US Army Corps of Engineers®
**Engineer Research and Development Center**

Coastal Inlets Research Program

Coastal Modeling System

Description

The work unit develops the Coastal Modeling System (CMS) and conducts basic research to further understanding of sediment transport under mixed oceanic and atmospheric forcing. The CMS is a suite of coupled two-dimensional numerical models for simulations of waves, hydrodynamics, salinity and sediment transport, and morphology change. The CMS was identified by the USACE Hydraulics and Hydrology - Coastal Community of Practice (CoP) as a Preferred model for Coastal Engineering and Coastal Navigation studies. The work unit also conducts research on nearshore hydrodynamics and sediment transport. Ongoing research includes bed-load dispersion, mixed cohesive/non-cohesive sediment transport, modeling long-term morphology change, cross-shore sediment transport, coastal structure breach evaluation, and computer-based model calibration and uncertainty analysis.
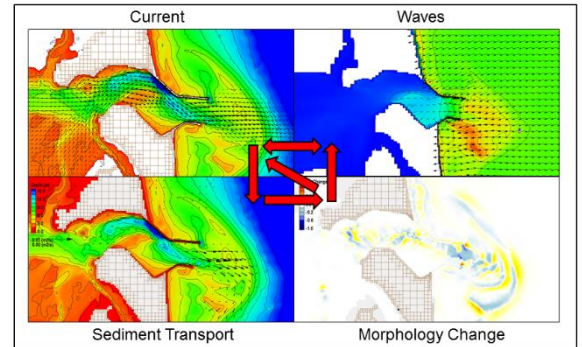
CMS simulated coastal processes.

Issues Addressed

District scientists and engineers need efficient tools to understand coastal processes and to design and manage coastal inlets, navigation channels, ports, harbors, coastal structures, and adjacent beaches.

Products

The primary product of the work unit is the Coastal Modeling System (CMS). Auxiliary products include the Surface-water Modeling System (SMS) interface. The CMS has been verified and validated with analytical, laboratory, and field data sets that document idealized and applied studies on waves, current, sediment transport and morphology change.

Application of Products

CMS has been applied at more than 70 project sites in the US and 7 international project sites. Examples documented in CMS publications include Matagorda Bay, Texas; Grays Harbor, Washington; Mouth of the Columbia River, Washington/Oregon; Ocean Beach, California; Southeast Oahu Coast, Hawaii; Field Research Facility, Duck, North Carolina; Hazaki Oceanographic Research Facility, Japan; Mississippi Sound and Barrier Islands; Gironde Estuary, France; Rosetta promontory, Egypt; St. Augustine Inlet, Florida; and Shark River Inlet, New Jersey.

Projected Benefits

The CMS provides coastal engineers and scientists a PC-based, easy-to-use, accurate, and efficient tool to assist in designing and managing coastal engineering and navigation projects by facilitating the following:

- Integrated and coupled calculations of waves, currents, water levels, sediment transport and morphology change in and around inlets, ports and harbors, and associated navigation channels and coastal structures such as jetties, breakwaters, groins, and seawalls.

- High resolution short- (weeks) to mid-term (seasonal to multiple years) project scale simulations.
- Representation of a wide range of nearshore physical processes, such as wetting and drying, advection, diffusion, turbulent mixing, tides, wind, atmospheric pressure, waves, river flows, wave-current interaction, multiple-sized sediment transport, bed sorting, and morphology change.
- Representation of weirs, culverts, porous rubble mounds, and tidal gates.

Documentation

CMS help is available through workshops, webinars, on-site training, and a wiki technical documentation for CMS-Flow and CMS-Wave is presented in ERDC/CHL TR-14-2 and TR-08-13, respectively. Documentation on verification and validation is given in TR-11-10. The wiki website contains technical documentation, user guidance, step-by-step instructions, utility links, and many other model resources. The User Manual may be downloaded from the wiki website. For more information, please visit CIRP online.

Points of Contact

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CIRP Website

- Please see the CIRP website to download documentation:
  http://www.erdc.usace.army.mil/Missions/WaterResources/CIRP/Publications.aspx
- View archived webinars:
  http://www.erdc.usace.army.mil/Missions/WaterResources/CIRP/TechTransfer.aspx
  and
- Review guidance documented on the CIRP wiki: http://cirpwiki.info/wiki/CMS.