Coastal Inlets Research Program
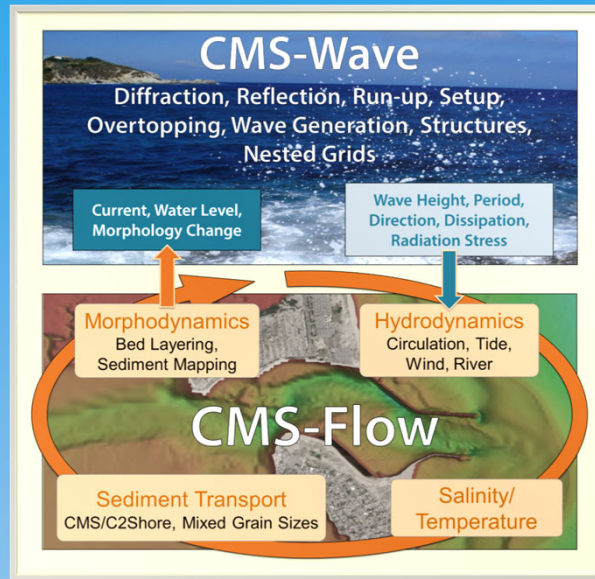# Recent Advancements in the Coastal Modeling System (CMS)
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US Army Corps of Engineers
ERDC

CIRP
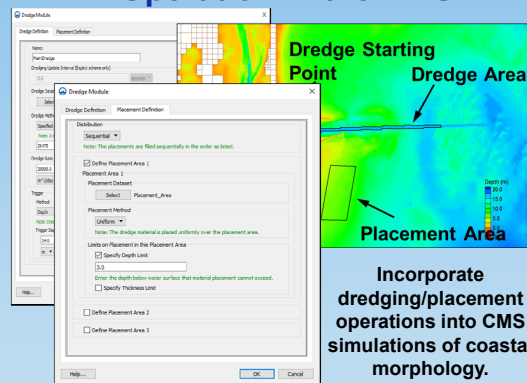Mission Support · Technology Transfer
Research & Development

Introduction

The CMS is a suite of coupled two-dimensional numerical models for simulations of waves, hydrodynamics, and sediment transport, and morphology change. The CMS is developed for USACE to conduct basic and applied research to understand coastal and estuarine physical processes, and is a USACE Hydraulics, Hydrology, and Coastal (HH&C) Community of Practice Preferred model for Coastal Engineering and Navigation studies.
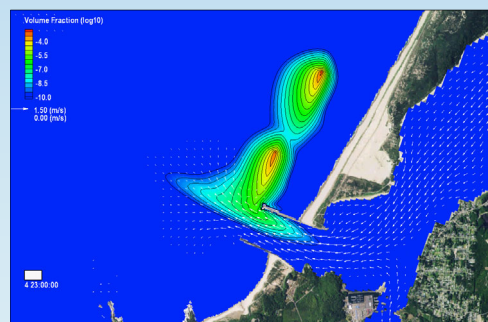

CMS-Wave
Diffraction, Reflection, Run-up, Setup, Overtopping, Wave Generation, Structures, Nested Grids

Current, Water Level, Morphology Change

Wave Height, Period, Direction, Dissipation, Radiation Stress

Morphodynamics — Bed Layering, Sediment Mapping

Hydrodynamics — Circulation, Tide, Wind, River

CMS-Flow

Sediment Transport — CMS/C2Shore, Mixed Grain Sizes

Salinity/Temperature

New Features

The recent releases of CMS V5.1 and Surface-water Modeling System (SMS) V12.3 and 13.0, include implementation of sediment mapping, dredging/placement operation, long-term simulation with sea level change (SLC), and coastal hydraulic structures. The CMS is set up within the Coastal Model Test Bed. The upgrades to CMS provide the USACE with improved predictive capability in navigation planning, design, and maintenance, adjustment of nearshore structures, and coastal response to SLC.

Long-term Simulation with Sea Level Rise

Projected low, intermediate and high SLR curves at Galveston Pleasure Pier, Texas from 2000 to 2100.

Specify boundary conditions with WSE-forcing and SLC time series.

Calculated water surface elevations at an inlet channel output location. Model results were obtained with (a) tidal boundary forcing only and (b) tidal boundary forcing and 100-year SLR scenario.

Dredging/Placement Operation in the CMS

Dredge Starting Point
Dredge Area
Placement Area

Incorporate dredging/placement operations into CMS simulations of coastal morphology.

Sediment Tracer Simulation

Volume Fraction (log10)

Eulerian approach in simulating sediment tracer movement and identifying sediment transport pathways

Availability

- CMS with SMS package
- Tech Reports, Tech Notes, journal papers, presentations, and videos
- Assistance through emails, phone calls, workshops, DOTS training
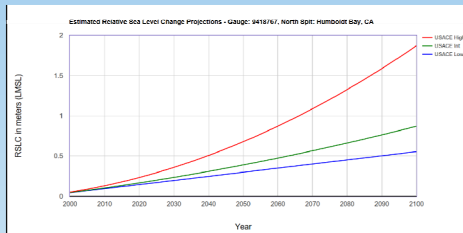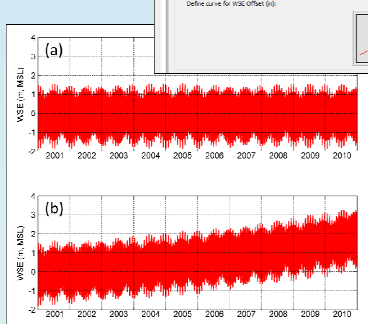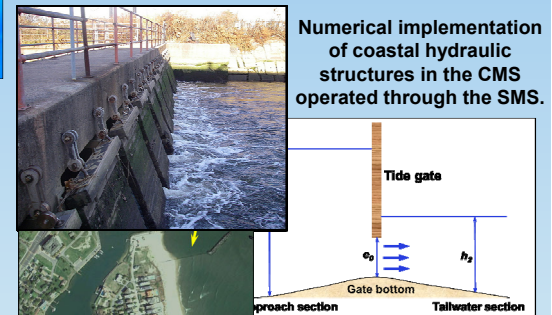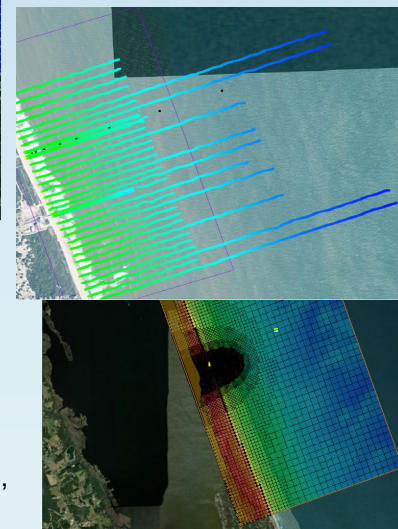- CIRP website -
  http://cirp.usace.army.mil/

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Coastal Hydraulic Structures Implemented in the CMS

Numerical implementation of coastal hydraulic structures in the CMS operated through the SMS.

Tide gate
Gate bottom
Approach section
Tailwater section

Coastal Model Test Bed (CMTB)

The CMTB is an initiative to evaluate the strengths and shortcomings in the performance of the coastal numerical models by comparing the model results to high-resolution measurements at the Coastal and Hydraulics Laboratory's (CHL) Field Research Facility (FRF) in Duck, NC.

COASTAL & HYDRAULICS LABORATORY

SMS