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On the control factors of the colluvial landslides after 1999 Taiwan Chi-Chi earthquake

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It is generally accepted that the high frequency of landslide in Taiwan area is strongly affected by its geography and geology background. Taiwan is located in the subtropical area with high precipitation, especially during typhoon season in the summer. Besides, the geomaterials are highly fractured due to the tectonic activity of collision of Phillipine sea plate and Eurosian plate. As landslides are quite frequent in Taiwan area, a large proportion of those landslides are resliding in colluvial geomaterials. The main purpose of this study is to investigate the control factors for colluvial landslides in Taiwan Western Foothill after 1999 Chi-Chi earthquake. The study comprises two major parts, i.e., investigation and analysis. The former part includes field investigation and GIS investigation on the DTM with focus on geology, geomorphology and weathering factors. And the later part includes in situ and lab testing on the geomaterial of different geological area and the study on the correlation of the control factors on the landslides.

This study introduces the Landslide Rainfall Index (Id) to correlate the rainfall and landslide. It is defined as the relative closeness between upper bound and lower bound of the scattered cumulative rainfall - maximum rainfall density relations of the interpreted slidings. To reflect the influence of dip slope, the Dip Slope Index is also introduced. The dip slope index is used to quantify the correlation between dip direction of bedding plane and dip direction of slope.

For the analysis of landslide potential, this study applies the Instability Index method in which an empirical formula in terms of control factors was statistically established. For comparison, the instability index analyses are performed separately for regions of

Plio-Pleistocene, Miocene, and Oligocene formations. This study preliminarily adopts nine influence control factors and subsequently removes minor factors through the test of significance. The results reveal slope angle, NDVI (Normalized Difference Vegetation Index), and Id (Landslide Rainfall Index) are the top three control factors for the landslides, although the ranks are different in different regions due to the difference in geomaterial and precipitation.