



## **Debris flow initiated characteristics after extreme rainfalls: case study in the Chenyulan watershed, Taiwan**

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Extreme rainfall causes numerous landslides and debris flows in mountainous watersheds, which generally deposit large amounts of loose debris in gullies and on slopes. The supply of loose debris plays an important role in the occurrence of future debris flows during subsequent rainfall events. The rainfall threshold for debris flow initiation caused by a rainfall event may differ before and after an extreme rainfall event. This study analyzed the characteristics of rainfall related to debris flow occurrence after suffering five extreme rainfalls between 1963 and 2016 in the Chenyulan watershed. The purpose of this study is to investigate the variation in the rainfall conditions related to debris flow occurrences, and the empirical relationship between the return period of rainfall characteristics (T) and the corresponding the probability of debris-flow occurrence (P).

Results of the study showed that the rainfall index RI could reflect the debris flow initiated characteristics after extreme rainfalls. RI is defined as the product of the maximum 24 h rainfall (Rd) and the maximum hourly rainfall (Im). The critical RI for debris-flow occurrence dropped after an extreme rainfall and it gradually recovered to the threshold before the extreme rainfall (the original threshold). The recovery period t, the required period from the lowered rainfall threshold to the original threshold, has an increasing tendency with the increasing RI. The empirical relationship between P and T was also developed.