



Field Experimental Analysis of Prototype Twin Dam Failure Phenomenon

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We constructed a full scale two-dam system in Landao Creek, Huisun forest, Taiwan. From its own alluvium to investigate the dam break morphology and physical properties between two dams with three intervals in 16.2m (case 1), 32.4m (case 2) and 64.8m (case 3). We adjusted the interval by fixed upstream dam and changed downstream dam site to observed and analyzed dam failure processes and hydraulic properties of the dam system. Grain size distribution investigation and 3D Lidar model of the stream bed were executed before and after dams break to discuss the river morphology evolution. In addition, to explore the type of breach varying with time, we used the method of 3D Remodeling from Motion Structure with Multi-View Stereo, which is a 3D spatial modeling process by photoing an object at same time in more than four different angles with over 70% overlap to each other, to construct the 3D model of dams system in this study. Furthermore, the dam break process were analyzed by cameras images and data recorded from water level gauges.

The result showed that the shortest intervals in Case 1 result in a stronger torrent impact at upstream side of downstream dam, more significant reduction in dam intensity and wider breach which was 22% more than that in Case 2. On the contrary, the failure duration between two dams in Case 3 was 4.0 and 2.7 times longer than that in Case 1 and Case 2, respectively. Consequently, the decrement of dam interval led to a greater damage and rapid increment of water level which was prompted by outburst flow from the upstream dam failure at downstream dam, and shorter failure duration in two-dam system. In addition, the transport distance of sediment which yielded from upstream dam breach depend on whether downstream was obstructed or not. The 90% sediment of upstream dam breach were deposited on the upstream side of downstream dam with a comparison of entire loss in case of downstream dam.