

Analysis of Morphometric Parameters for Mountains Ranges and Landslides due to the July 2018 Heavy Rain in Western Japan Using GIS Data

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Morphometric parameters for mountains ranges have been analyzed in many studies. These studies in recent years used Digital Elevation Models (DEMs) to calculate values of morphometric parameters within mountains and provided consideration on landform evolution. In addition, morphometric parameters calculated by DEMs have been used for producing landslide hazard maps. This study investigates geomorphometric parameters within the Chugoku and Shikoku Mountains, Japan, and the relationships among the parameters. In addition, landslides caused by the July 2018 heavy rain in western Japan is also investigated and the relationships between the landforms of the mountains and the landslides are discussed. Altitude, slope angle, slope aspect and slope curvature are chosen for morphometric parameters to be investigated.

Morphometric parameters for the Chugoku and in Shikoku Mountains computed using DEMs and GIS have some characteristics common to the Japanese Alps. For example, for wide altitudinal zones, slope angle tends to be constant around 30 to 40 degrees even if altitude changes. However, the values of the constant slope angle are not the same, which may be due to geological differences or the difference in the formation age of mountains. Although the frequency distribution of slope aspect is similar to the Chugoku and Shikoku Mountains, anisotropy of slope aspect is different between the two mountains. This may be caused by differences in the formation age, formation mechanism, or geology of the mountains.

Analysis of landslides caused by the July 2018 heavy rain in Hiroshima using landslide data and DEMs revealed that landslides mostly occurred around 300 m in altitude, at 15 to 30 degrees in slope angle, and on concave slopes. Although the characteristics slope angles higher than 30 degrees point to frequent slope failures at high and steep mountain slopes in the Chugoku and Shikoku Mountains, landslides corresponding to one rainfall event do not necessarily follow this, because they depend on the distribution of rainfall during the event. Therefore, possibility of landslides in low and gentle mountains close to populated areas needs to be considered seriously for mitigating landslide disasters.

Keywords: GIS, Mountain landform, Landslide, Morphometric parameters