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Combining TRIGRS and Massflow Models for the Assessment of Flash Flood Disasters Related to Sediment Supply in Mountainous Watersheds

Tong Sun, Xiekang Wang, and Xufeng Yan

Sichuan University, State Key Laboratory of Hydraulics and Mountain River Engineering, China (suntong9711@163.com)

Abstract: Evaluation of a large number of rainstorm disasters shows that the coupling effect of sediment supply and floodwaters is one predominant cause for the occurrence of flash flood disasters. Rainfall-induced shallow landslides often provide an adequate source of solid materials to recharge moving sediment during flash floods. In this study, we used the TRIGRS model to analyze the rainfall-related landslide stability in a mountainous basin and gain potential landslide volumes as potential sources for sediment loads. Then, with the calculated results of landslides as input, the Massflow model was used to evaluate how the landslides as sediment loads evolved with flows. The results showed that there was a large amount of sediment deposited in the channel, which can be initiated and transported by heavy rainfalls, leading to the destruction of villages at the mouth of gullies. In general, this study offers a strategy of evaluating sediment-coupled flash flood disasters that the TRIGRS can provide the estimate of landslide distribution and volume first and the Massflow provides the estimate of subsequent movement of the solids caused by flash floods.

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