

## Detailed geomorphic landslide assessment by airborne laser scanner analysis

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<http://www.slope.dpri.kyoto-u.ac.jp/mountain/doshidahp/index.html>

Shallow landslides play an important role in slope development. However, previous methodology for analyzing shallow landslides is not very effective for investigating a wide area with high resolution. Airborne laser scanner, a technology that has been developed recently, can scan through the interstices of tree canopies to measure the ground surface with high accuracy, providing a revolutionary tool to analyze landforms. We applied the airborne laser scanner to obtain a high-resolution DEM with a mesh size of 1 m, and characterized the geomorphological features and the features of shallow landslides. On the basis of these data, slope development is discussed.

We developed a topographic feature image in order to visually recognize the minute geomorphological features from the airborne laser scanner data. In addition, we extracted valley and ridge lines and developed a method for automatically extracting convex slope breaks. We analyzed landforms in granitic rock areas and mud rock areas where shallow landslides have occurred frequently. Research areas are Mt. Kaba (Ibaraki Prefecture) and Obara village (Aichi Prefecture) as granite and granodiorite areas, and Niikappu mud volcano area (Hokkaido) and the right bank of the Ribira river (Hokkaido) as mud rock areas. Obara village and the right bank of Ribira river are areas where many shallow landslides occurred by rainstorm in recent years. In the Mt. Kaba and Niikappu mud volcano areas only a few shallow landslides occurred recently, but many shallow landslides were recognized as widely distributed geographical features.

The following landslides features have been clarified in this research. The largest average size of individual landslides within the four sites of granitic rocks was 184 m<sup>2</sup>. In contrast, the smallest average size of individual landslides within the four mud rock sites was 820 m<sup>2</sup>. Total landslide area ratio (landslide area divided by total area) was less than 4.5 % in the four granitic rock areas, while this ratio more than 17 % in the four mud rock areas. This indicates that shallow landslides are more effective in slope development in mud rock areas. Shallow landslide sites are strongly controlled by geomorphology in granite and granodiorite areas, while they are rather dependent on slope inclination in mud rock areas. These differences in landslide sites reflect geological conditions.