

# Sediment and Water Quality Measurements

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Sandia National Labs



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# Sandia's Water Power Research

## SNL Water Power Research Program

**MHK Technology**  
with NREL, ORNL,  
and PNNL

*System Design & Modeling:*  
Develop tools to assist the  
industry in the design,  
development, and optimization  
of MHK devices

Advanced Materials and  
Manufacturing

Instrumentation, Testing and  
Evaluation

**MHK Environmental**  
with PNNL, ORNL,  
and ANL

*Evaluating the  
effects of MHK  
technologies on the  
surrounding  
environment and  
resources*

*Support project  
planning and  
permitting*

**Conventional  
Hydro** with  
PNNL, ORNL,  
and ANL

*Hydropower  
Optimization:  
Seasonal Analysis*

*Grid Services and  
Integration Modeling*

**Reference Model**  
with PNNL, ORNL,  
and NREL

*Develop baseline  
cost of energy  
(COE)*

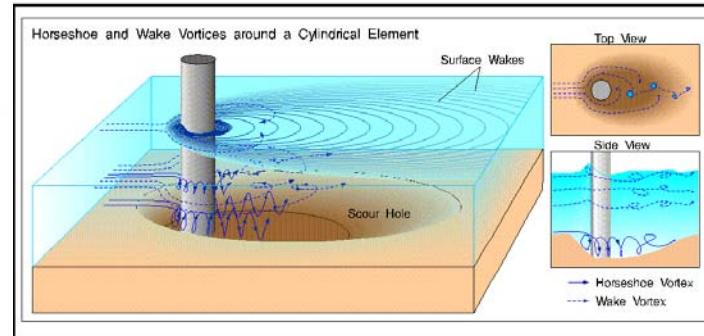
*Identify and evaluate  
key cost reduction  
pathways.*



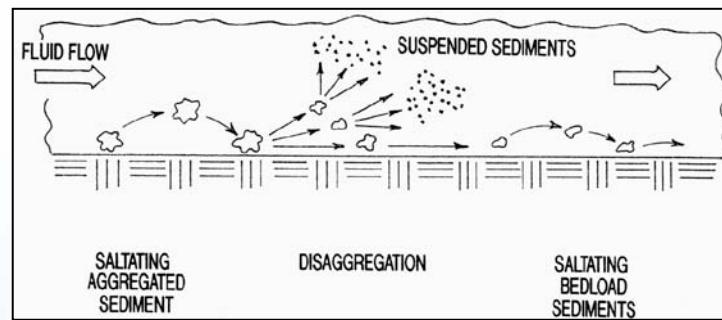
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# *Focus on Sediment & Water Quality Measurements*

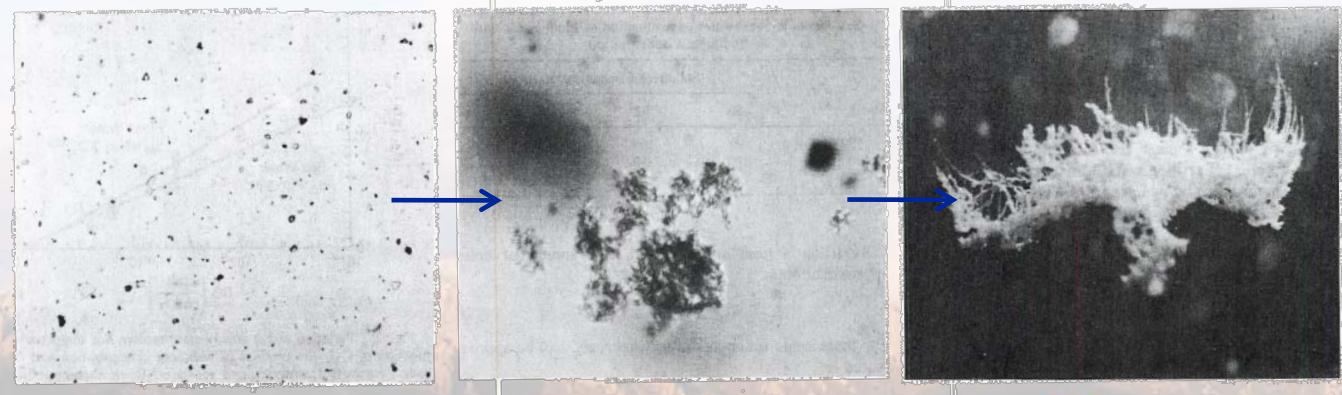
## Erosion and Scour



## Bedload or Suspension



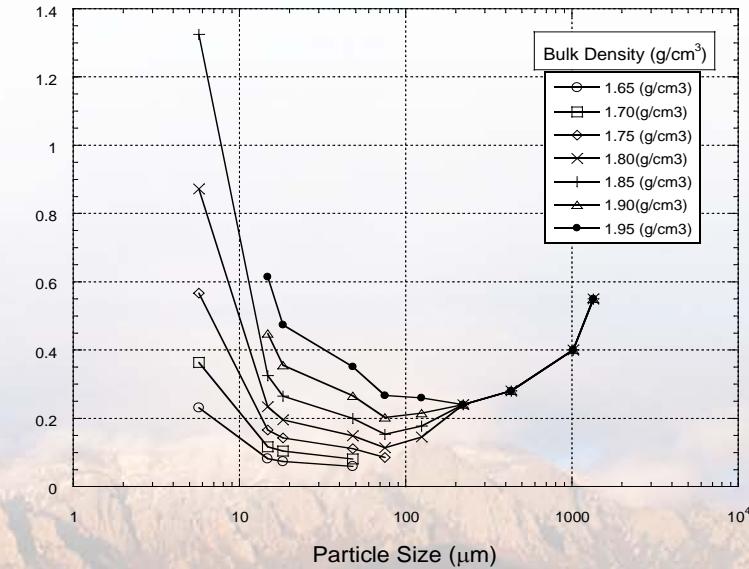
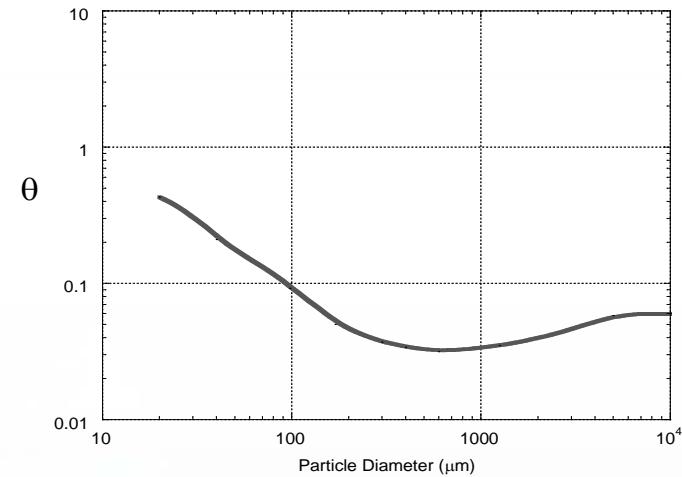
## Settling



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# Erosion and Scour: Cohesive vs. non-Cohesive Sediments

- Non-Cohesive Sediments (Particle Sizes  $> 200 \mu\text{m}$ ): Use Shields Curve for erosion and scour prediction
- Cohesive Sediments (Particle Sizes  $< 200 \mu\text{m}$ ): Use direct measurement or function of bulk properties for erosion and scour prediction



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# *Sediment Bulk Properties*

- **Particle size**

- Sieve analysis
- Laser particle sizer

- **Density and/or water content**

- Wet/dry weight
- X-ray analysis

- **Mineralogy**

- XRD analysis

- **Organic content**

- Acid treatment

- **Benthic activity**

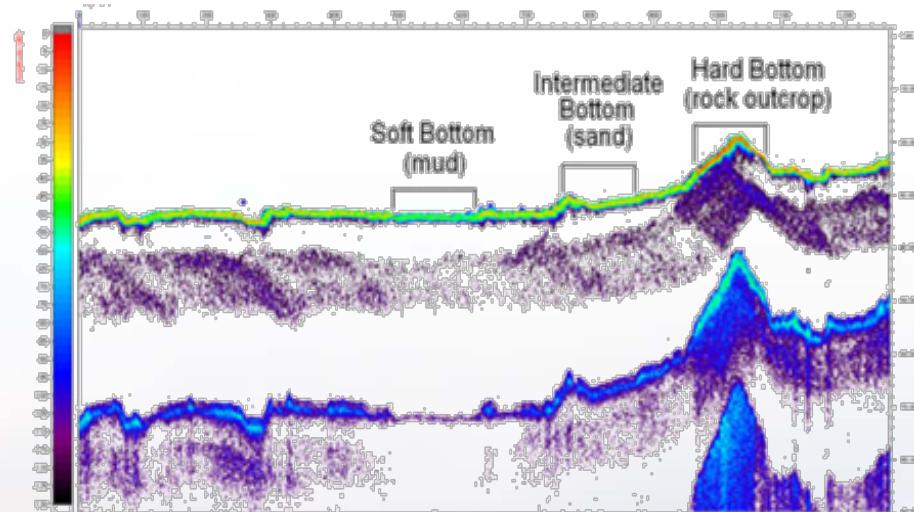
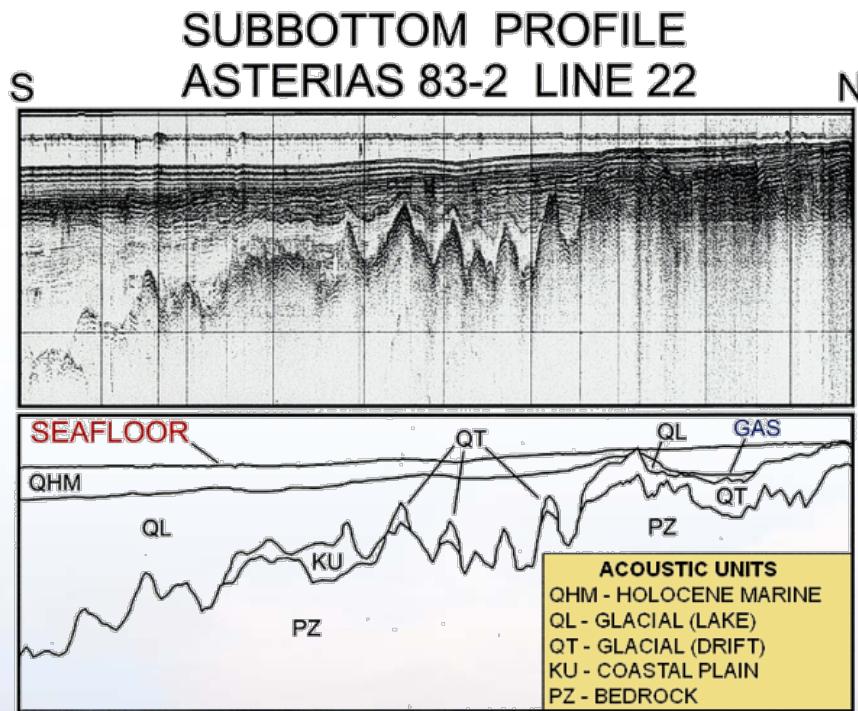
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None of these helps predict sediment erosion and transport without another direct measurement or analysis



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# *Sediment Bulk Properties: Side Scan Sonar or Hydroacoustic*

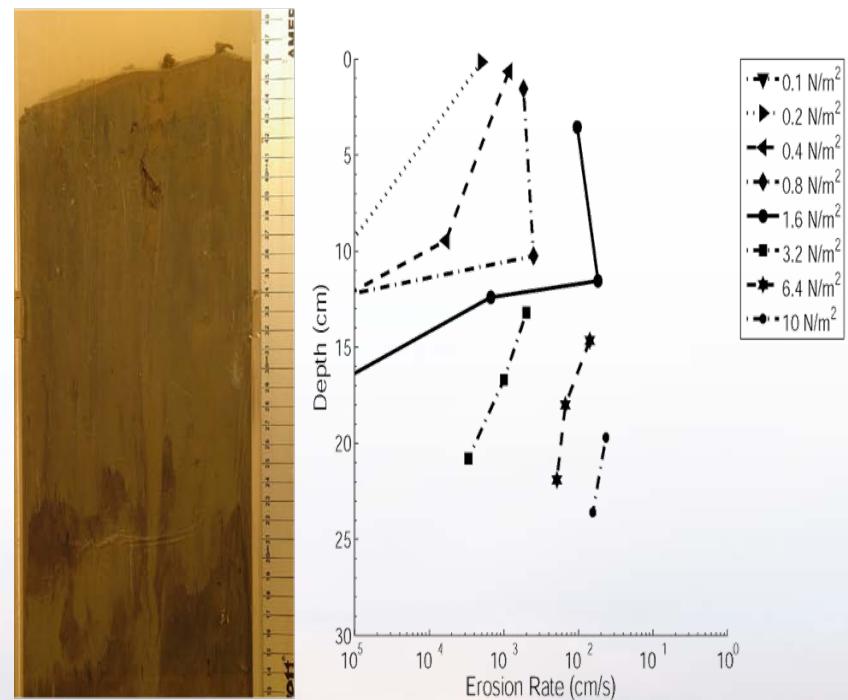
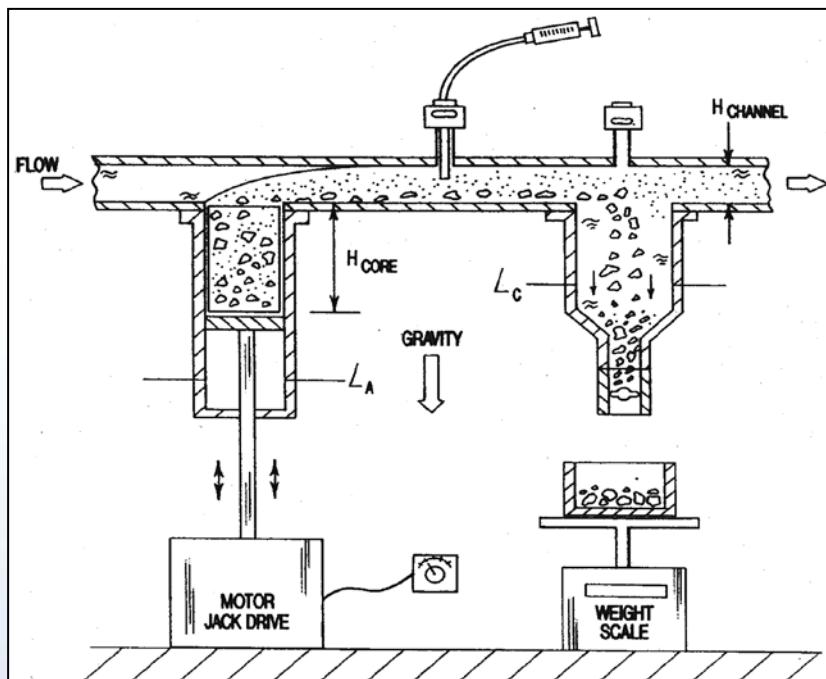


(ORNL owned system)



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# Erosion and Transport Flumes: ASSET Flume (Adjustable Shear Stress Erosion and Transport)

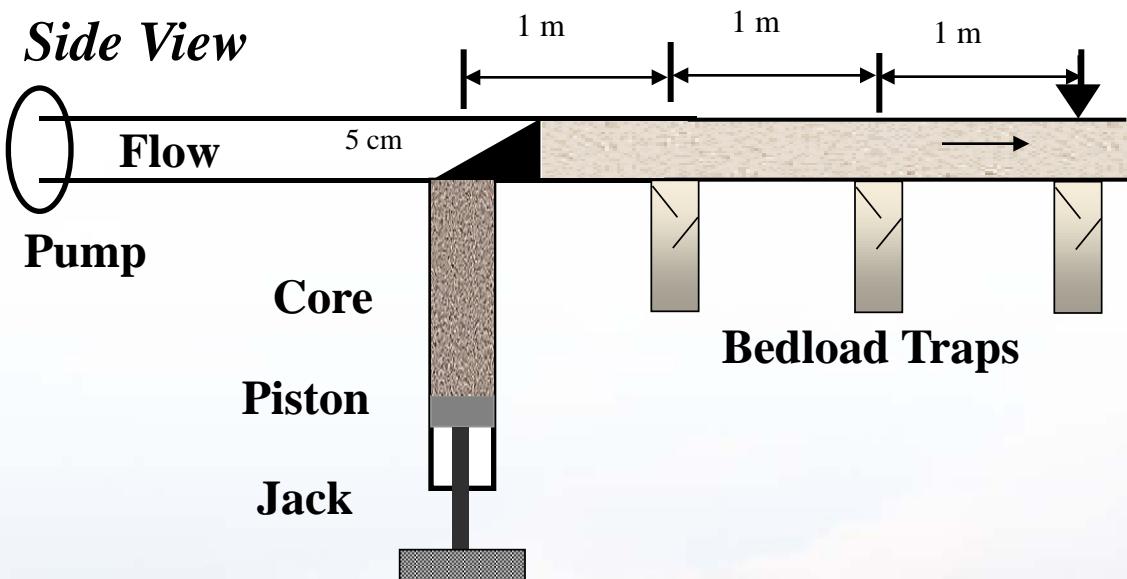


## Ex-situ Measurement



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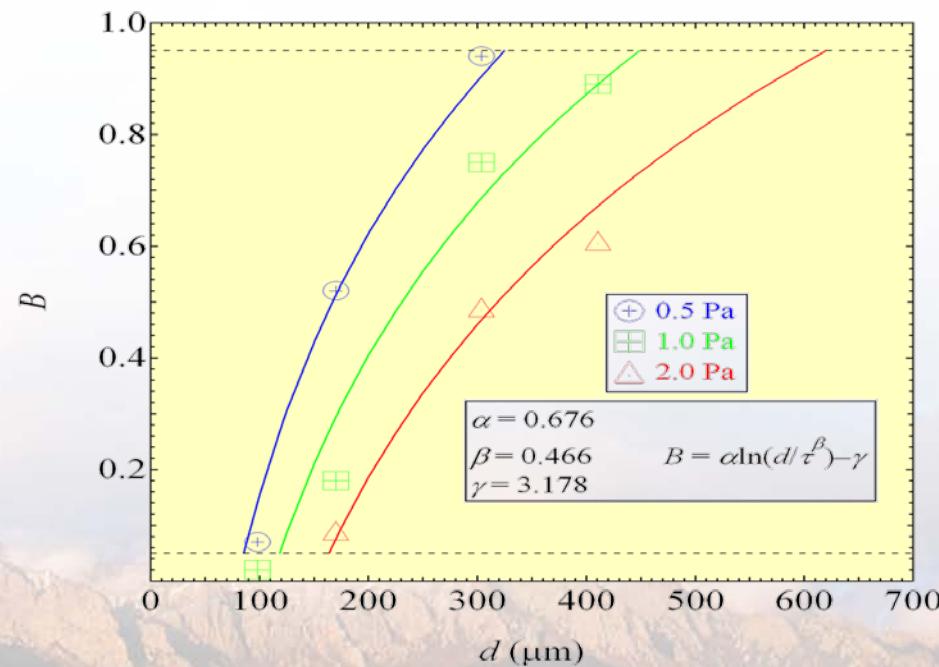
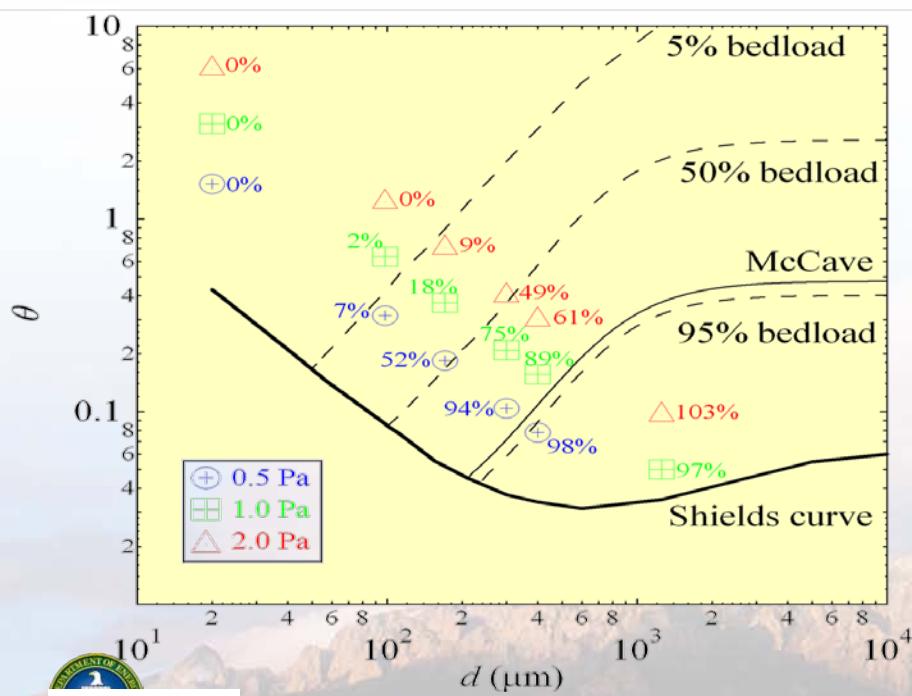
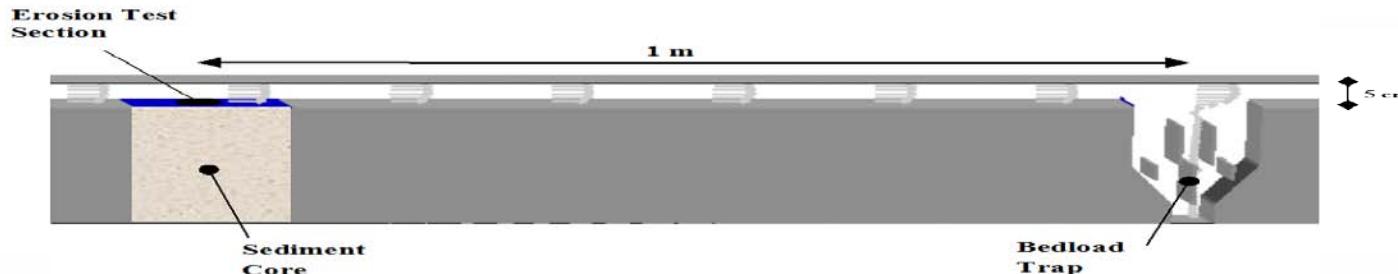
# Erosion and Transport Flumes: ASSET Flume



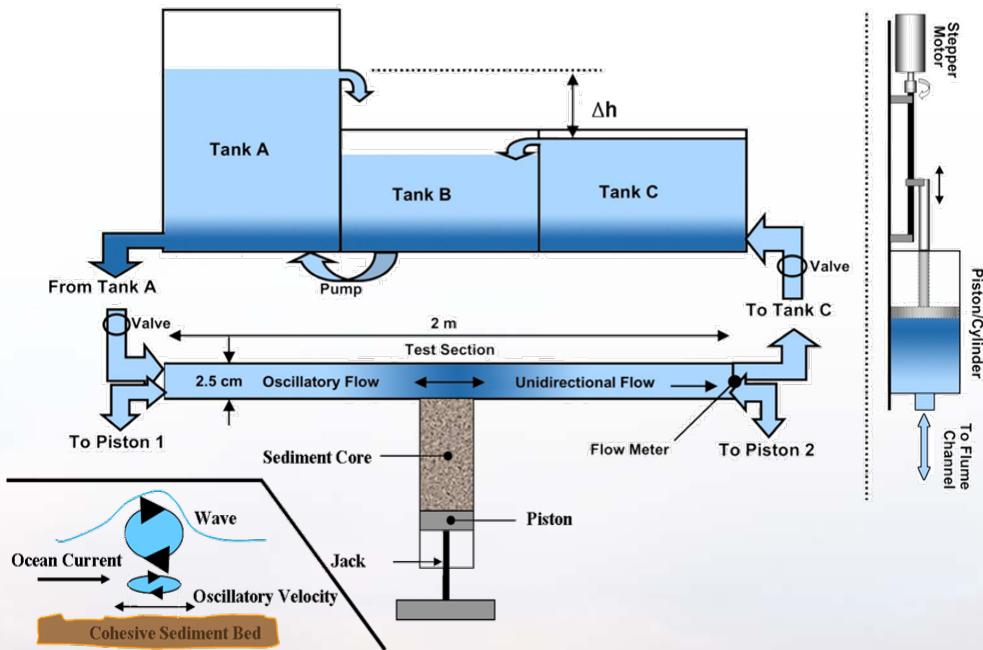
Measures erosion rate and transport mode as a function of shear stress and depth within the sediment bed



# Erosion and Transport Flumes: ASSET Flume



# SEAWOLF (Sediment Erosion Actuated by Wave Oscillations and Linear Flow)



## Ex-situ Measurement



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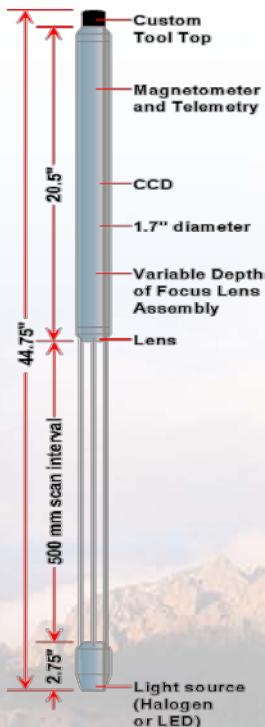
# Sediment Suspensions



LISST (Laser In-Situ Scattering and Transmissometry): In situ particle size and concentration



## Scanning Sediment Scope



Grab samples:  
Bedload and/or  
suspended load



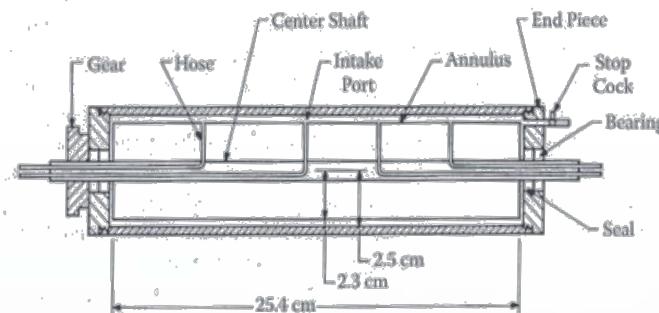
Turbidity: In situ  
concentration (no  
particle size)



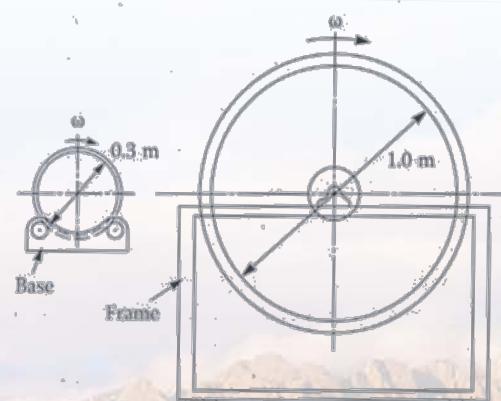
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# Sediment Settling

## Flocculation (Marine Snow)



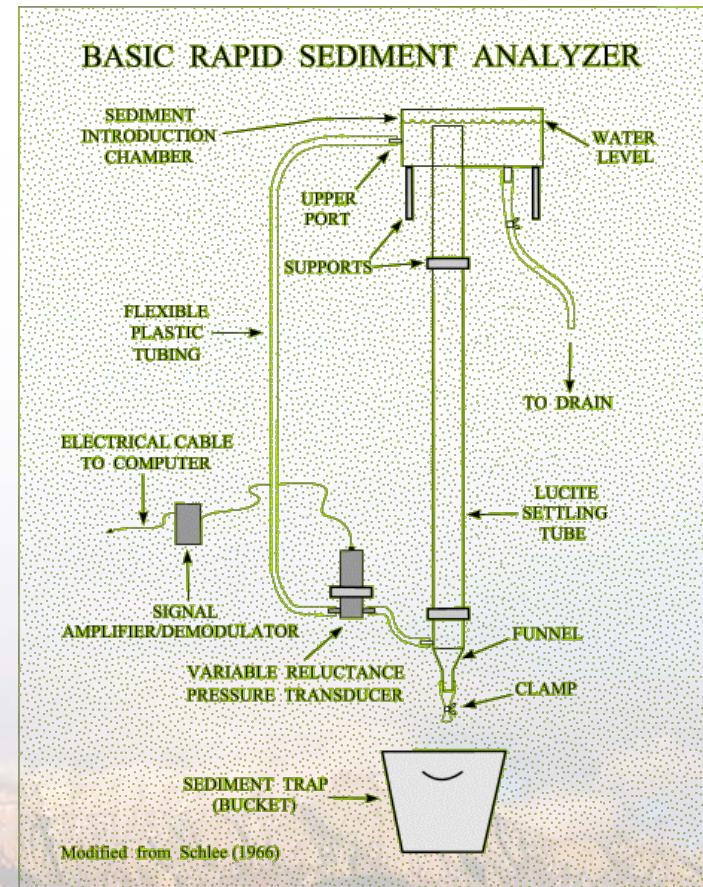
Couette Flocculator



Disc Flocculator

Settling measurements

- In situ (boroscope)
- Settling tube



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