



The fractal dimension of topographic surface associated with landslide distribution: a case study in Tseng-Wen reservoir basin in Taiwan

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The landslide in the reservoir basin seriously influences the effective life of the reservoir and the water quality. Many factors may affect the stability of the slopes in the reservoir basin, such as topography, geology, climate, humanity activity and land-use. The Tseng-Wen reservoir basin in south western Taiwan was chosen to study the effect of the influence factors on the landslide. A GIS-based hydrologic analysis is first carried out by dividing the 481 km² study area into several sub-catchments. Considering the high resolution DEM, the fractal dimension of each sub-catchment topographic surface is calculated by using triangular prism method. The object-based classification was subsequently applied to interpret the landslide and land-use map within FORMOSAT-2 imagery. Finally, the relationship between topography (fractal, slope, roughness, and relief), land-use (farm and construction land), climate factors and landslide distribution (landslide density, two points correlation dimension and size frequency distribution) was performed by multiple regression and neural network methods. The results show that including fractal dimension into the topographic factor will improve the landslide hazard analysis. This study finds that the fractal dimension has the most significant correlation than other topographic factors in landslide distribution.