US Army Corps of Engineers®
Engineer Research and Development Center

Ongoing Research

CIRP: Particle Tracking Model (PTM)

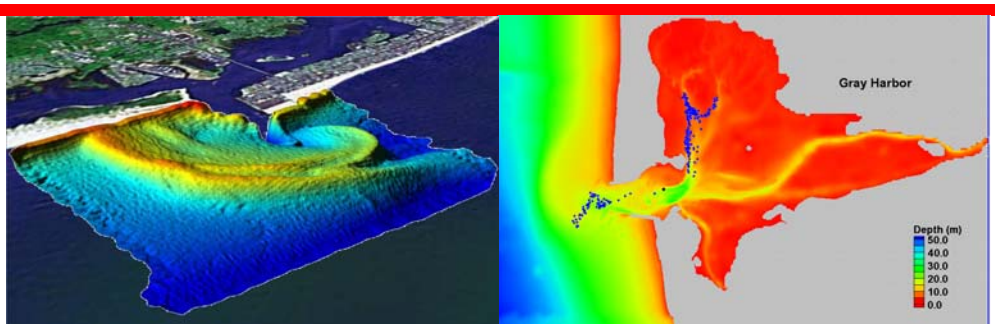

Fig. 1. Complex ebb shoal and navigation channel morphology at Ocean City Inlet, MD, motivating PTM development (left); and PTM demonstration at Gray Harbor, WA (right).

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 forcing by currents and waves. The PTM allows the user to investigate sediment fate and pathway, and constituent transport associated with advection, dispersion, settling and entrainment, suspended load and bed load, and deposition and resuspension. Particles originate from local sediment sources, including dredging, disposal sites, inflows, vessel propeller wash, in coastal, estuarine and river environments. 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.

Purpose CMS-PTM was developed to monitor the pathways and fate of specific sources of sediment parcels in inlets and navigation channels, and investigate accretion and erosion zones for sediment particles. PTM provides a tool to quickly assess alternatives to optimize dredging, dredged material placement, and to understand sediment pathways in and around navigation channels, structures, and adjacent beaches.

Users Corps Districts, academia, and private sectors. The PTM was developed jointly by the CIRP and the Dredging Operations and Environmental Research (DOER) Research Programs of the USACE.

Benefits CMS-PTM supports reconnaissance, feasibility, and design of O&M projects, and can be applied for nearshore berm placement, beneficial use of dredged sediment, and bypassing at inlets. The computational efficiency of PTM permits short-term (storm cycles) to long-term analyses of multiple alternatives for channel deepening, widening, and lengthening; beneficial use of dredged sediment; and transport pathways for coastal navigation channels and adjacent beaches.

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