

The most suitable window size of the slope gradient and the convexo-concave index for the assessment of shallow landslides

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In this presentation, we introduce a case study that investigates the optimum window size for the assessment of shallow landslides using 2 m DEM of LiDAR. Study areas are the Izumozaki area (20 km² mountains in the Nishiyama hills between Izumozaki and Nagaoka in Niigata Prefecture) and the Niihama area (17 km² mountains in the Sekikawa hills of Ehime Prefecture). Both areas lie on fold mountains of interbedded sandstone and mudstone. The Izumozaki area is composed of soft rocks such as Haizume formation, and the Niihama area is composed of weathered rocks of Izumi group. Both are regarded as vulnerable rocks to landslides, though their depositional ages are different.

In the study areas, many shallow landslides were occurred by the August 1961 heavy rainfalls and the July 2004 heavy rainfalls for the Izumozaki area, or the October 2004 heavy rainfalls for the Niihama area. Most of landslides were shallow landslides and they were concentrated in the valley head or the foot of steep slope.

We investigated the optimum window size as follows. We first calculated slope gradients and values of the convexo-concave index by various window sizes. Then discriminant analyses were done using raster data of shallow landslides as an objective variable, raster data of slope gradients and values of the convexo-concave index as explaining variables. A window size which showed highest score in the discriminant analysis was the optimum window size. Easy terrain classification maps were produced for the verification.

According to the results, the most suitable window size was essentially proportional to the size of target landslides. Resultant terrain classification maps are rough hazard maps of dangerous slopes for very shallow landslides. The assessment of shallow landslides would be improved to be more accurate by obtaining the most suitable window size.