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## Estimation of ground movement of the Iwate-Miyagi Nairiku Earthquake 2008, from the Geomorphic Image Analysis of LiDAR D

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In the previous work, authors developed the new method to estimate the ground deformation of 1m order quantitatively and easily used high resolution periodical DEM, applied the technique of the image matching analysis - Patent No.4545219. And we showed the result of measurement of displacement of the mass movement due to the earthquake with high accuracy by using this technique. In the present study, we applied the same technique to the area of about 20km<sup>2</sup> where the surface rupture appeared due to Iwate - Miyagi Nairiku Earthquake 2008, and tried the extraction of wide area ground deformation.

The topographical data used in this research is two times of 2mDEM by the Airborne laser survey immediately after the disaster in June 2008, and September 2006. The slope angle map where the angle of gradient in the grid point had been shown by gray- scale was used for the digital geomorphological image used for the image analysis. The software improved to use MPIV described with MATLAB for three dimensional analyses was used for the image matching. When 2mDEM is used, the displacement magnitude that can be extracted by the digital geomorphological image matching is about the 1/10 grid size or more.

As a result of the investigation, 0-0.8m upheaval tendency to the rise on the west side was admitted in the entire region. And, the tendency of horizontally shortening of the surface by displacement for the eastward and for the westward was admitted. Moreover, a lot of small area where the direction of the movement was different was found, and the displacement magnitude in each small area was 0.2- 1m. The sites where the ground surface displacement was found by existing investigations are corresponding to the places where the direction and the magnitude of displacement of the ground change suddenly. Especially, the site Okayama where low cliff of westward up was formed is located in the collision zone of the displacement of the direction of east and west. In addition, the direction of displacement is greatly different in both shores along Ubusume River.

In conclusion, it is presumed that surface of the ground had been divided into the small blocks, and each block moved independently and minutely due to the earthquake. It is thought that the shape of the each block reflects the geological structure of underground. And it is thought that remarkable deformation of ground surface appeared in the zone where the direction and magnitude of displacement change suddenly. In the future, an unconfirmed surface deformation may be discovered in the area where a big distortion is assumed.

Keywords: active fault, DEM