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Application of airborne laser scanner to the analysis of slope development by shallow landslides in mud rock area

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Shallow landslides play an important role in slope development, because they occur in many numbers simultaneously by rainstorms even though each one is small. However, previous methodology for analyzing shallow landslides were mostly depended on aerial photograph interpretation and were not very effective for investigating a wide area with high resolution, particularly when the ground is covered by forest.

We applied the airborne laser scanner or LiDAR to obtain a high-resolution DEM with a mesh size of 1 m, and characterized shallow landslides in mud rock areas covered with vegetation. On the basis of these data, we discussed slope development in mud rock areas where shallow landslides have occurred frequency. Research areas are Niikappu mud volcano area and Ribira mudstone area in Hokkaido, Japan.

We found that there is a critical inclination in the slopes and the critical inclination is very important in slope development. In the Niikappu mud volcano area, the critical inclination was about 20˚; slopes with inclinations of 20˚ or more are unstable and subject to landslide. Shallow landslides dissect the mud volcano bodies from surroundings. On the other hand, in the Ribira mudstone area, the critical inclination was 33-38˚. Shallow landslides dissect gentle slope areas at higher elevations from surroundings. The critical inclinations of slopes in mud rock areas might be determined by mechanical properties and weathering behavior of these rocks; mud volcanoes in Niikappu consist of much weaker material than the mudstone in Ribira. In both the

mud rock areas, we identify convex slope breaks along the aligned heads of shallow landslides. This is a sort of denudation front.