

# Winnowing and Flocculation in Bio-physical Cohesive Substrate: A Flume Experimental and Estuarine Study

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## Summary

The existing sediment transport predictions for many terrestrial and marine environments are seriously impeded by an almost complete lack of process-based knowledge of bed and suspended sediment behaviours (e.g., winnowing and flocculation) in natural substrates that consist of complex mixtures of cohesionless sand and biologically-active cohesive muds. Tidally-influenced fluvial, estuarine and coastal environments are likely to be highly sensitive to climate change and accompanying sea level rise. In order to fill this knowledge gap, this research project work presented in AGU 2016 is aiming to:

- 1) understand the spatio-temporal development of current ripples and dunes on a flat bed as a function of clay and EPS content, accounting for the contribution of clay winnowing, flocculation and biochemical binding.
- 2) test important aspects of the laboratory models of sediment transport dynamics in a natural, mixed-sediment environment, using novel and unrivalled measurement technologies.
- 3) use the acquired data in flume experiments and field survey to develop new, improved regional sediment transport models.

The laboratory experimental studies conducted in the flume tank (schematic graph showed in Fig.1) of the Environmental Total Simulator lab at university of Hull show:

- 1) Sediment winnowing can be reduced with the increasing of clay fraction in bed substrates.
- 2) Flocculation occurred in all experimental runs with various fractions of clay and EPS components, and they grew at a relatively quick pace (within 30 mins).
- 3) Assessment of winnowing data revealed that the fine particles can also permeate deeper into the newly deposited sediments, as they can mobilize between the voids created by larger inert sand grains.

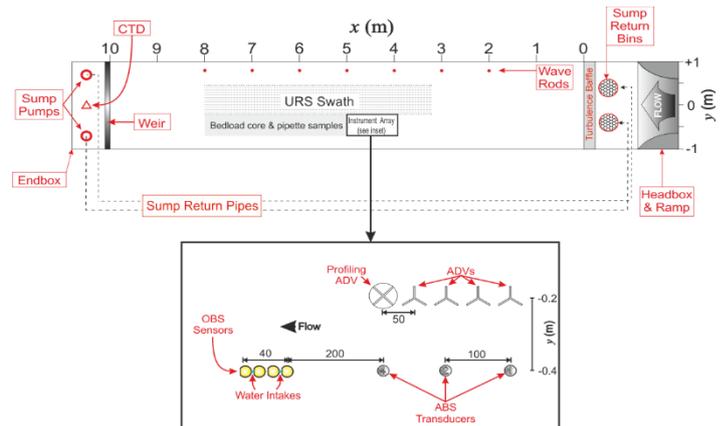


Fig.1 Schematic of the flume setup

The grant provides the great opportunity for me to travel from UK to US for the biggest geoscience conference all over the world with other 20,000 scientists together. As an PhD student, this travel provides me a best stage to show the research I am doing at the university of Hull, UK. And also a great chance to communicate with other scientists from all over the world. It is one of the best way to start an early career for an young scientist.