Landform classification mapping in Tomari-no-tai area, Shirakami Mountains, Japan

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About seven years have passed since airborne light detecting and ranging (LIDAR) was applied for landform measurement in Japan. Airborne LIDAR is expected to understand vegetation-covered landform in Japan, because landform is directly measured by laser light which penetrates vegetation.

In this study, landform classification was mapped using airborne LIDAR contour map. The study area is Tomari-no-tai area (3.8 km^2) in Shirakami Mountains, which is located at the north of Mt. Futatsumori (1,086 m). The study area are mainly covered with beech forest, and there we have much snow in winter. In classifying the landform, field survey result was considered. Almost all of the study area is middle Miocene series mudstone, and it was intruded by late Miocene granite of Futatsumori mountain body. Tomari-no-tai area is the gentle slope formed by the catastrophic rock slide, which occurred at least 1,000 years ago, whose main scarp is north-face of Mt. Futatsumori.

Airborne LIDAR data were measured 1,200 m above the ground on 30 October 2004, the data have the density of a few laser light reflected points per 1 m^2. The points which were reflected on the ground were extracted and after the interpolation one-meter-grid digital elevation model (DEM) were produce. Furthermore, one-meter-interval contours were mapped and interpreted. Landform were also interpreted on the 1/8,000 aerial photographs taken by the Geographical Survey Institute in 1975, finally, both interpretation results were combined and 19-classified landform map was produced. In the study area no detailed landform classification map existed until this study produced it, because there was no more large scale contour map than 1:25,000. Explanation of the classification is as follows;

B1. Crest slope: A little gentle slope around summit and crest surface. It is thought that it has kept the landform before the catastrophic rock slide.

B2. Upper slope: Steep slope including main scarp of the catastrophic rock slide.

B3. Landslide side slope: Lateral slope of the landslide, which was formed by the catastrophic rock slide.

B4. Lower slope: It is located at the lowest part of the lower slope next to the valley bottom, and it forms remarkable steep slope.

B5. Avalanche furrows: Snow avalanche furrows, which are U-shaped shallow in cross section, incise not only granite but also mudstone steep slopes (Sekiguchi and Sugiyama, 2003).

B6, B7, B8. Steep (22-25 degree), Medium (9-14 degree), Gentle (5-8 degree) slope alluvial fan. They were formed by the debris transported by snow avalanche in winter and debris flow in rainy season.

B9. High-level surface: It consists of several flow units of thick massive sand layer and thin angular granite cobble layer. It may have been formed by the debris flows after the catastrophic rock slide.

B10. High-level gentle slope: Gentle fan-like slope on the high-level surface.

B11. Low-level surface. It is the block moved by the catastrophic rock slide. The strata tend to contain big and weathered granite rock bodies compared with the strata of high-level surface.

B12. Slope failure (Clear): Shallow disrupted landslide and rock slide avalanche. It is clearly interpreted on aerial photographs.

B13. Slope failure (Semi-clear): It is not clearly interpreted on aerial photographs but on the one-meter-interval contour map.

B14. Slope incised by avalanche furrows: Avalanche furrows are clearly interpreted at high density.

B15. Scarp: It was formed at the same time as the landslides (#16).

B16. Landslide: It was formed at the same time as the catastrophic rock slide or after the slide.

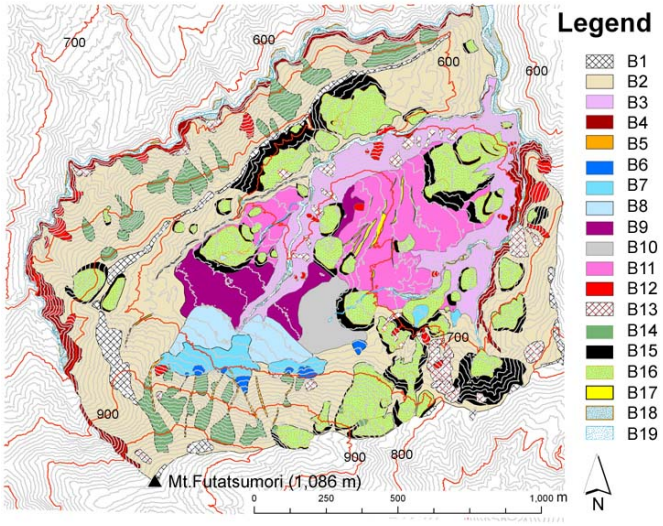
B17. Enchelon cliff: It may indicate pressure ridges fromed by the catastrophic rock slide.

B18. Debris-flow terrace.

B19. Valley bottom: Main valleys were shown.

Reference

Sekiguchi T, Sugiyama M (2003) Geomorphological features and distribution of avalanche furrows in heavy snowfall regions in Japan. Zeit fur Geomorphologie.N.F. 130: 117-128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Mt.Futatsumori (1,086 m)
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