

The origin of the ruptures on the slope caused by the Iwate-Miyagi Nairiku Earthquake 2008, estimated from analysis of LiDAR DEMs

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In the Iwate-Miyagi Nairiku Earthquake in 2008, a large-scale landslide occurred and the remarkable surface ruptures appeared in the northern area of the Aratozawa dam reservoir. About the generating mechanism of these ruptures, a possibility of being a surface part of earthquake fault, and a possibility of being boundaries of landslides are considered. In this study, we researched the high resolution DEM of 2m grid created from the airborne LiDAR survey to determine the amount of ground movement after the earthquake. First, the difference of elevation was calculated from 2 periods DEMs, and the area where the amount of change is remarkable was extracted. Next, the area with large horizontal displacement was extracted, and the direction of movement was presumed from the relation between the pattern of change of elevation, and the ups-and-downs form of original ground. Furthermore, we created geomorphic quantity image which emphasized the ground surface details from DEM, to calculate horizontal and vertical difference by the Image Correlational Analysis.

As a result, the amount of movements extracted in the region are a maximum of 5.2 m and a minimum of 0.2 m and the direction of ground shortening was generally E-W or WNW-ESE. Additionally, several blocks with the different move direction in a small area were determined. Under the assumption that there is upheaval movement after the earthquake in the whole region, we recognized that in the horizontal displacement of most of blocks there was a tendency of downward movements rather than upward movement, and there were upheaval deformations in the marginal part or the collision part between different blocks. Furthermore, it turned out that there are remarkable geographical features in the position where ruptures appeared, and it is possible that those ruptures have formed in the same position also in the past.

Although the trigger of remarkable ruptures in this area was presumed to the tectonic deformation by wide-area compression stress, and some part of rupture may have been generated also in the past, it is thought that the gravitational mass movement in the earthquake restricted strongly the generating position, scale, and surface morphology of ground deformation of ruptures.