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US Army Corps of Engineers®
Engineer Research and Development Center

Coastal Inlets Research Program

Particle Tracking Model (PTM) with Coastal Modeling System (CMS)

Description

The Particle Tracking Model (PTM) is a Lagrangian model designed to evaluate the behavior of water-borne constituents, such as sediment, chemicals, debris, or biota, under the combined effect of currents and waves. The Coastal Inlets Research Program (CIRP) supports the PTM with the Coastal Modeling System (CMS), which provides coupled wave and current forcing for PTM simulations. CMS-PTM is implemented in the Surface-water Modeling System, a GUI environment for input development, model execution, data pre- and post-processing, and visualization.

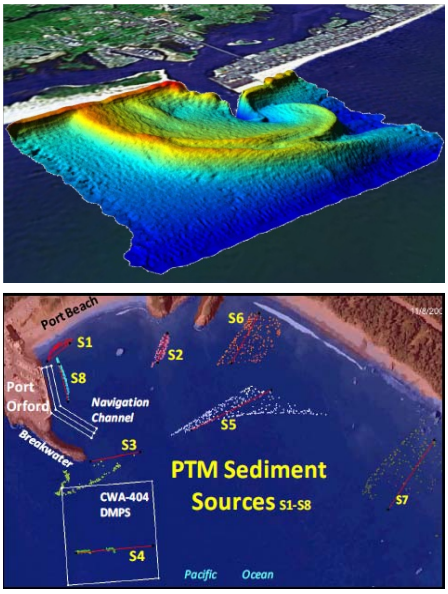

Figure 1. Complex ebb shoal and navigation channel morphology at Ocean City Inlet, MD, motivating PTM development (top); and CMS-PTM application at Port Orford, OR (bottom).

Issue Addressed

The PTM allows district scientists and engineers to investigate sediment fate and pathways, constituent transport associated with advection, dispersion, settling and entrainment, suspended load and bed load, and deposition and resuspension in coastal, estuarine and river environments. Local sediment particle sources include dredging, placement sites, inflows, and vessel propeller wash.

Products

The PTM calculates pathways and fate of neutrally buoyant or sediment particles under wave and hydrodynamic conditions. Calculations estimate sediment movement and distribution in a coastal, estuarine and/or riverine system.

Application of Products

Example applications of CMS-PTM include Long Island Sound, Connecticut; Shinnecock Inlet, New York; Ocean City, Maryland; Poplar Island, Maryland; Cape Fear, North Carolina; Charleston Harbor, South Carolina; Bahia Grande, Texas; Grays Harbor, Washington; Port Orford, Oregon; Humboldt Bay, California; Noyo, California; Dana Point Harbor, California; West Maui, Hawaii; and the Rosetta Promontory, Egypt.

Projected Benefits

CMS-PTM supports reconnaissance, feasibility, and design of O&M projects, and, within the coastal inlet navigation mission area, can be applied for nearshore berm placement, beneficial use of dredged sediment, evaluation of dredged material placement sites, and bypassing at inlets. The computational efficiency of PTM permits short-term (storm cycles) to long-term analyses of multiple scenarios to determine fate and pathways of sediments during dredging and placement, and transport pathways for coastal, bay, and estuarine waterways.

Documentation

One ERDC/CHL technical report, three ERDC/CHL technical notes, and webinar documents.

Points of Contact

For use of the PTM with CMS, please contact Dr. Honghai Li, Honghai.Li@usace.army.mil

CIRP Website

- 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/Main_Page .