Enhanced Sediment Resuspension Source Models for Dredging Operations

Dredging Operations Environmental Research (DOER) Program

U.S. ARMY CORPS OF ENGINEERS BUILDING STRONG®

Focus Area

Dredged Material Management

Problem

Suspended sediment generation and the resulting turbidity plumes during dredging continue to raise concerns. Fish windows constrain dredging projects and increase costs in an attempt to protect fisheries from suspended sediment plumes and subsequent deposition. Dredging operations in proximity to sensitive habitats or species (corals, mangroves, sea grass beds, etc.) often face scrutiny because of concerns associated with potential suspended sediment impacts. Meanwhile, available data show that suspended sediment plumes associated with dredging tend to be transient with relatively low suspended sediment concentrations. Despite that, the lack of a definitive, accepted approach for predicting and modeling sediment resuspension continues to result in unnecessary controls and limitations on dredging projects.

Study Description

Existing far-field models (e.g. PTM) are capable of predicting suspended sediment movement once it is in the water column. However, far-field models only model the movement of suspended sediment concentrations once they are in the water column. Further, these models tend to use large grid cells, usually at least 10 m x 10 m and often 100 m x 100 m or more to facilitate computations over a large geographical area. Dredging operations at a specific time are usually contained within the space of a single grid cell. Near-field models are necessary to generate rate of sediment resuspension that occurs within that grid cell and temporal variations that may result from dredging operations. Currently available near-field models were developed decades ago. They provide simple, first generation steady-state estimates of sediment loss which grossly over-predict the amount of sediment loss. Further, they are singular terms and do not represent the spatial and temporal variations in concentrations associated with dredging operations necessary to accurately predict suspended sediment transport. More data are now available, and our understanding of the sediment resuspension process has improved significantly. These will be combined to develop mechanistic models of sediment resuspension during dredging operations for common equipment types.

Products

This research project will produce at least 4 products:

- DOER Tech Note summarizing available data associated with suspended sediment generation during dredging operations
- New version of the DREDGE model reflecting updated modeling approaches (including documentation and User's Guide)
- Journal paper(s) on resuspension modeling of dredging operations.
- Final research report summarizing the research findings

Summary

This research project will produce more reliable methods for estimating water quality impacts associated with dredging operations. These methods will be implemented through a new version of the DREDGE model.

Balancing operational and environmental initiatives and meeting complex challenges of dredging and dredged material placement in support of the navigation mission.

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