Focus Area

Sediment and Dredging Processes

Problem

ERDC maintains multiple sediment transport codes developed by different teams for differing purposes. Each code has advantages and limitations. The SEDZLJ code was originally developed to simulate transport of predominately fine-grained (silt/clay) cohesive sediment in current-dominated environments. It has been modified by ERDC for mixed sediment transport (sand/silt/clay) in coastal environments. Another ERDC developed sediment transport code is SEDLIB which was developed to simulate multi-grain transport in fluvial processes. SEDLIB has mostly been applied for reimbursable projects as a sand transport code in riverine systems. Coastal and estuarine capabilities are currently being readied for field use. ERDC has invested significant manpower and funding to developing two alternative sediment transport codes. What is required is one sediment transport code which operates across multiple hydrodynamic platforms and permits user-selected features from both SEDZLJ and SEDLIB. This unitary library code will permit ERDC to compete efficiently with other models and provide the best transport predictions to clients in a cost effective manner.

Study Description

The purpose of this research is to develop a unified mixed sediment transport library (to be called CORSED) that 1) will have the broad applicability required to address a wide range of sediment transport issues addressed by ERDC in creeks, rivers, estuaries, and coastal seas, and 2) be linked to the following ERDC hydrodynamic and transport models: ADH, CMS, and GSMB. CORSED will include SEDLIB, the sediment transport library in ADH, and SEDZLJ the sediment transport model in GSMB. CORSED and the linkage to the listed hydrodynamic models will be thoroughly tested using both laboratory and field scale data sets. Figure 1 show the existing sediment transport practice at ERDC using unlinked models on the left, and the new CORSED practice with linked models on the right.
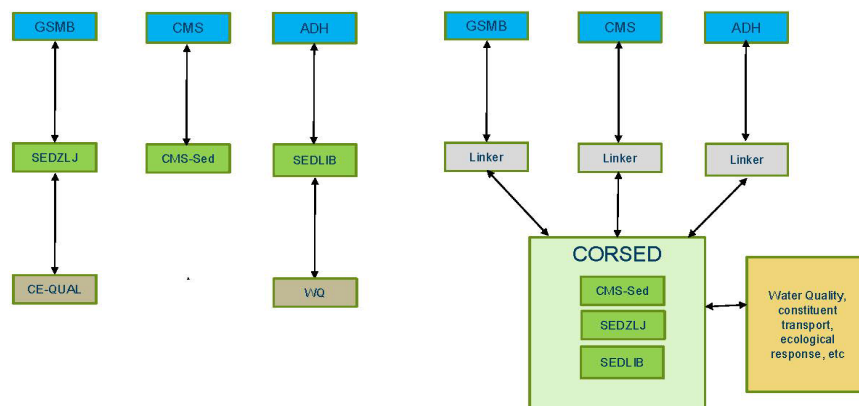

Figure 1   Existing sediment transport modeling practice (left) and the new linked CORSED practice (right)

Products

Products include the CORSED library implemented in ADH, GSMB, and CMS, modularized SEDZLJ and SEDLIB, and an updated GUI in the SMS. A number of codes based on Python will be developed as a linker to connect CORSED with the hydrodynamic models. The data and results of verification and validation (V&V) will be utilized to establish a database for test and application of the library and the flow models. Model development and the V&V results will be published in conferences and documented as technical notes and reports. Products also include 1) a TN documenting the library form of SEDZLJ and V&V at a test site, 2) a TN describing the conceptual framework of SEDZLJ, SEDLIB, and CORSED, 3) a TR documenting CORSED, including all process routines, and 4) CORSED user's manual (a living online document).

Summary

This project will provide USACE projects requiring sediment transport modeling an adaptable sediment transport framework which has been applied at multiple sites where validation data are available. CORSED library will be linked with operational hydrodynamic frameworks such as ADH, GSMB, and CMS, and will be incorporated into reimbursable projects as an alternative to existing, more limited sediment transport codes. Therefore, technologies will be transferred to districts through this collaboration. ERDC and USACE will benefit from a new team of sediment transport modelers who understand the complexity of cohesive sediment model parameterization and interpretation.

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

Earl Hayter and Gaurav Savant   January 2022
Environmental & Coastal and Hydraulics Laboratories • earl.j.hayter@erdc.dren.mil