PREDICTION OF LANDSLIDE BY MARKOV AND LOGIT MODELS --- THE CASE STUDY OF NANTOU COUNTY, TAIWAN

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ABSTRACT

Earthquake or torrential rain often trigger the landslide, a major earthquake (M_L =7.3) had occurred near Chi-Chi town in the Nantou County, Taiwan on September 21, 1999 (17:47 GMT on 20 September). The death toll had exceeded 2400. The bare landslides also exploded several ten thousands in Nantou County. Every year when the plum rains and typhoon seasons are coming, there are always some disaster and many new landslides, and Nantou County is always one of the suffering areas. In this study, we use five period of satellite images (1999, 2002, 2005, 2008, 2011) of Nantou county. Landslide Prediction is a spatio-temporal problem because it depends on the past environment conditions at that location as well as the past conditions of other local sites. We focuses on a statistical model - the Markov Model and logistic regression, the purpose is to develop a robust methodology for modeling natural processes on a landscape while accounting for the variability in a process by utilizing environmental and spatial random effects. The Markov model is applied to predict future landscape changes, and the Logit regression model with 5 terrain factors was used to analyze the spatial relationship between landslide and environmental factors. And the future change of landscape was predicted by the Markov model. As for the spatial distribution using the Logit regression analysis, the results showed that the occurrence of landslide is related to the elevation, slope, cumulative rainfall, soil type, and geologic bed, with particularly high correlations with the slope.

Keywords: Landslide, Prediction, Markov model, Logit regression