

**CIRP**  
Research & Development

**COASTAL & HYDRAULICS LABORATORY**  
**ERDC**  
Engineer Research and Development Center


## Inlet Geomorphology W.U.

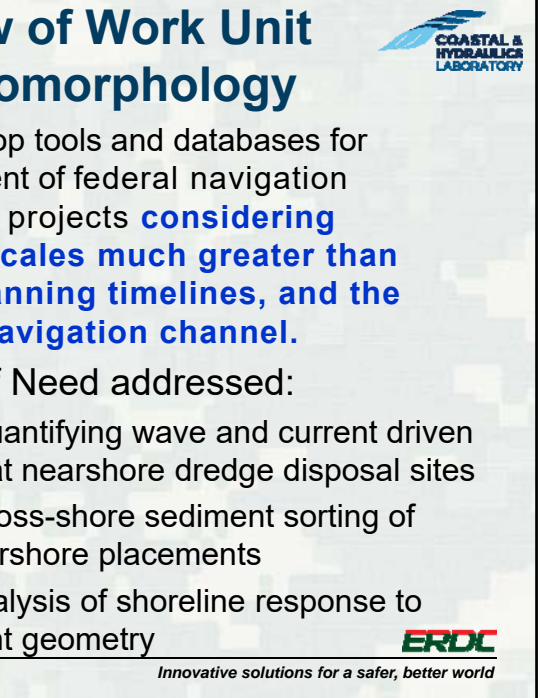
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**US Army Corps of Engineers**




**CIRP**


**COASTAL & HYDRAULICS LABORATORY**

## Overview of Work Unit Inlet Geomorphology


- Work unit focus: Develop tools and databases for operation & management of federal navigation channels and coastal projects **considering temporal & spatial scales much greater than dredging cycles, planning timelines, and the dimensions of the navigation channel.**
- FY18 Statements of Need addressed:
  - ▶ SoN 2016-N-04: Quantifying wave and current driven sediment transport at nearshore dredge disposal sites
  - ▶ SoN 2017-N-69: Cross-shore sediment sorting of mixed sediment nearshore placements
  - ▶ SoN 2017-N-70: Analysis of shoreline response to nearshore placement geometry

  
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# Overview of FY18 Products




- **Technical/Special Reports**
  - Beck, T.M. (in progress). Literature Review of Inlet Management Practice. ERDC/CHL SR
  - Krafft, D., et al., (in progress). Wave Metrics for Berm Migration and Erosion, ERDC/CHL-TR-X
  - Zarillo, G. et al., (in progress). Fort Myers Beach Report, ERDC/CHL-TR-X
  - Brutsché, K.E., et al., (in final review). Literature Review of Nearshore Berms, ERDC/CHL SR-18-X.
  - Styles, R., et al., (2018). Long-term Morphology Modeling for Barrier Island Tidal Inlets, ERDC/CHL TR-18-12.
  - Priestas, A.M., et al., (in progress). Performance of Nearshore Berms from Dredged Sediments: Comparison and Validation of the Sediment Mobility Tool. ERDC/CHL TR.
- **Technical Notes**
  - McFall, B.C., et al., (2018). Uncertainty Associated with Sediment Mobility Tool. CHETN.
  - McFall, B.C. and Brutsché, K.E., (2018). User's Guide for the Sediment Mobility Tool Web Application, ERDC/TN RSM-18-4.
  - Beck, T.M., Arnold, D.E. (2018) U.S. Tidal Inlets Atlas: An update to the CIRP Inlets Database
- **Web Applications**
  - Sediment Mobility Tool Web Application updated with NACCS study results
- **Journal Paper**
  - Beck, T. (in progress). Morphodynamics of Barrier-Inlet Systems in the Context of Regional Sediment Management in the United States
- **Presentations**
  - Brutsché, K.E., Arnold, D.E., McFall, M.C., Li, H., Maloney, E.C., and Bucaro, D.F., 2017. "Nearshore Placement Techniques in Southern Lake Michigan," 2017 ASBPA National Coastal Conference, Fort Lauderdale, FL
- **Other**
  - New Smyrna Beach collaborative effort to replace Sand Island
  - ERDC Award for Outstanding Achievement in Tech Transfer (Non-Fed): Sediment Mobility Tool

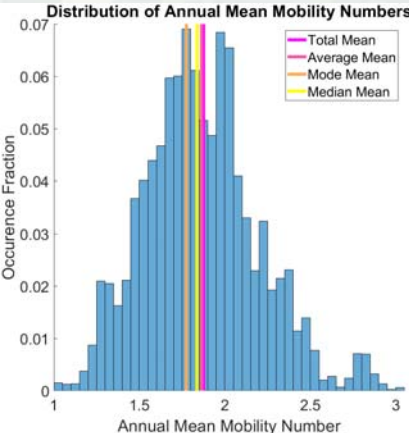
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# Wave Averaging




- Draft TR
- Determine appropriate wave climate predictions to relate to nearshore berm evolution
- Compiled methods to determine wave metrics
- Applied to Fort Myers Beach




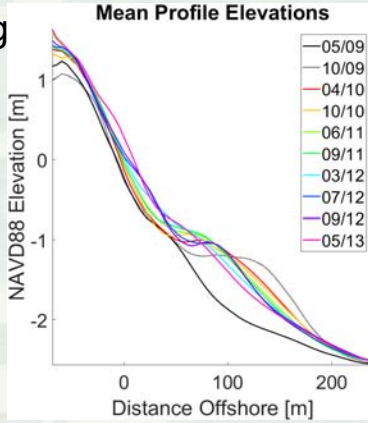
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## Wave and NB Relationships




- Relate wave metrics to nearshore berm evolution using 2009 Fort Myers Beach data
- Wave data were compared to nearshore berm response to determine possible relationships
- Wave energy flux and Larson and Kraus (1992) relationship seem most influential
- Included in Draft TR







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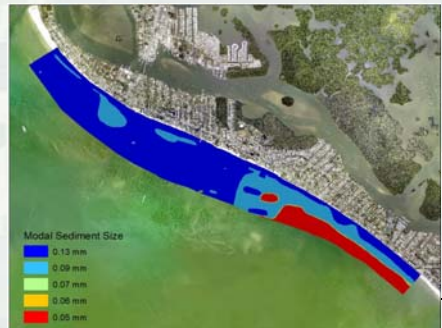



## Fort Myers Beach



- Draft TR (FIT)
- Master's Thesis (S. Ramos)
  - ▶ Morphological Feature Analysis
  - ▶ Shoreline Trend Analysis
  - ▶ Sediment Grain Size Distribution Statistics
  - ▶ Sediment Grain Size Changes
  - ▶ Longshore Transport Analysis







September 2016 to January 2018



## New Smyrna Beach




- Collaborative effort: SAJ, FRF, RSM proposal for next year
- Test Mini-Argus, shoreline change with nearshore placement
- FRF set up Mini-Argus
- Placement happening soon








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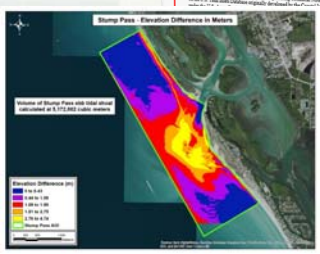


## Guidance for Numerical Modeling of Navigation Inlet Mining Studies

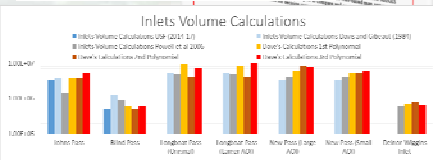


- Special Report (SR) – Literature Review of Inlet Management Practice (Draft)
- Updated Inlets DB and Webservice [<https://arcg.is/nS599>]
- Tech-Transfer on the Coastal Modeling System (CMS) and tracer studies at tidal inlets (ASBPA 2018)
- CHETN: U.S. Tidal Inlet Atlas Update
- JP: Morphodynamics of Barrier-Inlet Systems in the Context of Regional Sediment Management in the United States (Draft)








Stump Pass - Elevation Difference in Meters




Inlets Volume Calculations



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## Overview of FY19 R&D and SoNs




- Investigation into Nationwide Sediment Grain Size Information from “Citizen Scientists”
- Nearshore Berm Migration Near a Wetland (RSM, F&C, DOER/EWN?)
- SMT JP
- Testing of C2SHORE for Modeling of Nearshore Berms
- Nearshore Berm Workshop and Working Group
- New Smyrna Beach (continued)
- Nearshore Berm Experiment (FRF or District)
  - ▶ SoN 2016-N-04: Quantifying wave and current driven sediment transport at nearshore dredge disposal sites
  - ▶ SoN 2017-N-69: Cross-shore sediment sorting of mixed sediment nearshore placements
  - ▶ SoN 2017-N-70: Analysis of shoreline response to nearshore placement geometry





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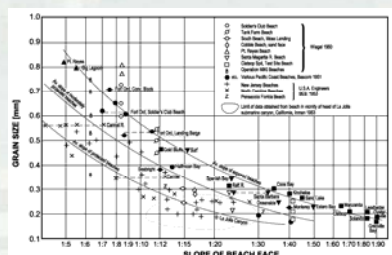
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## Grain Size Data using Citizen Scientists




- Collaboration with JMU to investigate whether it was feasible to use citizen scientists to gather grain size vs. beach slope data
- Update to Wiegels (1964) study to include world wide beaches
- JMU creates and maintains the website







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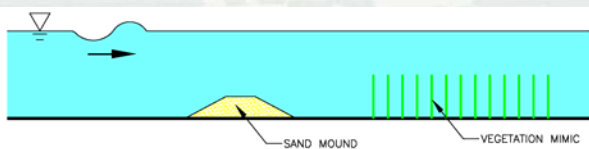
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## Nearshore Berm Migration Near a Wetland




- Collaboration with CIRP, RSM, F&C, DOER/EWN (?)
- Two phase experiment to fill knowledge gaps on wave energy dissipation and sediment transport in vegetation
  - ▶ First Phase: hydrodynamics of waves propagating through submerged vegetation
  - ▶ Second Phase: Monitor sediment transport of berm placed near vegetated areas







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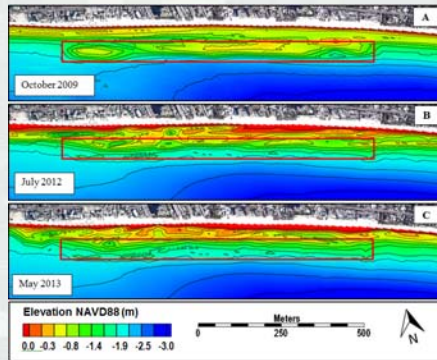
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## Testing C2SHORE for Modeling of Nearshore Berms




- Use existing data from Fort Myers Beach (2009 and 2016 berms) to test C2SHORE (now integrated into CMS) as a potential model for nearshore placement of dredged material
- Test capability, not necessarily detailing new information on nearshore placement
- Technical Report summarizing results







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## Data Collection




- Nearshore Berm Experiment
  - ▶ Action item from Nearshore Processes Workshop
  - ▶ FRF if possible, potential to execute at a district
  - ▶ Use FDCAB Mini dredge if at FRF
  - ▶ Need to create PDT now
  - ▶ Collaboration across several programs at ERDC?
- Wrap up of New Smyrna Beach Berm with FRF and SAJ
  - ▶ Mini-Argus results and write up

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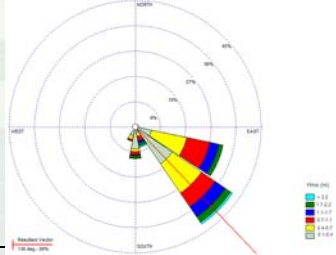


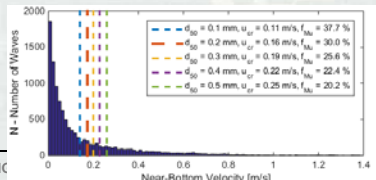
## Other





- Nearshore Berm Workshop and Working Group
  - ▶ Districts want easy-to-use tools for a not so easy answer
  - ▶ Discuss State of Science and Future Directions
  - ▶ Form Nearshore Berm Working Group
- JP on SMT
 


$d_{50}$ (mm)	Frequency of Mobilization	Predicted Sediment Migration
0.1	16 – 38%	83% Offshore
0.2	14 – 30%	60% Onshore
0.3	12 – 26%	84% Onshore






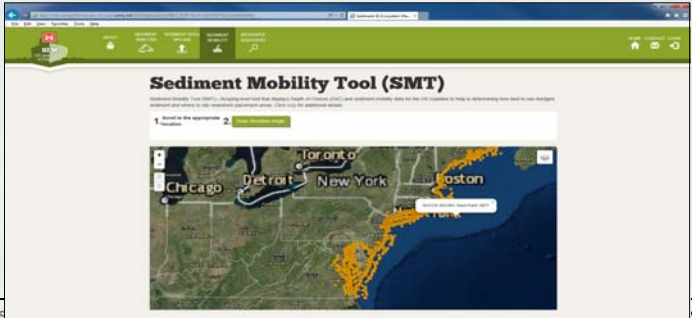
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## Reimbursable Studies




- Continued positive feedback from Districts as well as industry on SMT
  - ▶ Ease of use
  - ▶ Efficiency in determining correct placement depth
  - ▶ Communication with stakeholders













## Collaborations





- Regional Sediment Management Program
- Dredging Operations and Environmental Research Program
- Mobile District
- Jacksonville District
- CESU with FIT
- Delft (FY19)
- JMU (FY19)
- Flood and Coastal










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## Conclusion

- **FY18 Major Advances**
  - ▶ Wrap up of Fort Myers Beach
  - ▶ Relationship between wave metrics and nearshore berm response
- **FY19 Key Products/Advances**
  - ▶ Begin nearshore berm near wetlands study
  - ▶ Form Nearshore Berm Working Group
  - ▶ Test C2SHORE on nearshore berms
  - ▶ Nearshore Berm Experiment
- **FY19 Challenges**
  - ▶ Nearshore Berm Experiment at FRF may be tough to schedule/execute
  - ▶ Potential complications applying C2SHORE coupled with CMS because it hasn't been tested thoroughly



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