Landslide catchment analysis of granitic areas in Japan; Case study of disaster areas in Hiroshima prefecture

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ABSTRACT: In August 2014 several landslides were triggered by heavy in Hiroshima prefecture, southwest Japan. Even though the same climate and physical condition, granitic areas are more vulnerable to landslide than other rock types. However, most of the studies related to spatial analyses using GIS has uncertainty of methods of measuring slope angles of landslides. Therefore, the present study examined the difference of several kinds of slope angles of landslide initiation areas in granitic areas. The targeting 405 landslides are distributed in Asa-kita and Asa-minami wards in Hiroshima city. All these slope angles were calculated by three different digital elevation model (DEM) data sets, i.e., 1-m, 5-m and 10-m DEMs because the resolution of DEM affects the geomorphic modeling. To determine the optimal resolution of the DEM and to calculate the slope angle of the initiation areas, four different types of slope angles measured. They are defined as "center-top-slope angle", "center-center-slope angle", "mean-slope angle" and "longitudinal-slope angle". Firstly descriptive statistics were calculated and then ANOVA test was performed to compare the mean values of the data sets. Simultaneously, slope angle difference calculated with 5-m and 10-m data sets were compared with the size of the landslide initiation areas. Next, the other three slope angle methods were compared with longitudinal-slope angle which gives the most reliable slope calculation in nature, order to access the best method to calculate the slope angles. The result shows that less variations generated by 1-m, 5-m DEM data sets while significantly large variation between 5-m and 10-m DEM data sets. Considering the absence of high accuracy 1-m DEM data, 5-m DEM data should be used for this kind of analytical purpose. Furthermore, the angle data calculated from center-center-slope angle data sets showed the highest R^2 value than the other two data sets. Analysis result concluded that landslide initiation areas less than 100 m^2, a 5-m DEM resolution is more suitable for slope angle calculations. Center-center-slope methods have the highest possibility for replacing use of spatial analysis from longitudinal-slope angle method because of convenient calculation.

Keywords: *Hiroshima, Digital elevation model (DEM), Slope angle*