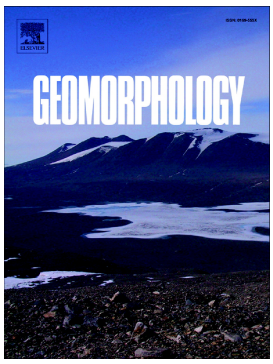

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Real-time observation of an active debris flow watershed in the Wenchuan Earthquake area

Cui Peng[a,b], Guo Xiaojun[a,*], Yan Yan[a,c], Li Yong[a], Ge Yonggang[a]

[a]*Key Laboratory of Mountain Surface Process and Hazards/Institute of Mountain Hazards and Environment, Chinese Academy of Sciences, Chengdu, 610041, China*

[b]*Centre for Excellence in Tibetan Plateau Earth Sciences, Chinese Academy of Sciences, 100101, Beijing, China*

[c]*College of Civil Engineering, Southwest Jiaotong University, Chengdu, 611756, China*

**Corresponding author: e-mail: aaronguo@imde.ac.cn*

Abstract: Debris flows occur frequently and cause considerable damage in the Wenchuan Earthquake area; however, there has been no systematic real-time monitoring of such events. This study used a monitoring system to consider the spatial variation of meteorological and flow processes in a 39.4 km^2 watershed. The system comprised three rainfall gauges at different locations, and three hydrological monitoring stations, located on the mainstream and tributaries, with instruments to measure the velocity, height, and density of debris flows. Based on the monitoring data, the debris flow events were categorized and the general runoff velocity, discharge, and density were analysed. We proposed empirical methods for estimating the velocity and the total volume of debris flows based on other easily obtainable parameters, e.g., maximum flow depth and duration. Comparison of the results derived using the monitoring data and empirical formulas with those obtained in other small watersheds worldwide revealed the debris flow characteristics in this relatively large watershed. Rainfall threshold for the debris flows was proposed, which is higher than those proposed for the same region for periods shortly after the Wenchuan Earthquake (2008–2013), and the temporal evolution of the rainfall conditions