

Effect of geometrical configuration of sediment replenishment on the development of bed form patterns in a gravel bed channel

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Dams interrupt the longitudinal continuity of river reaches since they store water and trap sediment in the upstream reservoir. By the interruption of the sediment continuum, the transport capacity of downstream stretch exceeds the sediment supply, thus the flow becomes “hungry”. Sediment replenishment is an increasingly used method for restoring the continuity in rivers and for re-establishing the sediment regime of such disturbed river reaches. This research evaluates the effect of different geometrical configurations of sediment replenishment on the evolution of the bed morphology by systematic laboratory experiments. A typical straight armoured gravel reach is reproduced in a laboratory flume in terms of slope, grain size and cross section. The total amount of replenished sediment is placed in four identical volumes on both channel banks, forming six different geometrical configurations. Both alternated and parallel combinations are studied. Preliminary studies demonstrate that a complete submergence condition of the replenishment deposits is most adequate for obtaining a complete erosion and a high persistence of the replenished material in the channel. The response of the channel bed morphology to replenishment is documented by camera and laser scanners installed on a moveable carriage. The parallel configurations create an initially strong narrowing of the channel section. The transport capacity is thus higher and most of the replenished sediments exit the channel. The parallel configurations result in a more spread distribution of grains but with no clear morphological pattern. Clear bed form patterns can be observed when applying alternated configurations. Furthermore, the wavelength of depositions correspond to the replenishment deposit length. These morphological forms can be assumed as mounds. In order to enhance channel bed morphology on an armoured bed by sediment replenishment, alternated deposit configurations are more favourable and effective.

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