

Estimation of three-dimensional structure of forest using LiDAR data in Abukuma mountainous region

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Many shallow slope failure has occurred in granite area. The root of tree has effects of suppressing collapse. However, it is difficult to study using a method to dig roots. The tendency that root width is larger as stump diameter is larger as the results of field survey in southern part of Abukuma Mountains. In the meantime, Okatani et al., (2013) reports that it is possible to understand the 3D structure of forest by using LiDAR data. This study has two goals in Abukuma Mountains central area. The first is surveying the relationship with weathering layer of granite and root system development, the second is considering usefulness of LiDAR data for detection of the 3D structure of forest.

Research method for the first goal are field survey and data analysis. In 75 points in survey area, root system data (stump diameter, root width and root depth), weathered layer, slope topography (upper or under of slope, ridge or valley), slope orientation and inclination were surveyed. And the relationship of those data was analyzed using GIS. Investigation method for the second goal are every tree survey in two square zone and the forest zone, and analysis LiDAR data. Those data were superimposed, and number, tree height and total cross-sectional area sum was compared whether match or not using GIS.

In the first result, a positive correlation was found between stump diameter and root width, and between stump diameter and root depth. Also, the thinner soil layer thickness is the wider root width. In the second result, about the number, the estimated value by LiDAR data was significantly lower than the measured value in both square sections. But compared by two squares, the magnitude relation of the estimated value was the same as the measured value. In the forest zone, the actual measurement value of 7 out of 10 points didn't differ the estimated tree height. Also, a positive correlation was found between stump diameter and tree height.

From there results, in a wide range, there is a possibility that the depth of the root can be estimated by the 3D structure of forest detected using LiDAR data.

Keywords: LiDAR data, three dimensional structure of forest, granite, Abukuma Mountainous region