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The role of bed surface configuration on river response under increasing flows

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This research aims to explore how bed surface configuration influence channel evolution, vertical and downstream sediment sorting, and sediment transport in gravel bed streams under varying flows. While a significant body of research has been focused on channel evolution under constant flow regimes, few studies have focused on the impacts of flow variations in channel adjustments. Particularly, we are interested in examining the impact of the degree of bed surface coarsening and particle arrangement on channel adjustments and sediment transport rates. To this end, we conducted a set of experiments in a 0.55 m-wide, 5 m-long tilting flume. Flow discharge during the runs was initially held constant at 25 l/s for a period of time after which discharge was gradually increased at steps of certain duration. Flow rates during the rising limb of the hydrographs ranged from 26 l/s to 40 l/s. Initial bed slope was 0.04 m/m for all runs. Some of the experiments were conducted under no feed conditions while others were carried out with sediment supply, which ranged from 1 kg/h to 10 kg/h. The feed texture in these latter runs was identical to that of the original mixture (D_g = 5.65 mm and σ_g = 3.05). Bed slopes and surface configuration were obtained after varying times of conditioning under constant flow and no feed. Data acquisition included: 1) bed surface images covering the entire flume, 2) bed scans at 2 mm resolution of the whole flume and 3) real-time measurements of bedload transport (rate and texture) at the outlet of the flume. This set up allows us to obtain fractional particle mobility, i.e. how much bed area covered by a particular grain size changed at a given time and to link to sediment transport rates. Data gathered from this study 1) will contribute to better understanding of river dynamics under unsteady flow conditions (floods) and 2) will help us improve sediment transport predictions under such conditions.