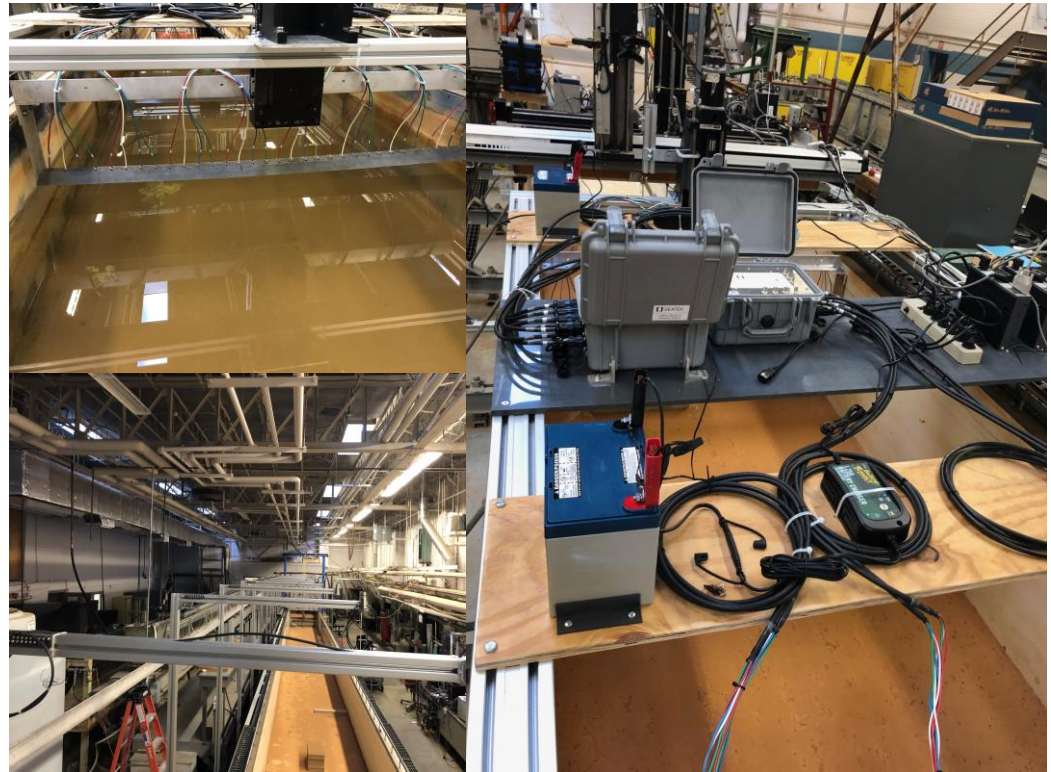




Analysis of Bed-Load Flume Measurements and ISSDOTv2 Calculations

Description

The U.S. Army Corps of Engineers (USACE) Engineering and Research Center, Coastal and Hydraulics Lab (ERDC-CHL) has partnered with the U.S. Department of Agriculture (USDA) Agricultural Research Service, National Sedimentation Lab (ARS-NSL) to develop a set of appropriate flume tests to validate the Integrated Section, Surface Difference Over Time version 2 (ISSDOTv2) code for more stringent conditions than in previous cases. The experiments are being carried out in facilities of the ARS-NSL lab in Oxford Mississippi.



Issue/Challenge To Address

The tests will attempt to validate the code for three distinct scenarios:

- 1) basic steady state flow conditions to test new changes to the code,
- 2) non-equilibrium flow conditions, and
- 3) lateral variability in the transport.

Even though the ISSDOTv2 method is widely accepted within USACE, the uncertainties in the method have prevented acceptance and corresponding usage by other agencies. Accordingly, the experiments are being planned to provide data from which confidence intervals of the ISSDOTv2 output results can be determined. Also, the relationship between suspended bed-material load and bed load as related to scour/deposition ratios will be investigated. It is possible that this ratio can be used as a direct correction to ISSDOTv2 computed values for unsteady flow conditions. The success of this part of the



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National Regional Sediment Management Program ERDC-CHL, ARS-NSL, USGS and FISP:



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study will be dependent on the ability to accurately measure the suspended bed-material load.

Successes Lessons Learned

Lessons learned will be compiled during the duration of this study, and reported in the quarterly progress reports, or in the final report as appropriate.

Expected Products

- Collected data and processed files from multiple flume runs over a wide range of flows and conditions.
- Computed bed-load results from the ISSDOTv2 method for the stated conditions.
- Enhanced quantification of uncertainty through verifiable confidence intervals.
- Journal publication(s).

Stakeholders/Users

Stakeholders include USACE Districts, ERDC-CHL Vicksburg MS, ARS-NSL Oxford MS, the US Geological Survey, and the Federal Interagency Sedimentation Project (FISP).

Projected Benefits Value Added

This study will provide a more comprehensive set of test data for the newest version of the ISSDOTv2 code under steady uniform conditions. Then it will be repeated with more difficult conditions of unsteady flow with non-equilibrium sediment transport. Additionally, the ability of the method to capture the lateral variability of bed-load transport will be shown. This R&D effort should result in an automated bed-load transport measuring methodology that delivers repeatable, consistent, and accurate bed-load measurements with a quantifiable uncertainty.

Leveraging Opportunities

The ISSDOTv2 methodology has filled a need of USACE Districts and other Federal Agencies charged with regional sediment management on America's waterways with a tool that aids in providing the bed-load portion of the total sediment load. The method has been used at multiple sites on the Mississippi River, Atchafalaya River, Missouri River, Ohio River, Snake River, Clearwater River, Rio Grande River, Chippewa River, and Red River. It has been developed through a combination of R&D program funds and District applications. This work will leverage these previous investments. While many USACE agencies utilize ISSDOTv2 currently, the result of this R&D effort would result in a higher level of confidence making it more appealing to USACE Districts as well as other agencies. The flume tests will be performed at the USDA National Sedimentation Laboratory in Oxford, MS providing an opportunity to leverage funding, equipment, and expertise.

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Participating Partners

USDA-ARS-NSL, US Geological Survey, and FISP