

U.S. Coastal Research Program

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For more information on the motivation and goal of the USCRP as well as current initiatives, please see the USCRP website, <https://uscoastalresearch.org/>.

Become a member of the USCRP

We encourage our federal agency, academic, and stakeholder partners to become a USCRP member today! Go to: <https://uscoastalresearch.org/> and join for free. As a member, you will contribute to a coordinated, coastal voice; receive the quarterly newsletter & mailing list announcements; inform future USCRP funding opportunities; participate in three-way communication with agencies, academics, and stakeholders; help direct activities towards training the next generation of coastal scientists and engineers; connect agency, academic, and stakeholder research and funding needs; and network with other coastal researchers.

DUNEX – Project Update

The DURING Nearshore Event eXperiment (DUNEX) is an academic, multi-agency, and non-government collaborative community experiment being supported by and planned under the USCRP to study nearshore coastal processes during one or more coastal storms. The motivation for DUNEX is to:

- Improve understanding of storm processes;
- Improve the ability to calculate and predict storm processes and impacts;
- Incorporate better physical representation of nearshore processes into numerical models;
- Identify and reduce sources of error in numerical predictions of storm processes;
- Identify knowledge gaps and collaborative research ideas to address those gaps;
- Improve strategies for short- and long-term coastal resilience; and
- Develop more effective communication methods for coastal communities impacted by storms.



The target data of the experiment include: hydrodynamics, meteorology, hydrology, sediment transport, geomorphology, morphological evolution of the beach/dune, dune overtopping/overland flow, and ecology.

DUNEX Information Webinar

On 31 January 2019, the DUNEX Leadership Team held an informational webinar to provide general information on the DUNEX pilot study to be conducted in the Fall 2019 and the full experiment focused on storm measurements to be conducted in the Fall 2020 to Winter 2021 time frame. The coastal community identified this multi-phased approach as desired by potential participating science teams. DUNEX will be conducted at a fixed-site along the Outer Banks, North Carolina that will thus require a target storm to reach the selected stretch of coast designated for the experiment. Because of the propensity for Fall storms in this region, the selected experiment location is the 100-mile stretch of the northern Outer Banks of North Carolina from the Cape Hatteras National Seashore north to the Virginia border. The US Army Corps of Engineer's Field Research Facility (FRF) will serve as the logistical base for the operation. The region's long history of field data collection provides an excellent opportunity to integrate storm processes with the longer term processes where information and knowledge at the FRF are available.



DUNEX is planned for several storm landfall locations along the northern Outer Banks, NC, with continual measurements at the USACE's Field Research Facility (FRF) in Duck, NC.

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Webinar attendees, which included over 100 participants from 12 academic institutions, 3 federal agencies, and 2 non-government organizations, were able to pose questions during the webinar via live chat as well as verbally after the formal presentation portion of the webinar. Responses to the questions were made verbally and captured in a frequently-asked-question (FAQ) document. For those who could not attend the DUNEX information webinar and are interested in additional information or potential participation, the **presentation slides** and set of frequently-asked-questions (**FAQs**) are available on-line at <https://uscoastalresearch.org/dunex>, along with a **DUNEX Fact Sheet** and **Logistics Survey** regarding potential participation in DUNEX.

DUNEX Logistics Survey

The DUNEX Leadership Team formed the initial leadership of the DUNEX Logistics Team which is tasked to identify individual researcher's goals and support needs, identify group support needs, schedule resources, and develop a data sharing plan. The DUNEX Logistics Team will eventually expand to include a Principal Investigator (PI) from each science team involved in the DUNEX experiment. The DUNEX Logistics Team has developed a **Logistics Survey** that is available on-line to begin to identify interest in related researcher initiatives to facilitate collaboration, common data needs that could be provided by agency collaborators (e.g. bathymetry), logistical support needs (e.g. deployment; fabrication etc.), and potential training topics of interest to the participants. The purpose of the Logistics Survey is only to

identify researcher's interest in participating in DUNEX, pending funding. Researchers are not required to have funding secured at this time.

To help the DUNEX Logistic Team plan and the FRF team host the experiment, interested participants are requested to please fill out a Logistics Survey and submit the completed survey by **15 Mar 2019 for the pilot experiment and 31 Dec 2019 for the full experiment**. Earlier submission is encouraged and plans may be updated at any time. The Logistics Survey can be downloaded from the USCRP website at <https://uscoastalresearch.org/dunex>.

Opportunities to Participate in DUNEX

There are multiple ways for interested researchers to participate in DUNEX. Individuals interested in conducting an experiment as a PI during the Pilot Study and/or Full Experiment should fill out a Logistics Survey so that experiment organizers can begin logistical planning. PIs must secure their own funding, will need to contribute a logistical support fee ~\$500-4500/wk per team depending on the level of support needed, and agree to a data sharing policy. Other means of participating include attending or leading a training session in the field and/or classroom. Lastly, students interested in the experiment are more than welcome to volunteer and assist with field work.

DUNEX Training Opportunities

As mentioned, DUNEX will also include training opportunities centered on the active field work, FRF facility, and the group of coastal experts on-site conducting experiments. The first type of training available will consist of traditional lectures focused on coastal processes including topics such as waves, water levels, currents, sediment transport, coastal geology and methods of coastal protection. In addition to lectures, this training will include field exercises that focus on some aspect of the lecture topic, for example, identifying dune scarping, wave type, wave period, changes in the wave breaking zone on Day 1 versus Day 5, wave runup, or possibly the formation of beach cusps. The second type of training will target more hands-on training in field methods, geared towards the different types of instrumentation. This training will include all things related to data – such as data collection methods, datums, data analysis and interpretation, data and instrument uncertainty, and how to design a data collection experiment. The third type of training will be offered in short, evening talks by the various DUNEX investigators discussing their experiment, new field methods and theories, and general networking to seek new ideas from each other. And lastly hands-on numerical modeling sessions will be offered for individuals to learn particular tools that can be applied to an area of interest or to validate to data collected during DUNEX.

These training opportunities are open and offered to students, staff from the federal agencies, local coastal managers, and other interested parties. Training space is limited, therefore complete the Logistics Survey and contact the DUNEX Training Team to participate or suggest other derivatives of the training opportunities mentioned here. There is no cost to participate in the training exercises.

Other Logistical Information

Office Space: There will be work space and office space in trailers located on the FRF property. East Carolina University's Coastal Studies Institute will also have office space available for teams working in the southern portion of the study reach.



Lodging: The Outer Banks, North Carolina is a tourist destination, therefore lodging can be expensive in the August time frame. It is recommended that you book early and possibly look for a rental property that can accommodate 5-10 researchers. Lodging rates decrease after Labor Day. There is no lodging available at the FRF and camping on the property is not permitted.

Ocean/Sound Access: There are no ocean boat ramps available, but small water crafts such as jet skis or rigid-inflatable boats can be launched by FRF equipment from the beach at the FRF. Public sound access ramps are available as well. Driving on the beach will require coordination with local authorities. Driving on the beach along the national seashores or wildlife refuges is not permitted.

Permitting: USCRP will assist in publicizing the experiment with local stakeholders, but it is the researcher's responsibility to contact the appropriate permitting authority where necessary. USCRP will help provide contact information for permitting. No permits are required for experiments conducted on FRF property.

USCRP Support

The USCRP supports the planning of DUNEX and is committed to helping promote DUNEX to a multi-disciplinary audience to ensure diverse data collection. USCRP's Virtual Program Office will work closely with the DUNEX Leadership, Logistics, and Training teams to coordinate logistical support and facilitate the development of the complete Logistics Team. The complete Logistics Team will consist of science PIs in collaboration with an NSF-funded Convergence-RAISE grant (OCE-1848650), who will:

- Assist in coordinating with local stakeholders;
- Assist in coordinating training classes and student volunteers to further the career development of U.S coastal researchers;
- Provide a community website for information, discussion, data sharing and access; and
- Coordinate agency-supported data collection efforts.

Agency Support

There have been commitments from several agencies to provide support including:

- Pre and post-storm airborne lidar along entire study site (USACE Joint Airborne Lidar Technical Center of Expertise (JABLTCX))
- Bathymetry at FRF site and potentially a southern site (at frequency determined by the Logistics Team)
- Ongoing USACE data available at the FRF:
 - <https://chlthredds.erdc.dren.mil/thredds/catalog/frf/catalog.html>
 - <https://frfdataportal.erdc.dren.mil/>
- High-frequency terrestrial lidar & UAS surveys provided by the FRF and US Geological Survey (USGS)

Invited contribution by **Mary Cialone**, USACE ERDC-CHL.



Project Spotlight:
Geomorphologic change in Southeast Florida following multiple tropical weather systems from 2016-2018

The beach environment provides several important functions such as providing habitat, recreation, economic benefits, and protection from storms and coastal flooding. (Hanley, *et al.* 2014; Houston, 2018). However, over 70% of beaches worldwide are experiencing erosion (Leatherman *et al.*, 2000). Hurricanes and large tropical systems, due to their duration and high-speed winds, create powerful waves capable of further eroding the beach. This study aims to evaluate storm impacts on various beaches along southeast Florida, in an effort to quantify the geomorphic changes that govern beach functions.

Study Area

Palm Beach County is located in southeast Florida and has 45-miles of coastline, of which over 33 miles are considered critically eroded. Between 2016 and 2018 two hurricanes, Hurricane Matthew (2016) and Hurricane Irma (2017), came into close proximity of Southeastern Florida’s coastline. Two additional storms, Nicole (2016) and Florence (2018), also lead to beach profile changes despite their distance from the study area.

Multiple study sites in southeast Florida were evaluated, including Deerfield Beach, Boca Raton, Delray Beach, Boynton Beach, and Jupiter. Sediment samples were taken pre and post storm events, as well as, once during each summer and winter season to establish baseline conditions. During the study period profiles were surveyed on a bimonthly to quarterly basis depending on location. In total 688 profiles [Deerfield Beach (98), Boca Raton (391), Boynton Beach (57), Delray (106), and Jupiter (36)] were analyzed over three years to evaluate the impact and recovery following high-energy events (based on wind and water level data). Volume and contour change was quantified using Regional Morphology Analysis Package (RMAP).

Preliminary Results

Cross-shore morphology varied following both hurricanes, including those sites in close proximity (<400 meters). Hurricane Matthew occurred in the region between October 4th and 6th, 2016, tropical storm Nicole from October 6th to October 18th of 2016, and Hurricane Irma from September 6th to the 8th, of 2017. In both Delray Beach North and Delray Beach South hurricanes were the most erosive events measured. Delray North experienced a shoreline retreat of just over 10 meters whereas Delray Beach South experienced a loss of just over 7 meters as a result of hurricane Irma. A summary of shoreline and volume change at these two locations illustrates the alongshore variability in beach response to several notable events (Table 1).

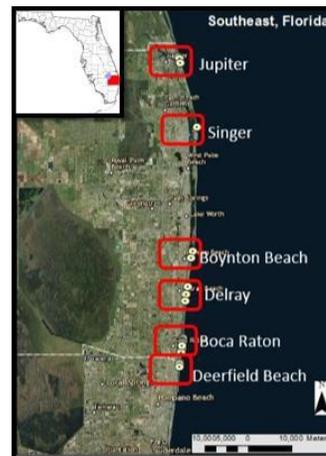


Figure 1: Study site locations in Palm Beach County,



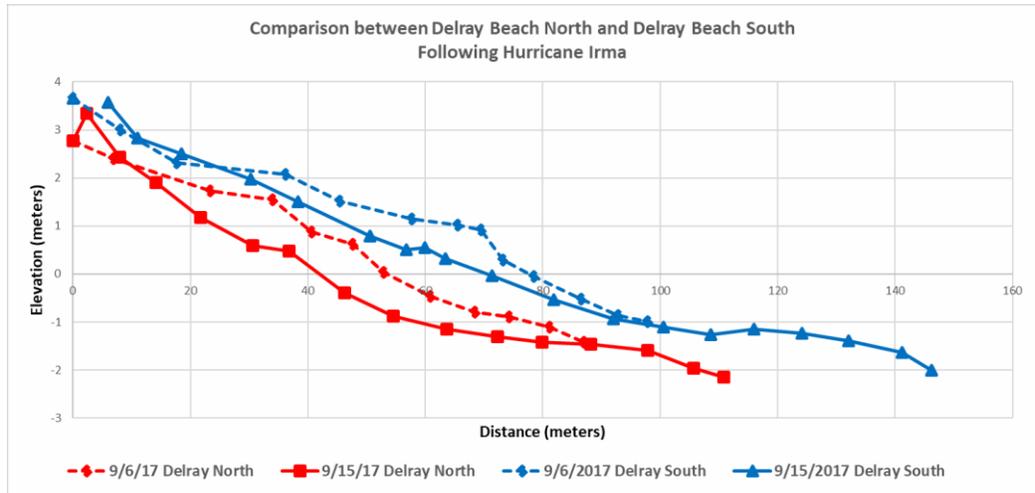


Figure 2: The change in the beach profile at Delray Beach South and Delray Beach North following Hurricane Irma.

2016-2017		Shoreline	Volume Change	Shoreline Change	Volume Change
Event	Profile	(m) of dry	(cu. m/m)	(m) of dry beach	(cu. m/m)
Post Matthew	10/9/2016	-0.93	-4.58	-2.57	-13.609
Dynamic Period/TS Nicole	10/18/2016	-5.93	-5.838	-2.55	2.411
Post November Supermoon	11/15/2016	-8.42	-1.113	11.28	31.149
Post Irma	9/15/2017	-10.07	-17.599	-7.08	-19.738
Post November Perigeon Tide	11/28/2017	-2.28	-0.965	-12.9	-16.267

Table 1.

Moving Forward

An increasing potential for stronger storms and storm clustering in the future (Burvingt *et al.*, 2017) emphasizes the importance of accurately quantifying and understanding storm-induced beach change. In addition, beaches that are impacted by tropical systems are more susceptible to increased erosion at the next storm event. Future stages of research will consist of running wave models to evaluate nearshore hydrodynamics. Observations of initial geomorphic conditions (including inlet proximity) and the resulting storm-induced morphology will be aggregated into a conceptual model of conditions associated with particular storm-impacts along this coast.

References:

- Burvingt, O., Masselink, G., Russell, P., & Scott, T. (2017). Classification of beach response to extreme storms. *Geomorphology*, 295, 722-737.



- Hanley et al. “Shifting Sands? Coastal Protection by Sand Banks, Beaches and Dunes.” *Coastal Engineering*, vol. 87, 2014, pp. 136–146., doi:10.1016/j.coastaleng.2013.10.020.
- Houston, J. R. (2018b). The Economic Value of Florida’s Beaches. *Shore & Beach*, 86(3).
- Leatherman, S. P., Zhang, K., & Douglas, B. C. (2000). Reply [to “Comment on ‘Sea level rise shown to drive coastal erosion’”]. *Eos Trans. AGU Eos, Transactions American Geophysical Union*, 81(38), 437. doi:10.1029/00eo00330

Invited contribution by **Julie Cisneros**, Ph.D. student at the Department of Geosciences, Florida Atlantic University

Project Spotlight:
Evaluation of resilience of Punta S’Aliga barrier beach (Sardinia, Italy)

Under several consultancy activities in the last decade, the Center of Environmental Sciences (CINSA) at the University of Cagliari has carried out numerical modelling and field surveys at the Punta S’Aliga barrier beach, located on the south-west coast of Sardinia (Italy). The main goal of these activities is the evaluation of resilience of the barrier beach to two driving forces affecting the barrier beach: winter storms and littoral drift. The Punta S’Aliga barrier beach separates the inner lagoon, the Boo Cerbus lagoon, from the sea. The Boo Cerbus lagoon has been defined as a critical polluted water site based on monitoring results that have highlighted the high concentrations of heavy metals, particularly cadmium and mercury. The Punta S’Aliga barrier beach is the natural obstacle against the diffusion of heavy metals in the clean sea and close touristic beaches. The research activities of CINSA aims to evaluate the risk of barrier overwash and breaching occurrence that would dramatically affect the coastal environment.

The morphology of the barrier beach is continuously changing and having a full understanding of this evolution is necessary to effectively and efficient manage and plan. While measuring *littoral drift* in this field would be difficult and subject to great uncertainty, the shoreline evolution describes a situation where the net sediment transport rate is significant. The evaluation of net longshore energy flux using the simplified approach of the CERC formula, presented in the Coastal Engineering Manual, provides an average value of 2000 W/m in the period between 1989 and 2018, and a constant direction of the annual energy flux toward the south. This flux has produced a continuous longshore sediment supply that is the strength of the barrier spit. Incipient or established foredunes provide a natural defense against winter storms that have caused severe erosion significantly reducing the active beach width. Resilience of the Punta S’Aliga barrier beach depends on the ability of the dune to recover in height and extent following storms where return time has decreased in the last decade. A change in storm frequency is a potential threat to Punta S’Aliga beach resilience, particularly for those sections of the beach where dune recovery has historically taken the longest time.

Numerical modelling and field surveys have been conducted using sources of information at different levels of accuracy and were used to estimate the longshore migration (barrier beach elongation). Specifically, imagery coverage with cloudless orthorectified aerial photographs and satellite IKONOS multispectral image (indirect sources), and topographical surveying using a RTK GPS were extensively used and processed in the Digital Shoreline



Analysis System to produce several statistical change measures. Currently, numerical modelling methods are applied to accurately predict different regime of dune change during storms. Specifically, XBeach, an open-source, process-based morphodynamic model, has been validated using the extensive field surveys.

The preliminary results of these activities are expected by the end of 2019 when a large beach restoration project will start to reestablish and stabilize the dunes.

Invited contribution by **Andrea Sulis**, Ph.D., Center of Environmental Sciences (CINSA), University of Cagliari Italy.

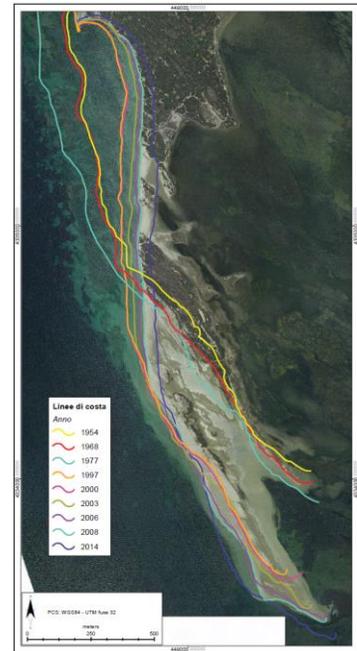


Figure 1. Shoreline positions from DSAS analysis over 2008 aerial picture.

Announcements & Upcoming Events

ASBPA 2019 Coastal Summit, “Investing in Resilient Coasts,” March 12-14, 2019.
ASAE Conference Center
1575 I St NW, Washington, DC
<http://asbpa.org/conferences/>

Coastal Sediments 2019 (CS19), “Advancing Science & Engineering for Resilient Coastal Systems,” May 27-31, 2019.
Tampa/St. Petersburg, FL.
<http://coastalsediments.cas.usf.edu/>

Coastal Engineering Research Board, August 13-15, 2019.
Detroit, Michigan

ASBPA 2019 National Coastal Conference, “Where Coasts and Rivers Meet,” October 22-25, 2019
Myrtle Beach, SC
<http://asbpa.org/conferences/past-meetings/>

For More
Information



If you are interested in contributing to the **June Quarterly Bulletin**, please contact Kathryn McIntosh (Kathryn.H.McIntosh@usace.army.mil) by May 17, 2019 to be considered for inclusion.

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