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Characteristics of debris flow trajectory and scour behind a check dam

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Debris flow is considered to be one of the common natural hazards in mountainous areas, which often causes devastating damage to the lives and property of local people. Hazard mitigation includes: non-structural(disaster monitoring, earlier warning, risk analysis, insurance policies) and structural countermeasures (check dams, drainage systems, stilling basins). The check dam construction along a debris flow valley is considered as a useful method for hazard mitigation in the debris flow discharging section. Previous work has concentrated on the different types of check dams and check dam foundation stability. However, little attention has been paid to the check dam spillway structure, characteristics of debris flow trajectory, and scour depth analysis behind a check dam. In the paper, a new type of spillway structure with lateral contraction was proposed. The projection theory was employed to predict trajectory of debris flow out from the spillway. The scour feature and scour depth based on theoretic analysis was also investigated. The results indicated that the "Y"-typed spillway structure with lateral contraction was a suitable spillway type for extending the debris flow nappe when debris flow passed through the spillway. The estimated data of the debris flow trajectory were in good agreement with the experimental ones. In addition, the conservation of momentum of the debris flow was employed to investigated the scour depth behind the check dam and the discrepancy between the theoretic values and experimental remained below 27.96%(relative error).