



Sediment transport control by a series of check dams, a laboratory study

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The main function of a series of check dams is to stabilize the torrential channel to prevent erosion. On the other hand these structures enable the deposition of sediments during floods. Therefore the deposition angle of the sediments between the structures changes according to the sediment rate and tends to an equilibrium gradient.

To quantify resp. to investigate the trend of sediment deposition and erosion within the series of check dams laboratory experiments were carried out in a flume with a physical scale of 1:30. Different settings of check dams were implemented into an 800 cm long and 40 cm wide channel with a slope of 18 %. 39 model experiments were performed with a variation of the following parameters: check dam spacing/height, grain size distribution and volumetric sediment concentration. The surface of the deposits were scanned with a 2D Laser-scan device after each experiment to create a surface model to derive three longitudinal profiles with a distance of 10 cm.

The results may be summarized in the following way:

The deposition slope increases by arithmetic progression with the sediment concentration irrespective of the grain size distribution, the distance between check dams and the absolute amount of the fluid- sediment- mixture. According to this a series of check dams is able to accumulate sediments at high transport rates and offers a self-emptying behavior by lower concentration rates. Sediment mixtures with a lower amount of fines, therefore a higher pore volume and a larger average grain diameter increase deposition slope and the volume of deposition. The slope of deposition together with the average grain diameter decreases from upper check dams to lower ones within the series. Pool dimensions, as the result of pure water experiments, are increasing within the series. Larger distances between the check dams, at the same height to distance ratio, increase the transient sediment volume and additionally offer a higher fundament protection by smaller pool dimensions.

The construction of a series of check dams represents a natural balancing process, reducing sediment transport by high bedload rates and offers the possibility to remobilize these sediments during lower rates and therefore sustaining the sediment connectivity.