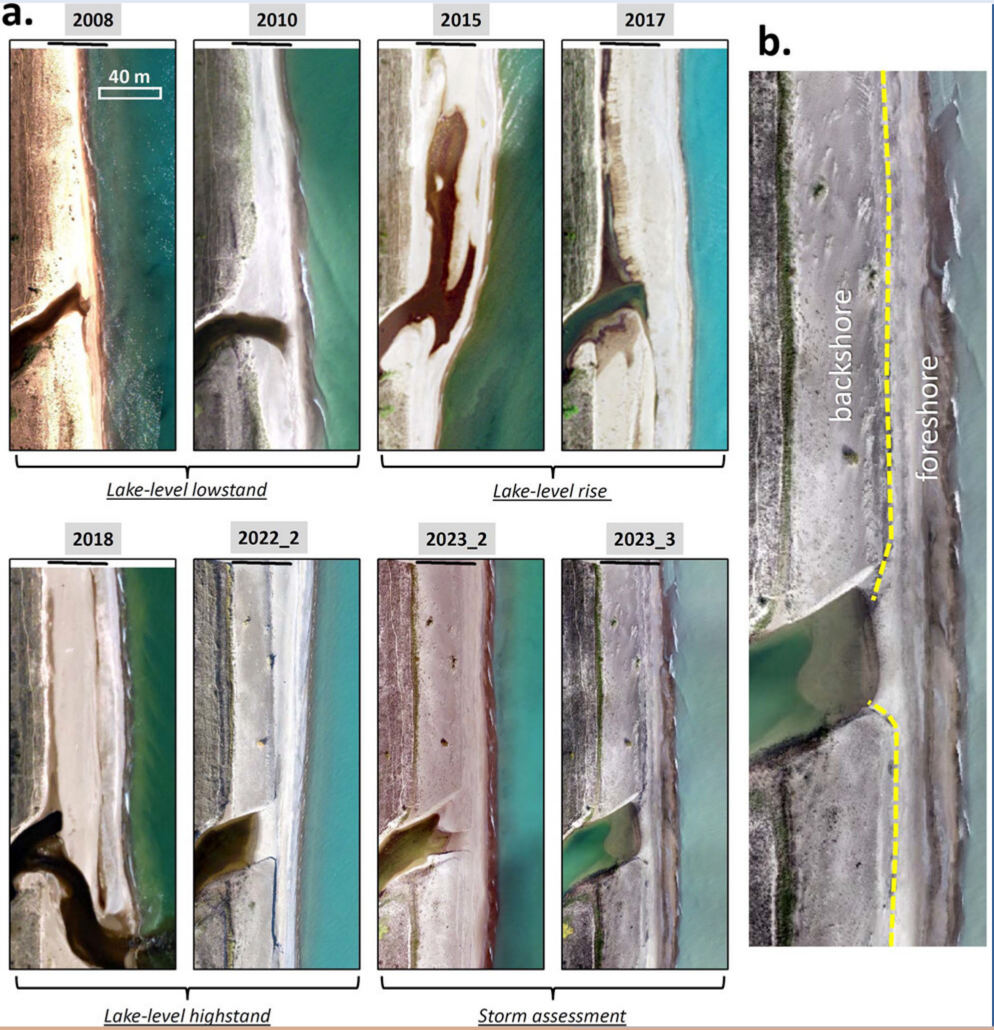

Figure 3. Select aerial photographic panels of the study area based on United States Department of Agriculture National Agriculture Imagery Program and Illinois State Geological Survey drone-based orthoimages from 2008 through 2023 (Part [a]), with the most recent Illinois State Geological Survey image collage showing the modern distinction between backshore and foreshore environments (Part [b]).

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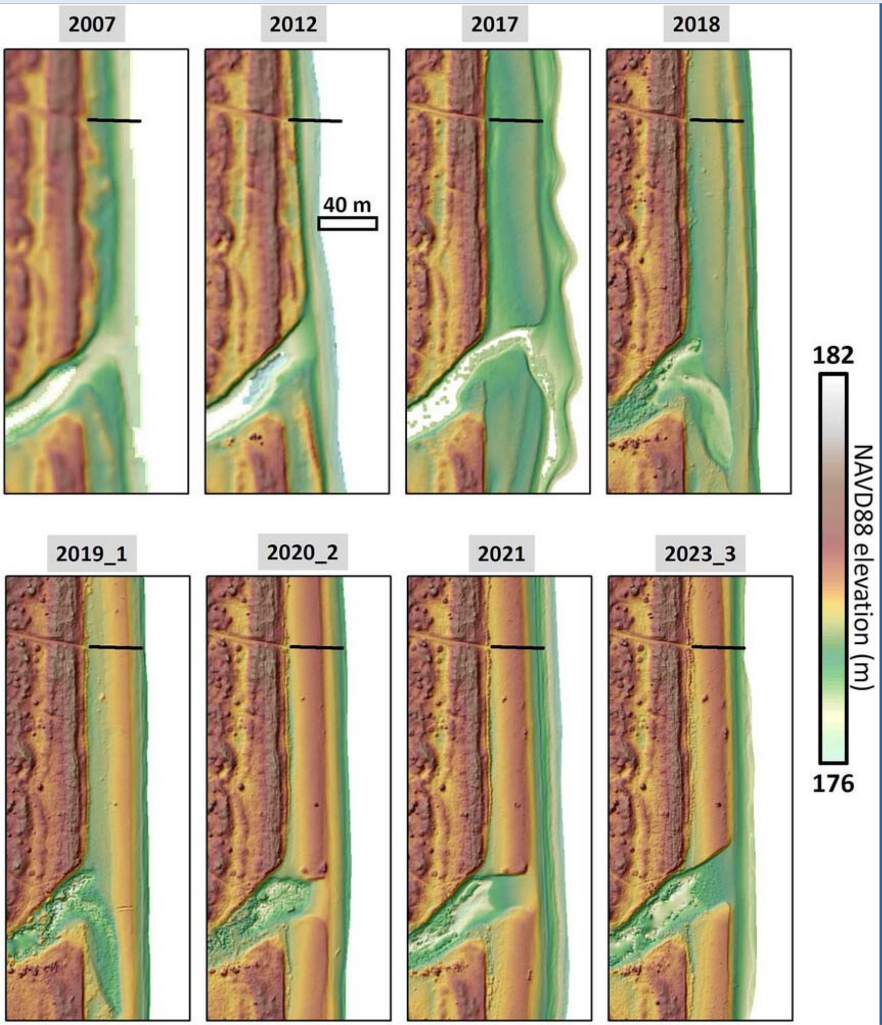

Figure 4. Hillshaded topographic digital elevation models showing geomorphic developments at the study area (Illinois Beach State Park [IBSP]-6) from 2007 through 2023. Data information is provided in Table 1. The color ramp is applied across the same elevation range for all models to allow for straightforward visual comparisons. The location of topographic profile extractions and pre- and poststorm ground-penetrating radar surveying is shown in black on all map panels. Perceived geomorphic textures within the Dead River are artifacts of Structure from Motion Photogrammetry and likely relate to the ponding of murky water; these elevation values should be discounted.

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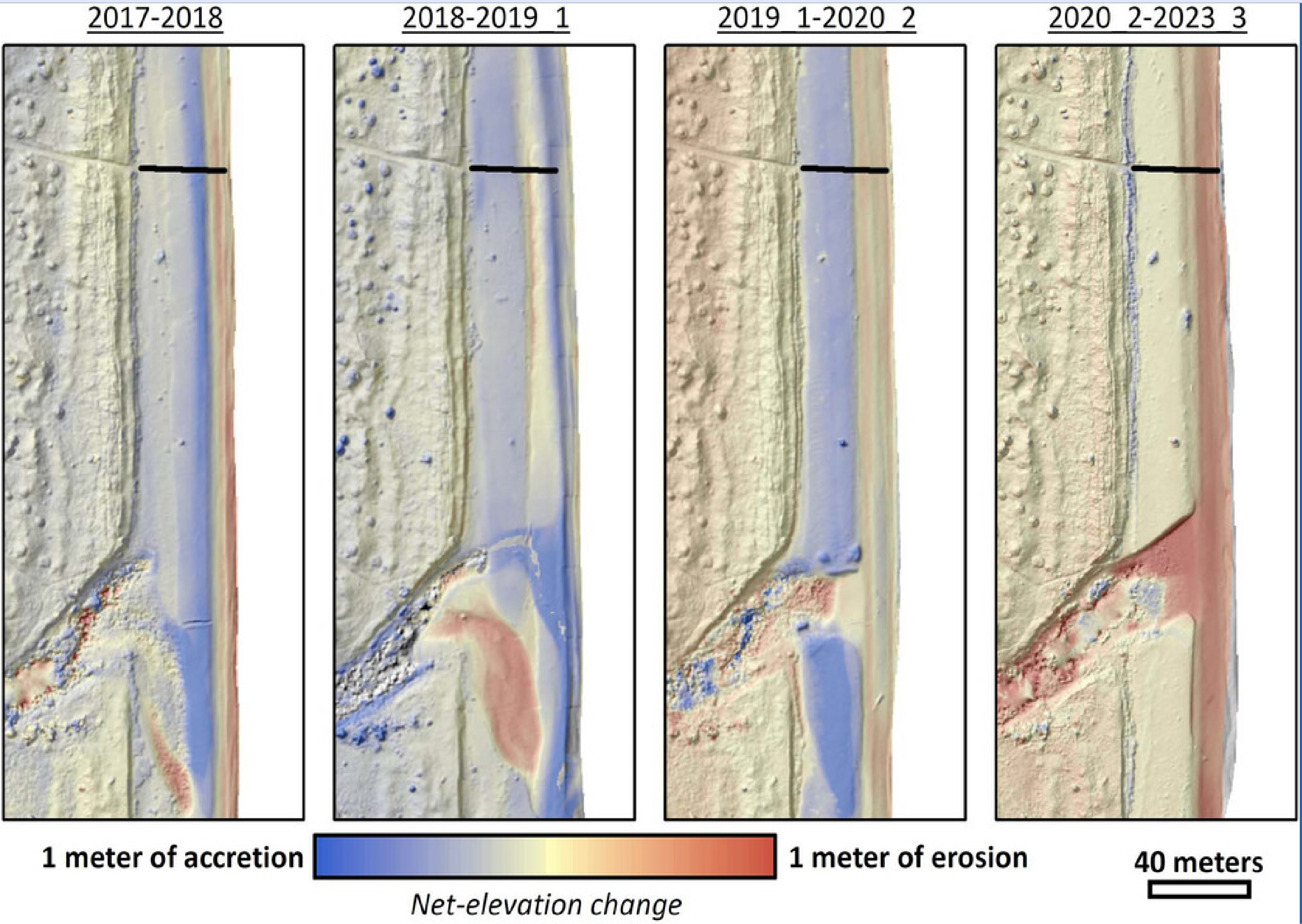

Figure 5. Geomorphic change models based on raster subtraction of select topographic digital elevation models, with red coloration indicating elevation loss (i.e. erosion) and blue coloration indicating elevation gain (i.e. accretion). The location of topographic profile extractions and pre- and poststorm ground-penetrating radar surveying is shown in black on all map panels. Perceived geomorphic textures within the Dead River are artifacts of Structure from Motion Photogrammetry and likely relate to the ponding of murky water; these elevation-change values should be discounted.

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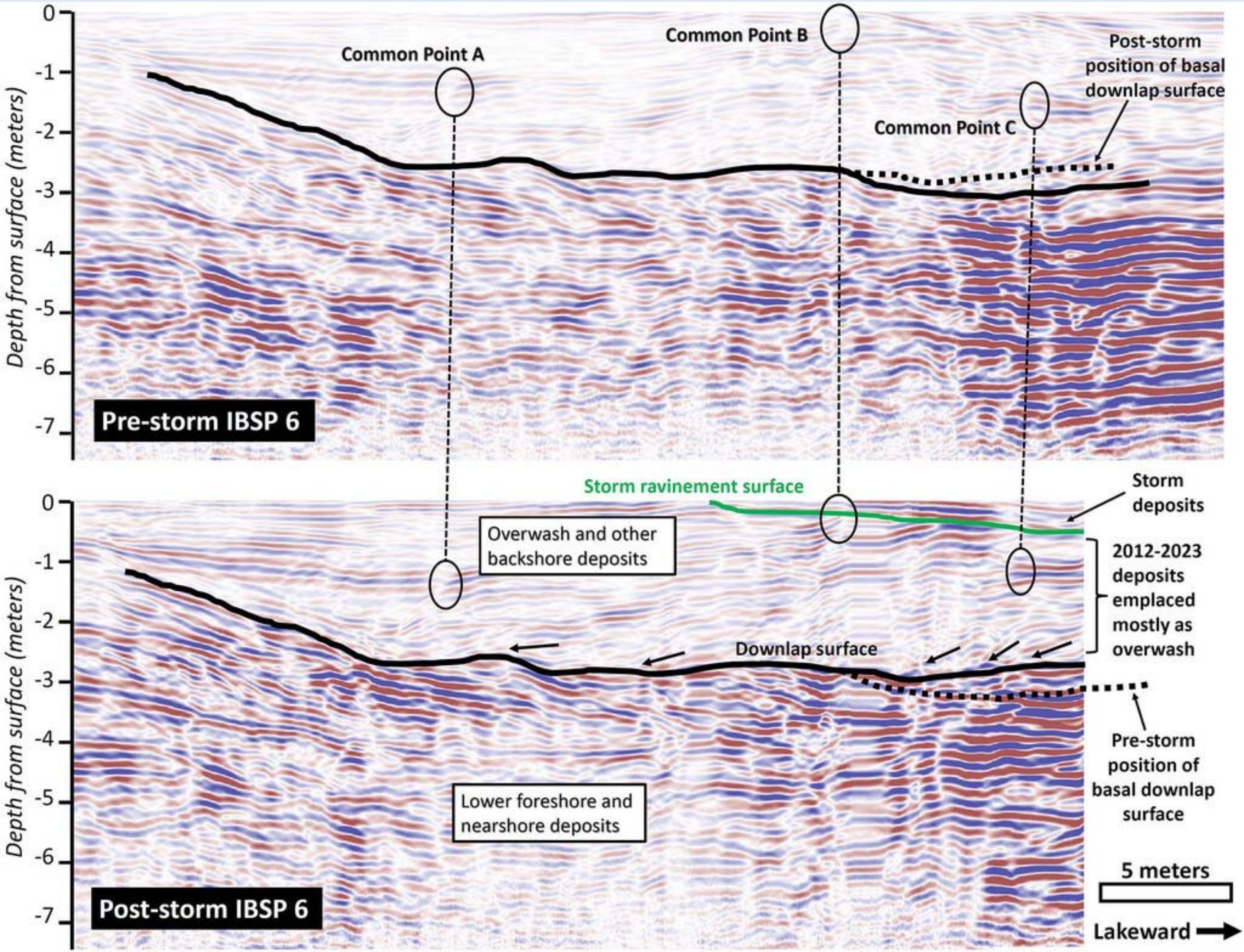

Figure 8. Interpreted ground-penetrating radar images from before and after a multiday storm event in October 2023.

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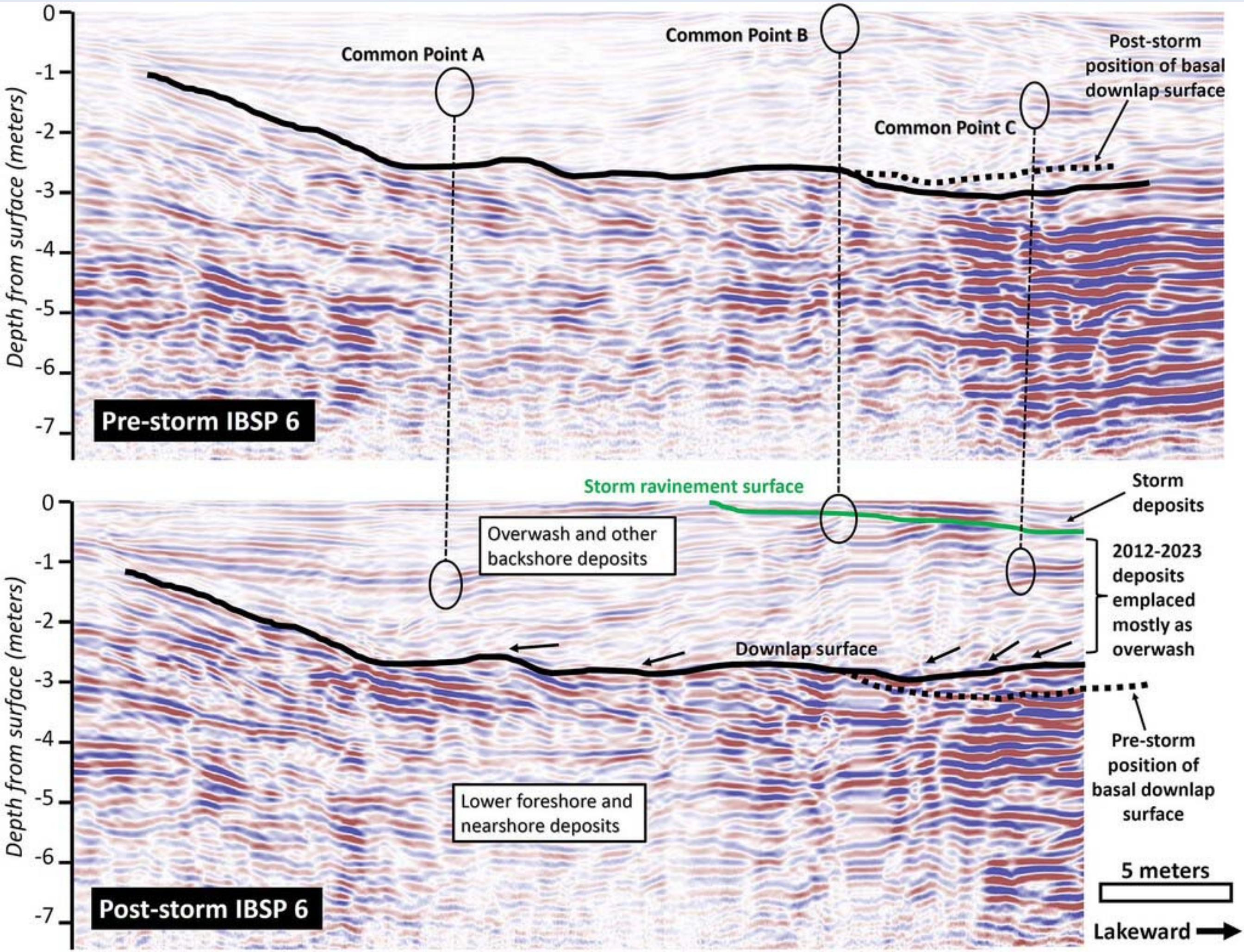

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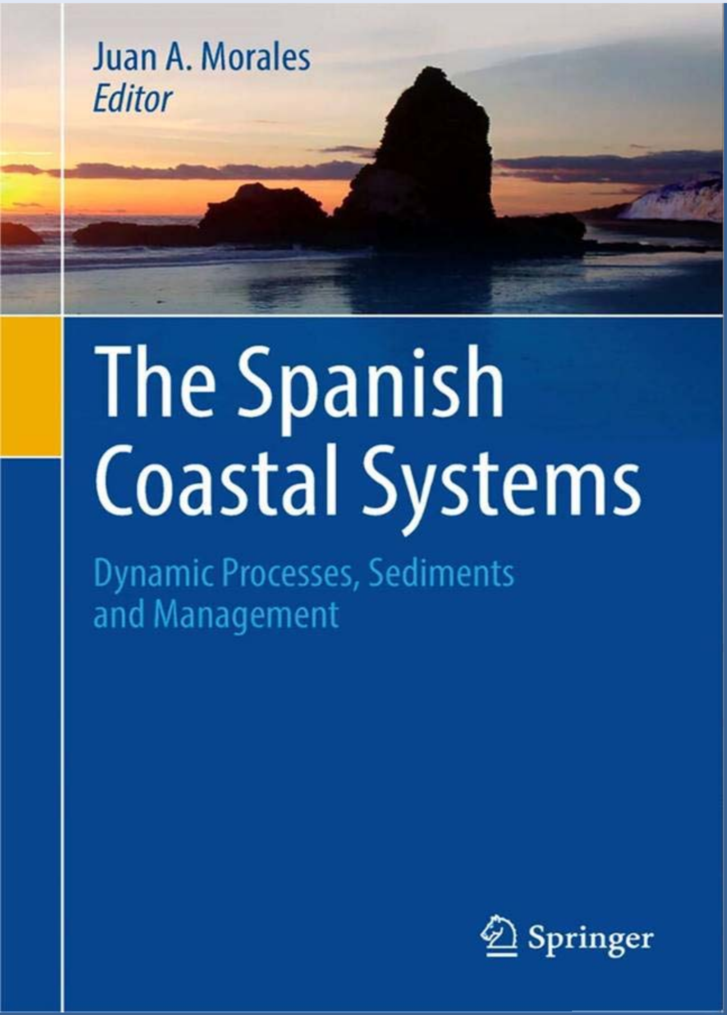
BOOK REVIEW

THE SPANISH COASTAL SYSTEMS:
Dynamic Processes, Sediments and Management
Edited by Juan A. Morales



Over the last four decades, coastal geomorphology and sedimentology in Spain have evolved from primarily descriptive, regionally focused studies into a consolidated research landscape that increasingly engages with international debates on shoreline dynamics, sediment budgets, coastal hazards, and human impacts. *The Spanish Coastal Systems*, edited by Juan A. Morales, represents the most comprehensive attempt to synthesise this scientific trajectory within a single volume. With over 800 pages and contributions from leading scholars from multiple universities and research centres, the book stands as a landmark work that documents, systematises, and contextualises the enormous geomorphological diversity of the Spanish littoral zone. For researchers and practitioners alike, it provides an invaluable overview of environments ranging from high-energy Atlantic rías (estuaries) to microtidal Mediterranean deltas, dune complexes, estuaries, volcanic coasts, and heavily urbanised beach systems.

The structure of the book enhances its utility as a reference source. Six major parts guide the reader from foundational process frameworks to detailed regional analyses, and finally toward management case studies and future perspectives. The introductory chapter by Morales and Pérez-Alberti is particularly noteworthy: It situates the Spanish coast within broader physical constraints—wave regimes, storminess, tidal types, sediment supply, tectonic setting—and does so in a way that bridges geomorphology, historical geography, and environmental change.

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