

崩塌誘發土石流之數值模擬研究 ~以南台灣紅水仙野溪為例

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摘要

2009年8月莫拉克颱風帶來長延時破記錄的累積雨量，導致台灣中南部地區發生嚴重的崩塌、土石流及洪水災害。本文以南台灣六龜區新發里之紅水仙野溪(土石流潛勢溪流編號:高市DF055，為一小集水區高崩塌率之土石流事件)為對象，使用FLO-2D模式進行土石流案例之數值模擬研究。首先，本文收集與調查紅水仙集水區之水文與地文特性資料，並分析土砂漿體之流變特性。其次，探討土石流入流歷線、土石流流量與清水洪峰流量的關係，以及分析濃度與曼寧係數對模擬結果的影響。最後，比較現地調查資料，決定出適合於本案例之之模擬參數，包括可用來決定土石流流量之流量擴增係數、土砂濃度與曼寧係數等。本文成果將可提供未來土石流模擬分析或評估土石流危險區域之參考。

關鍵字： 流變特性、入流歷線、擴增係數、莫拉克颱風。

Numerical Simulation for Landslides Induced Debris Flow – A Case Study of Hong-shui-xian Gully in Southern Taiwan

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Abstract

Typhoon Morakot struck central and southern Taiwan on August 8, 2009 with high rainfall intensity and accumulated rainfall, and induced several landslides, debris flows and floods. In this work, the Hong-shui-xian debris-flow caused by Typhoon Morakot in Xinfu Village of Liouguei District in southern Taiwan was selected for case study. A two-dimensional model (FLO-2D software) was used to simulate the debris flow. Firstly, hydrological and geomorphological data in the debris flow event were collected, and the rheological property of slurry taken from field was analyzed. Secondly, the relationship between debris flow discharge and water flow discharge that used to determine the inflow hydrograph was discussed; influence for the resistant parameters, such as sediment concentration and Manning coefficient, on debris flow simulation were analyzed. The simulation results were then compared with the aerial photos, and the deposited area and depth in field investigation. Finally, the bulked coefficient of discharge and the resistant parameters for using this model in the case study were presented. In this study, parameters and processes needed for the simulation of landslide induced debris flow are proposed to provide a reference for hazard zone mapping or debris-flow hazard mitigation.

Key Words： Rheological property, Inflow hydrograph, Bulk coefficient, Typhoon Morakot.