

Numerical Analysis of Rainfall Induced Landslide Dam Formation

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Abstract

In the recent years, due to long-lasting heavy rainfall events, a large number of landslides have been observed in the mountainous area of the world. Such landslides can also form a dam as it blocks the course of a river, which may burst and cause a catastrophic flood. Numerical analysis of landslide dam formation is rarely available, while laboratory experimental studies often use assumed shape to analyze the landslide dam failure and flood hydraulics in downstream. In this study, both experimental and numerical studies have been carried out to investigate the formation of landslide dam. Two case laboratory experiments were conducted in two flumes simultaneously. The first flume (2.0 m × 0.6 m × 0.5 m) was set at 22° and 27° slope to generate the landslide using rainfall intensity of 70.0 mm/hr. On the other hand, the second flume (1.5 m × 0.25 m × 0.3 m) was set perpendicularly at the downstream end of the first flume to receive the landslide mass forming landslide dam. The formation of landslide dam was observed at 15° slope of the second flume. The whole processes including the landslide initiation and movement of the landslide mass into the second channel was captured by three digital cameras. In numerical analysis, a two-dimensional (2D) seepage flow model, a 2D slope stability model (Spencer method) and a 2D landslide dam-geometry evaluation model were coupled as a single unit. This developed model can determine the landslide occurrence time, the failure mass and the geometry of landslide dam deposited in the second channel. The data obtained from numerical simulation results has good agreement with the experimental measurements.

Keywords : Numerical Analysis; Landslide Dam; Laboratory Experiment

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