COASTAL MODELING SYSTEM (CMS)
DEVELOPMENT, V&V, TECH TRANSFER, AND USER SUPPORT

Mitch Brown, Liz Holzenthal, Honghai Li, Lihwa Lin, Dylan Robinson, Yan Ding, Brad Johnson

PDT: Rod Moritz, Jessica Podoski, Grace Maze, John Winkelman

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COASTAL INLETS RESEARCH PROGRAM
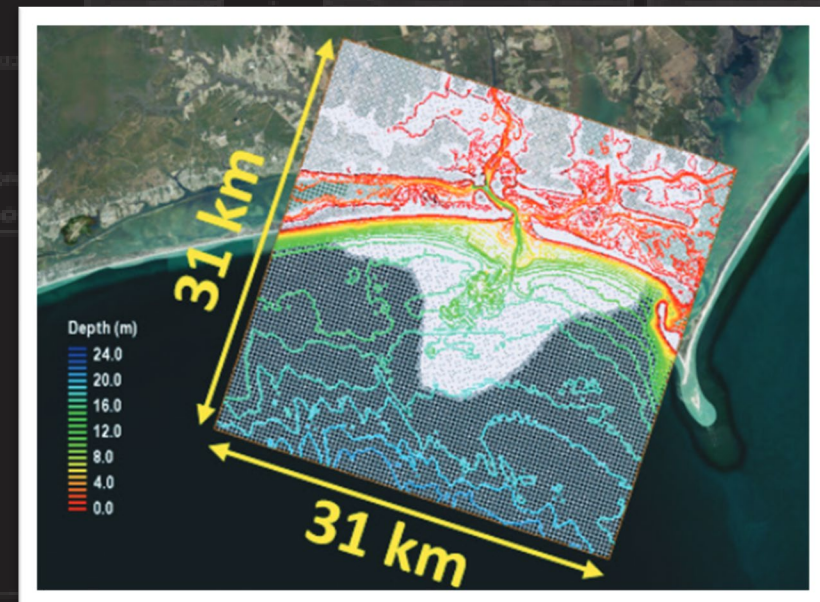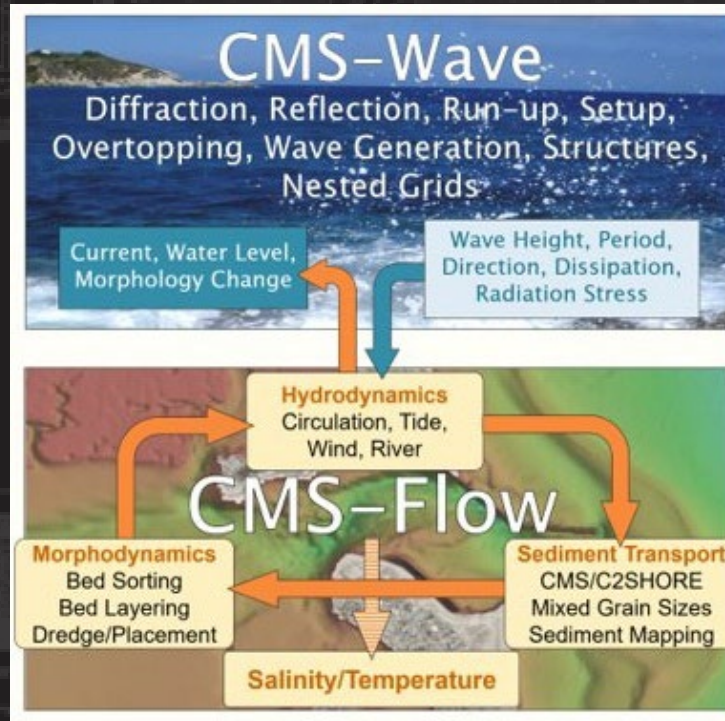*FY23 IN PROGRESS REVIEW*

U.S. ARMY

US Army Corps of Engineers®

ERDC

CIRP

CMS

PROBLEM STATEMENT

Users rely heavily on the calculations of waves, hydrodynamics, sediment transport, and morphodynamics to address problems related to channel shoaling, dredging, and coastal structure modifications. Systematic quality assurance and quality control processes are necessary because the CMS evolves continually, and different versions and updates often produce different solutions.

Statement of Need: 2018-N-1356: Long-term Modeling of Barrier Island Tidal Inlets
2019-N-1509: Morphodynamic Modeling of Navigation Designs
2021-N-1538: Nearshore Processes Research and Development
2022-N-1726: Nearshore Nourishment Best Management Practices

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CAPABILITY AND STRATEGIC IMPACT

The CMS gives users the capability to perform 2D simulations of project alternatives using advanced, integrated models complete with coastal hydrodynamic, wave, sediment transport, and morphodynamic process, including surf zone processes.

User-friendly, computationally inexpensive framework has enabled hundreds of projects by Districts, ERDC, and consultants, along the East, Gulf, Great Lakes, and West Coasts of the United States as well as other international locations.

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TECHNICAL APPLICATIONS

Scopes of Work (SOWs)

- SWG – USCG Station Waterfront Facility
- NAN – Stony Creek Marsh Island Ecosystem Restoration Project
- MVN – Shoaling Rate Comparison for Alternative vs. Tentative Plan
- NAP – CMS and GenCade evaluation of coastal structure performance and impacts at Indian River Inlet, DE
- POH – Study Pohoiki Bay hydrodynamic analysis, sediment budget and CMS modeling
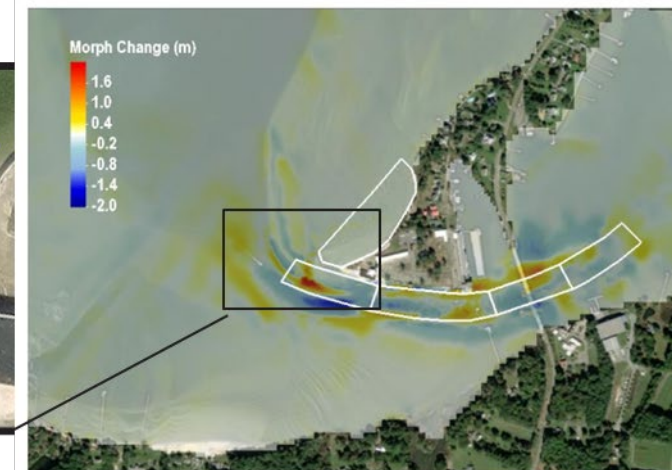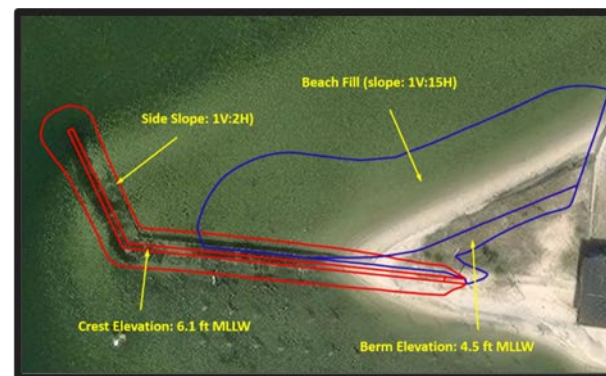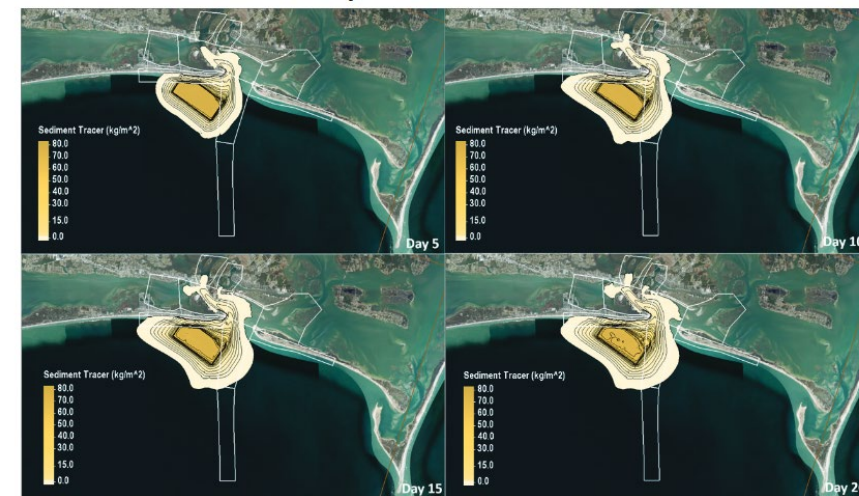
Reports

- NAN – Cupsogue Beach County Park, New York
- MVN – Shoaling Rate for Baptiste Collette Bayou
- SAS – Nearshore BUDM at Jekyll Island, Georgia
- NAO – Milford Haven
- NAO – Hampton Roads
- SAW – Sediment tracer study for Cape Fear Inlet
- SAW – Sediment tracer study for Beaufort Inlet

Transferability/transparency

- CMS OpenSource GitHub release (Jan 2024)
- CMS User's Guide TR published (Apr 2024)

Figure 4-26. Temporal evolution of a sediment plume originating from the Bogue Banks site in the 5-day interval for December 2018.

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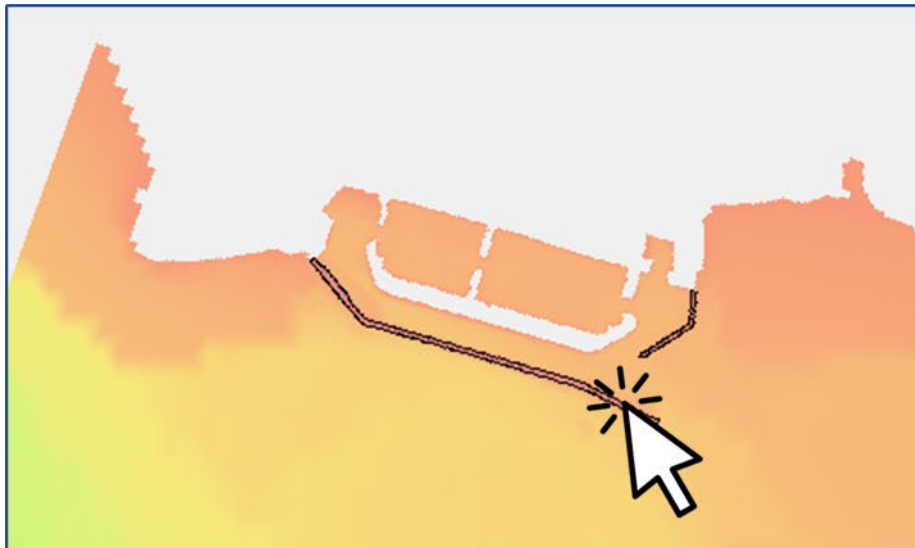
TECHNICAL ADVANCEMENTS

Identification and removal of bugs in code:

- Wave energy flux at boundary (Johnson), shown right
- Dynamic model interface (DMI) for sea level rise curve and permeable structures (Li)
- Wave file export and convergence (Li)

Improvements to Rubble Mound Structure DMI (Brown) allowing for either constant forcing or from a dataset:

TECHNICAL ADVANCEMENTS (cont.)

SMS Reintroduction of Tidal Database Boundary Condition for CMS
with update to **newest** ADCIRC 2015 databases (Brown)

Added the CMS-Wave model input tool on the WIS Data Portal (Brown)
- Presently works for WIS Stations only
- FY24 work will extend the capability to work with NDBC and MEDS buoys.

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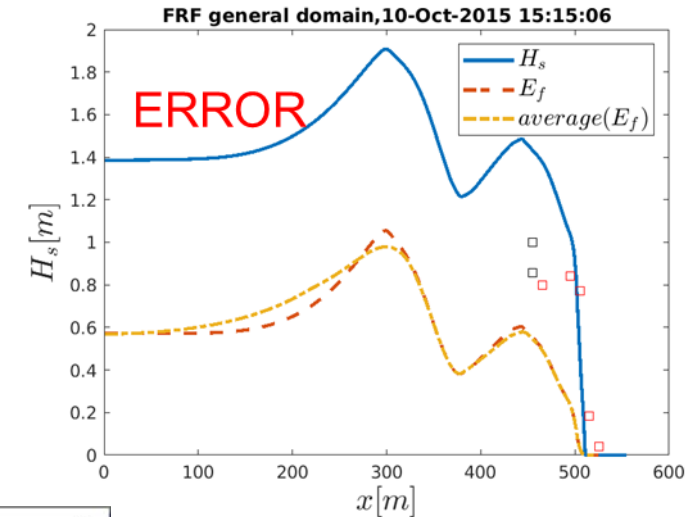
SUMMARY

FY23 Major Advancements in Capability

- Dynamic model interface (DMI) for rubble mound structures and others
- Addition of CMS-Wave tool within the WIS Data Portal
- Code debugging and feature testing
- Sediment Transport V&V test cases prepared

FY23 Major Products & Collaborations

- Release CMS version 5.3.8 [Jan 24], Push code to Open Source (GitHub)
- Publish CMS User's Guide
- User Training and Support to USACE Districts, Workshop @ SPL
- Interactivity between CMS and WIS teams
- Coordination with NMM and WW3 teams
- 1 journal paper, 6 conf. presentations; several Letter Reports
- 2 USACE Poster Sessions (CWG & RD24)

FY24 Products & Advancements

- Implementation of Continuous Integration (CI) QAQC framework to Git version control
- DMIs for three additional structure types (i.e., weirs, tide gates, culverts), Aeolis, sediment mapping, and hard bottom features
- Adding toolboxes to SMS to rapidly calculate meaningful hydro/morpho statistics of interest
- Review of implicit and explicit codes to streamline, standardize nomenclature, and carefully merge
- Update WIS Portal API to allow better access for users and through SMS
- Continue yearly workshops for USACE District staff and their consultants
- Documentation of various features and improvements and various tech transfer activities (i.e., training, web dev, conferences, pubs)
- Continue to investigate and implement fixes for known code issues
- Continue tech transfer through Workshop/Webinar & DOTS requests.

1 BAA (Clarkson University), Task Orders for Aquaveo and RPS/TetraTech contracts, 1 Task Order for CHL IDIQ (Reed)

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