

Numerical simulation of non-equilibrium sediment transport in a flume

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Abstract Simulations of non-uniform bed load sediment transport processes under non-equilibrium conditions require characterization of alluvial system processes to immediately overcome variations of sediment boundary conditions. Due to the introduction of man-made sediment barriers, the amount of sediment load entering in the downstream river reach is different from that going out and river reaches adjust to a new equilibrium condition. In supply limited rivers, bed degradation can occur, while in transport limited rivers bed aggradation can occur. When alluvial streams are unable to adjust to variation of sediment boundary conditions, spatial lags or adaptation lengths are required to reach the equilibrium transport capacity. Accordingly, quantitative estimates of sediment transport in river-control engineering and water management projects are essential to evaluate the changes in riverbeds. This study focuses on erosion processes caused by decreasing sediment load imposed at the upstream boundary of a straight flume and a 1-D numerical approach is used to simulate the process.

Key words rivers; erosion; sediment transport; hydraulic structure; numerical simulation