Deformation analysys of Pre- and post earthquake DATA set of airborne LiDAR 50cm DSM , Kumamoto 2016 earthquake.

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Estimation of distribution and displacement of such a dislocation is helpful for understanding and disaster prevention measures of the mechanism of the earthquake. In-SAR is suitable for detection of deformation of wide area, but cannot detect detail movement along fault zones. Ground survey can measure dislocation along linear structure like roads, etc., but hardly detect flexures without cracks. Differential Lidar is expected to detect such cases of dislocation along fault zones if Lidar data before movement is available.

We had measured airborne LiDAR just before (April 15) and after (April 23) of the main shock of the Kumamoto earthquake. The acquisition area of the both data is from Kashima-town to Nishihara-village, and acquisition density of the first data is one point per square meter, and four points per square meter for the second data. DSM of the 50cm mesh had been processed from the both LiDAR data and converted to Red Relief Image Maps(RRIM). The analysis of these data results that the quantity of biggest deflation was -2.3m in Fuda district of Nishihara-town. Horizontal displacement is clearly readable with the RRIM and aerial photos. For example, right-lateral strike-slip fault can be found at the north and south edge of Kiyama River low land, and the left-lateral strike-slip fault lies in the crossing direction (figure 1).

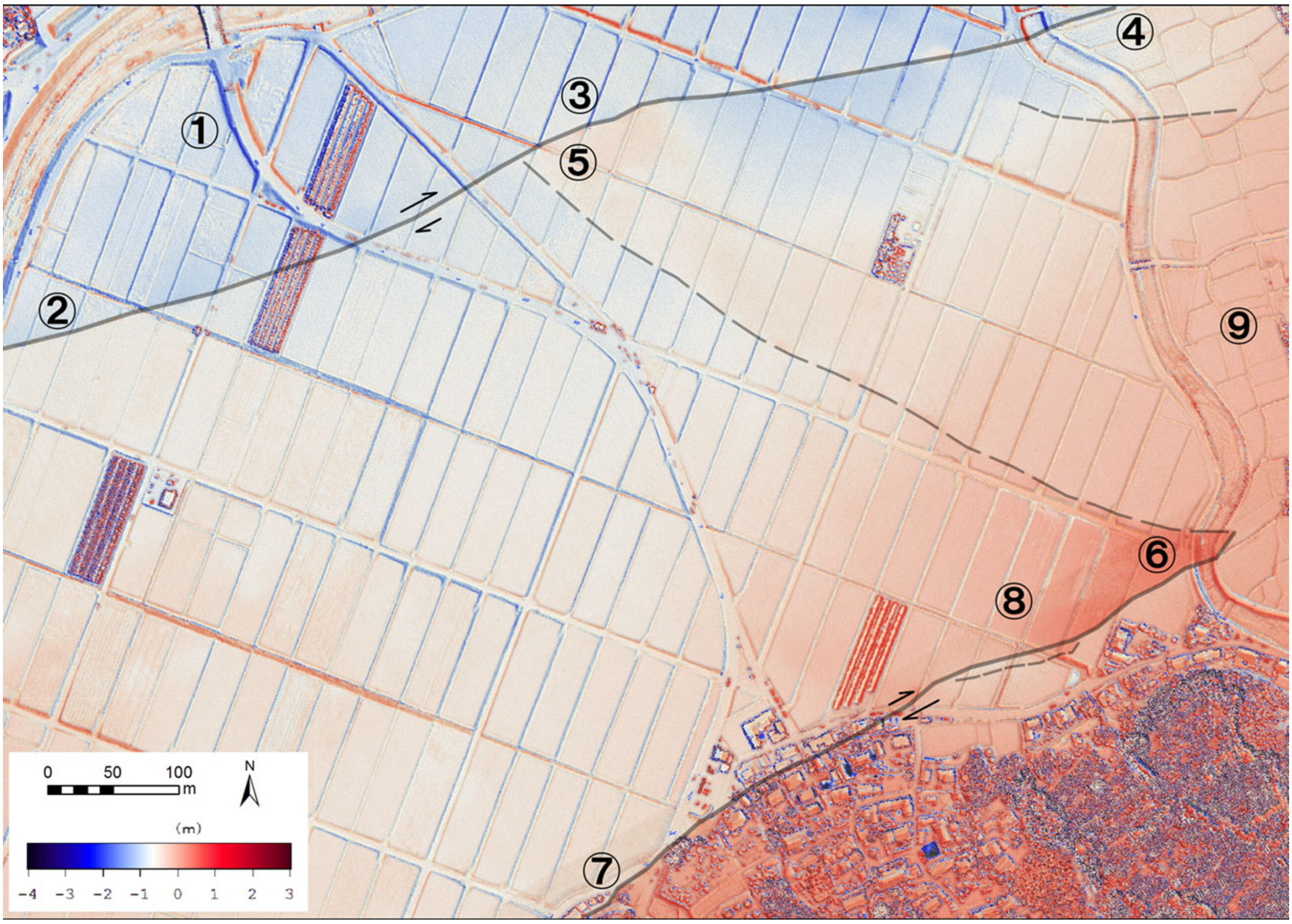
Movement between two point clouds before / after the main shock on 4/16 had been calculated automatically by point cloud registration with CCICP (Classification and Combined Iterative Closest Point) , where iteratively calculates rigid transformation in iterative process which first classifies point cloud into linear / planar / scatter points and minimizes point-to-plane and point-to-point distances between matching points of the same categories. The results of calculation with point clouds of about 50cm resolution shows precisely the tendencies of horizontal and vertical movement around the faults.

Reference

Oskin,M.E., et al.(2012),Near-field deformation from El MayorCucapah earthquake ewvealed by defferential LIDAR, Sciences,335,702-705,doi:10.1126/science.1213778.

Nissen et al.(2014),Coseismic failt zone deformation revealed with differential Lidar:examples from Japanese Mw~8 intraplete earthquakes,Earth and Planetary Science Letters,405,244-256.

Keywords: Airbone LiDAR, Aerial photograph, earthquake fault, defferencing of DEM



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