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The Dynamics of Suspended Sediment over Bedforms in Mixed Sand-Clay-EPS

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Quantifying and modeling sediment dynamics in flows, including the complexities of sediment mixtures and their biological status, is a key to parameterizing physical processes at the flow-bed interface and ultimately to predicting natural sediment transport (French, 2010). Such predictions rely strongly on accurate knowledge of relationships between hydrodynamics and sediment properties. The work presented here describes laboratory experiments that have been conducted using mixed cohesive and non-cohesive sediment and Xanthan gum as a proxy for the biological stickiness of Extracellular Polymeric Substances (EPS) (Vardy et al., 2007). The dynamics of suspended sediments and bed morphology were monitored and analyzed continuously in a set of experiments in a laboratory flume (at the University of Hull's Total Environment Simulator) facility. The tank was sectioned into a 10 x 2 m channel and during the study period, a total of 16 runs with varying bed sediment compositions were used (various ratios of sand, clay and EPS). Unidirectional flow rates were generated via recirculated pumped saline water (at 15 PSU). Suspended sediments were observed through (1) physical water samples (via pump) (2) vertically spaced OBS sensors, (3) LISST-100X, (4) ABS profiles. In addition, water samples were analyzed for flocculation properties using LabSFLOC (e.g. Manning et al., 2002), allowing the effects of varying suspended sands, clays and EPS on flocculation were monitored throughout. The results revealed a strong temporal variability in suspended sediment transport with the various proportions of substrate sand, clay and EPS. Work is ongoing and more details will be presented.