FY20 RSM IPR
Flume Studies to Validate the ISSDOTv2 Code under Multiple Flow Scenarios and Conditions

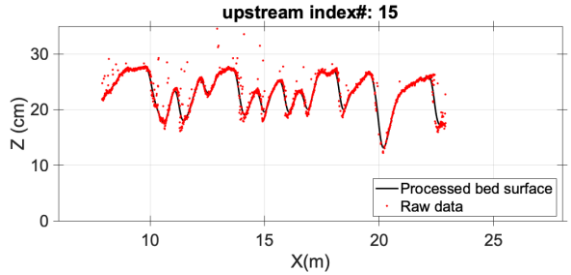
Tate McAlpin, David Abraham, and Keaton Jones

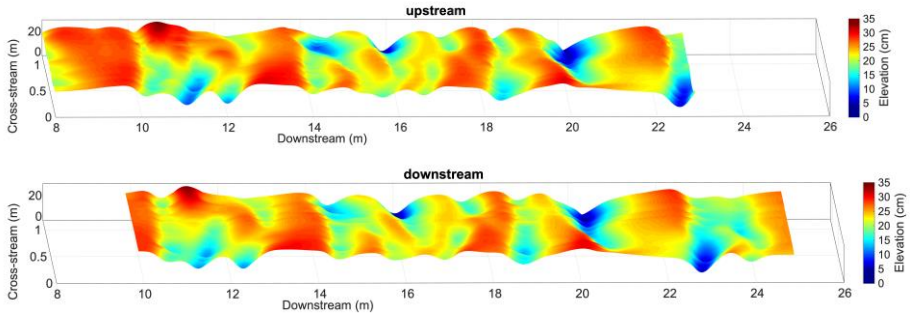
BLUF: The ISSDOTv2 method provides a means to measure bed-load transport in large, sand bed rivers. This study will collect additional data to further validate the ISSDOT methodology/code using flume experiments conducted at the National Sedimentation Laboratory.

Challenge

- Government Shutdown (Year 1)
- COVID-19 (Year 2)

Approach: Perform flume studies at the National Sedimentation Laboratory to validate the ISSDOTv2 code for steady/unsteady conditions along with the lateral variability in bedload.





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District/Other USACE PDT Members

Mr. Tate McAlpin, Dr. David Abraham, Mr. Keaton Jones, and Mr. David May (CHL)

Dr. Daniel Wren and Dr. Roger Kuhnle (USDA National Sedimentation Laboratory)

Dr. Clinton Willson and Dr. Kory Konsoer (Louisiana State University)

Leveraging/Collaborative Opportunities

National Sedimentation Laboratory (NSL) – Dr. Wren and Dr. Kuhnle's labor provided by NSL. They bring a wealth of experience in flume experiments and knowledge of bedform evolution/migration.

Louisiana State University (LSU) – Dr. Willson and Dr. Konsoer are experts in sediment transport measurements and processes.

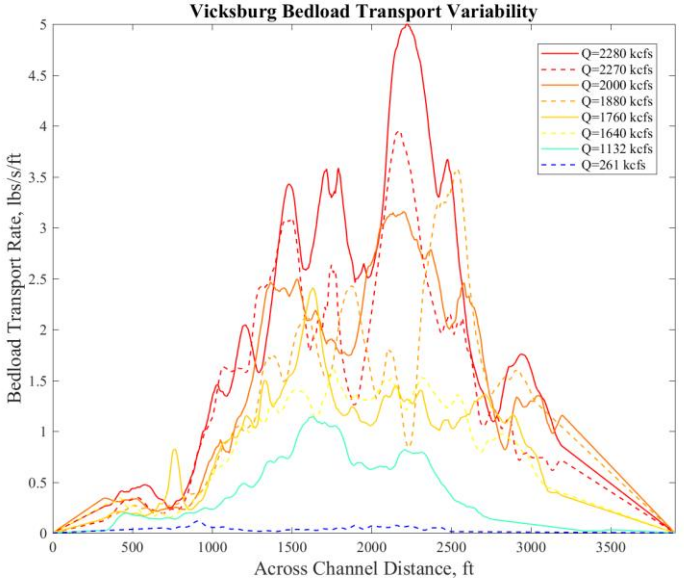
Stakeholders/Partners

National Sedimentation Laboratory (NSL)

U.S. Geological Survey (USGS)

Federal Interagency Sedimentation Project (FISP)

Several USACE Districts (St. Paul, Kansas City, Vicksburg, Omaha, New Orleans, Walla Walla, Albuquerque, and Louisville)



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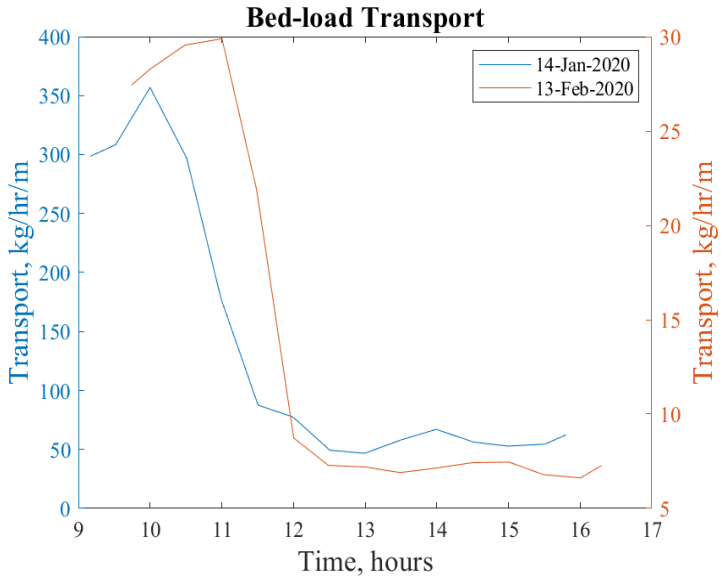
Accomplishments/Deliverables

- Better quantification of the accuracy of the ISSDOTv2 results along with improved understanding of the uncertainty in the measurements
- Improved efficiency in the ISSDOTv2 code (run times have been reduced by approximately half)
- Improved collaborative opportunities with the USDA National Sedimentation Laboratory and Louisiana State University
- Adoption of the ISSDOTv2 method as an acceptable practice by the USGS
- Publications of detailing improved understanding of bed form dynamics and bedload transport



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Potential usage of ISSDOTv2 Results:

- **Improved Sediment Budgets** – Previous efforts either neglected the bedload or assumed the bedload as a percentage of the suspended load. Now we can do better.

- **Development of Bed-Load Rating Curves** – Measurements at various flows provide an opportunity to determine a bedload vs discharge relationship for both bedload predictions and hindcasts.

- **Determine Habitat Suitability** – Has been utilized to identify locations of endangered mussel habitat.

- **Numerical Model Validation** – Has been utilized to quantify the accuracy of numerical model predictions of bed-load transport.

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Publications (In Development)

1) Steady Flow Bed Load Validation and Confidence Intervals for ISSDOTv2

Authorship: McAlpin et al.

This paper is based mainly on the ISSDOTv2 method and comparison of ISSDOTv2 results to the measured loads in the flume. Basic results from the flume experiments are included, but no in-depth analysis of bed topography is discussed beyond what is needed for the comparisons.

2) Bed Form and Sediment Load for a Range of Steady and Unsteady Flows in a Laboratory Flume

Authorship: Wren et al.

This paper will focus on a detailed analysis of the bed topography with discussion of detailed topographic measurements and continuous load measurement, which is not common in the literature. Wavelet analysis will quantify the contribution of small-scale bed forms as they rework the bed after dropping the flow rate.

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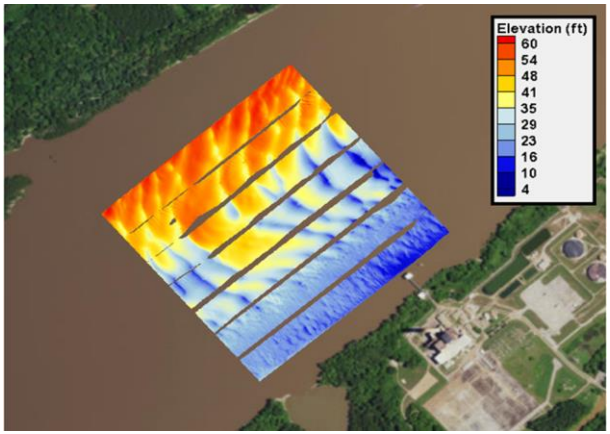

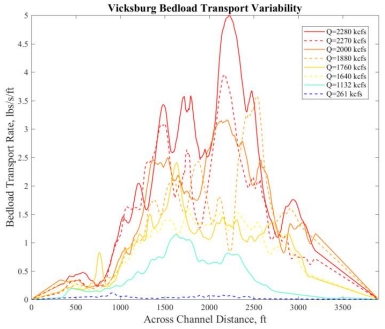

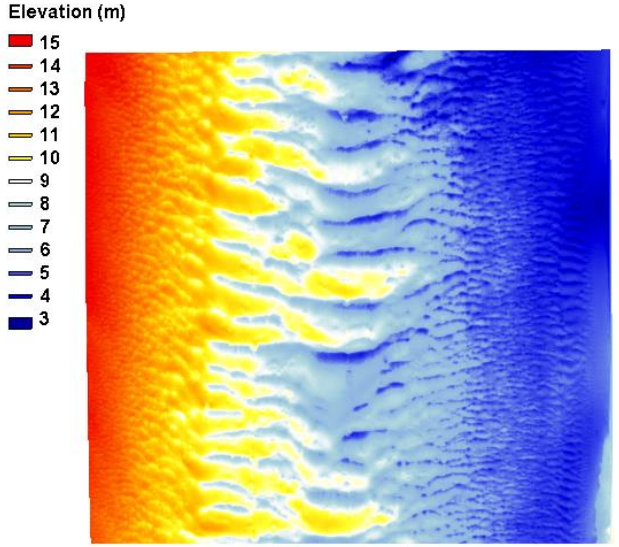

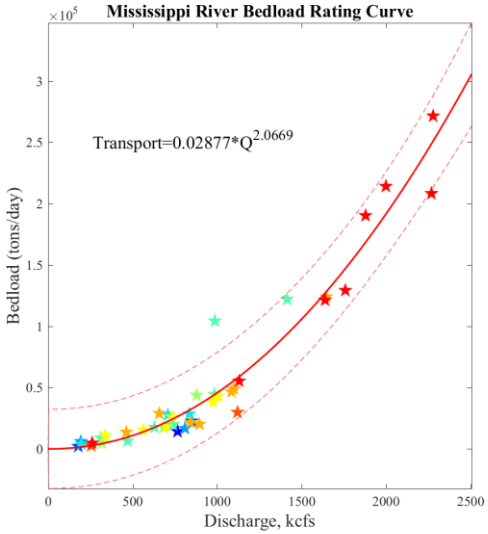

Questions???