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Sediment-trapping effectiveness of check dams with multiple debris-flow surges: Experimental study

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A series of check dams were constructed for debris-flow hazard mitigation in China. Based on the results of field investigation, check dam has a significant impact on the geomorphology of debris flow gully, especially the upstream and downstream of a check dam. According to the relationship between the sediment deposition thickness and the check dam height, the running status of a check dam can be divided into three states: without sediment deposition, half of the storage capacity with sediment deposition, and full of sediment deposition. With the accumulation of sediment transport, the running state of a check dam gradually changed and the sediment-trapping effect of check dams has gradually weakened, leading to the loss of part of the disaster mitigation effect, increasing the risk of downstream infrastructure and human security. Therefore, experiments with multi-surges of debris flows were carried out to study the geomorphic and sediment-trapping effectiveness of check dams. The results showed that with the increase of the sediment amount with multi-surges, the deposition slope in the downstream dam approached or even exceeded that of upstream dam. For one surge, deposition morphology has slightly difference in the cascade dams. At last, a method for calculating the reduction coefficient of deposition slope considering the check dam height and sediment amount with multi-surges is proposed.