

Three-dimensional Modeling of Hitotsumine landslide Niigata Chuetsu Earthquake

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Generally, preliminary geomorphological interpretation performed, using a topographical map and aerial photographs afford estimation of underground structure formed due to tectonic movement such as faults, earthquake induced landslide, a faulting, etc.

Recently, acquisition of the highly accurate and high resolution topographic data derived from aerial photo survey using and 3D laser profiler has become possible. Using modern surveying techniques it is easy to generate data with 1 meter resolution. Such high resolution data can express be used to visualize geomorpholoical feature in three-dimensions and interpret them more easily than the traditional techniques using a topographical map or an aerial photo.

In this study, we have evaluated the extent the underground movement that could be deciphered using Digital Terrain Model (DEM) generated using aerial laser profiler and orthorectified aerial image. The Hitostumine landslide in Niigata Prefecture, Central Japan was used as a test site for this study. This landslide was triggered as a result of the Niigata Chuetsu Earthquake which occurred on October 23, 2004. We used the 2 meter grid interval DEM and orthoimage and applied the SSA3D developed by Godai Development Corporation. The data analysis and visualization carried out using GRASS GIS. The following procedures were adopted to estimate of underground structure. However, the form of a slide side was assumed to be parallel to dip & strike of a bed.

- (1) Geographical feature interpretation using DEM and orthoimage.
- (2) Estimation of the form of slip surface using a topographic section.
- (3) Estimation of the three-dimensional form of a slip surface.

After estimating slip surface, we can build and visualize the three-dimensional model using the geographical data and slip surface.

In the present study, we estimate the underground structure using only topographical information, and develop the 3D model of the underground structure. The result of the study suggests that the 3D model provides a plausible interpretation that could be further verified by detailed survey.