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An application of the FLO-2D Model to debris-flow simulation – a case study of Shinfa village in southern Taiwan

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Taiwan is an island located in the subtropical zone where typhoons often bring heavy rainfall. Heavy rainfall, stream having steep slope, and weak geological condition resulted in a high susceptibility to debris flow. Especially, Typhoon Morakot struck southern Taiwan on August 8, 2009 with high rainfall intensity and accumulated rainfall as high as 2860 mm for 72 hours. Severe landslides and debris flow hazards were induced. In this work, debris-flow events caused by Typhoon Morakot in Shinfa Village of Liouguei District, where resulted in severe impacts to local communities, in southern Taiwan were selected for case study. A two-dimensional model (FLO-2D software) was used to simulate a debris flow, and the accuracy of the simulation, including flow depth, velocity, sediment, and inundation area, was analyzed in the case study. This study consists of three phases. In the first phase, debris flow data, including information on topography, rainfall and rheological parameters were compiled to establish a database of factors that influence debris flow. For the second phase, a numerical simulation was performed using FLO-2D with the results presented as area of debris-flow inundation, maximum deposit depth, and deposit volume. The simulation results were then compared with the aerial photos and the micro geomorphological study. Finally, suitable conditions for using this model and reasonable parameters needed for simulation are presented. In this study, parameters and processes needed for a numerical simulation method for debris flow routing and depositions are formulated to provide a reference for hazard zone mapping or debris-flow hazard mitigation.