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Experimental Exploration on Rainfall-induced Mass Re-mobilization after Giant Earthquake: A case study in Wenchuan earthquake hit region, China

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Prevention and mitigation of rainfall induced geological hazards after the Ms=8 Wenchuan earthquake on May 12th, 2008 were gained more significance for the rebuild of earthquake hit regions in China. After the Wenchuan earthquake, there were thousands of slopes failure, which were much more susceptible to subsequent heavy rainfall and many even transformed into potential debris flows. An typical example can be found in the catastrophic disaster occurred in Zhongxing County, Chengdu City on 10th July, 2013 in which the unknown fractured slope up the mountain was triggered by a downpour and transformed into subsequent debris flow which wiped the community downstream, about 200 victims were reported in that tragic event. The transform patterns of rainfall-induced mass re-mobilization was categorized into three major type as the erosion of fractured slopes, initiate on loosen deposit and outbreak of landslide (debris flow) dams according to vast field investigation in the earthquake hit region. Despite the widespread and hidden characters,the complexity of the process also demonstrated in the transforms of the mass re-mobilized by the erosion of both gravity and streams in the small watersheds which have never been reported before the giant Wenchuan Earthquake in many regions. As a result, an increasing number of questions for disaster relief and mitigation were proposed including the threshold of early warning and measurement of the volume for the design of mitigation measures on rainfall-induced mass re-mobilization in debris flow gullies. This study is aimed for answer the essential questions about the threshold and amount of mass initiation triggered by the subsequent rainfall in post earthquake time. In this study, experimental tests were carried out for simulating the failure of the rainfall-induced mass re-mobilization in respectively in a natural co-seismic fractured slope outside and the debris flow simulation platform inside the laboratory. A natural fractured slope was selected to conduct the field experimental test,after the field experimental test, the correlation of rainfall parameters, deformation criterion and water content as well as the failure volume of gravity erosion was investigated. In addition, the loosen mass re-mobilized by the stream was also simulated by the model experiment by which the correlation of rainfall thresholds, and the initial volume of mass triggered by the flow was analyzed. Thus, the threshold and volume measurement model for the initiation of mass re-mobilization were proposed by means of this experimental research. Despite of the fact that the simplicity of the model derived from experimental and empirical method and some drawbacks connected with the uncertainty and complexity of the geological phenomenon, the proposed method have contributed a lot in application for the early warning and prevention of mass transformed debris flows in earthquake hit region, China.