US Army Corps of Engineers®
Engineer Research and Development Center

SEDflume Mobile Laboratory

Purpose

The U.S. Army Corps of Engineers High Shear Stress flume (SEDflume) is part of a mobile sediment laboratory operated by ERDC's Coastal and Hydraulics Laboratory. SEDflume is designed for estimating gross erosion rates of fine-grained and mixed fine/coarse-grained sediments and the variation of the erosion rate with depth below the sediment-water interface. The erosion data are used to predict stability for contaminated sediments, capping material, native sediment, or dredged material and are often incorporated into numerical sediment transport models.

Specifications

SEDflume is based on a system originally designed by researchers at the University of California at Santa Barbara. The flume is designed to erode, layer by layer, sediment cores that are up to 100-cm in depth. The cores have either a 10-by 15-cm or 10-cm-diam surface area. Each core layer is eroded by regulating flow over the core surface. The flume is operator-controlled, so the operator selects the range of shear stresses for measuring erosion rate. The operator generally performs cycles of varying shear stress, starting at a low value and proceeding through several higher values. The cycle is then repeated as the operator moves down through the core. Erosion rate is quantified using the operator-controlled upward movement of the core and time duration of specified shear stress for each erosion test. This method provides data on variation with depth of erosion at constant shear stress. The end of the flume includes an exit section for removal of water and eroded sediment. The sediment core is destroyed during testing. The top of the flume is removable above the test section, allowing sediment samples to be extracted as various layers of the core are exposed during erosion tests. The mobile laboratory is self-contained with a power generator and pumps for water intake from external sources.

Benefits

Numerous Corps projects address sediment transport. Quantifying erosion potential is critical in assessing sediment stability, mobility, and transport. Cohesive sediment erosion rates can vary over orders of magnitude depending on sediment properties. There are no methods available for quantifying cohesive sediment erosion processes based on sediment properties. SEDflume permits site-specific parameterization of erosion rate for cohesive sediment transport studies.

Success Stories

SEDflume has been applied as part of several USACE dredging, navigation, and contaminated sediment/water quality studies, including New York Mud Dump, Mobile Harbor, Boston Harbor, Los Angeles/Long Beach Harbor, Palos Verdes Shelf, Housatonic River, DeLong Mountain Terminal, Rio Grande River, Pecos River, Savannah Harbor, Passaic River, Chesapeake Bay, and Port of Anchorage. USACE also uses this flume as a research tool to determine the influence of sediment properties (mineralogy, sand content, organic content, etc.) on erosion. Several of the field studies have supported EPA Superfund or Department of Energy.

ERDC POC

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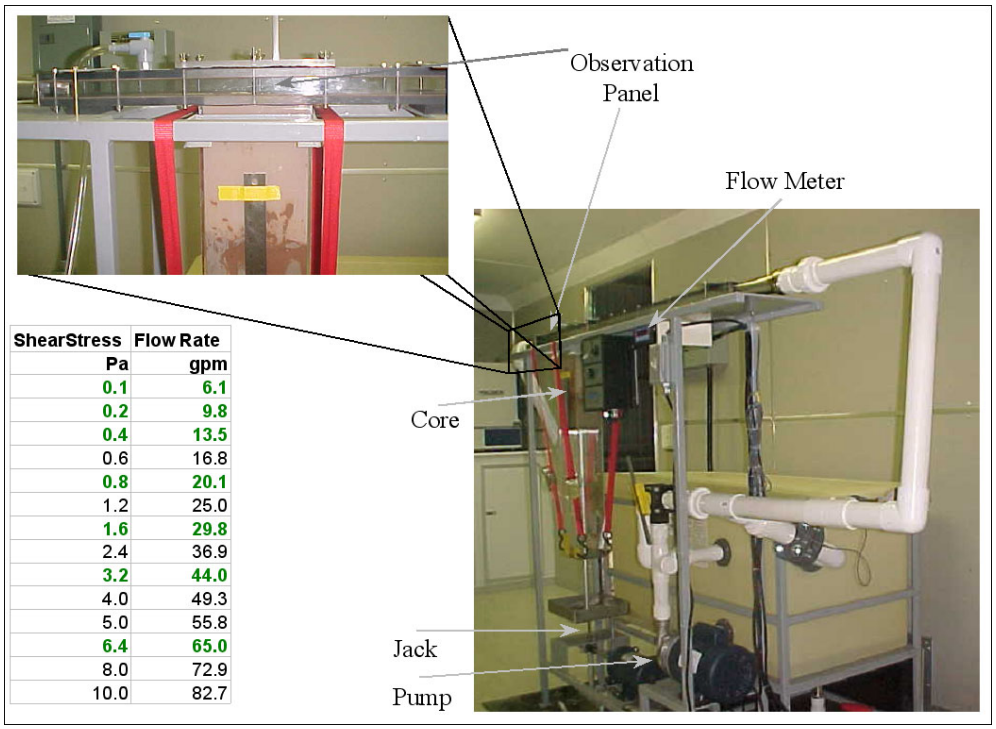

ShearStress	Flow Rate
Pa	gpm
0.1	6.1
0.2	9.8
0.4	13.5
0.6	16.8
0.8	20.1
1.2	25.0
1.6	29.8
2.4	36.9
3.2	44.0
4.0	49.3
5.0	55.8
6.4	65.0
8.0	72.9
10.0	82.7