The new visualization method Red Relief Image Map(RRIM) by high-resolution LIDAR DEM

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The Aokigahara lavas are distributed on the northwestern foot of Fuji Volcano and are the product of the 864-866 Jogan eruption, which is the most voluminous for the past 3,200 years.

The surface of the lavas is covered by thick forest called 'the sea of trees' and thus the topographic map cannot have been created using conventional aerial photography exactly.

The present study used a LIDAR (LIght Detection And Ranging) system 'LASER BIRD-II', which is an airborne range finder. This system uses laser pulses passing through gaps among tree leaves and can measure the exact distance from the ground surface even in an area covered by thick forests. We got a DEM (digital elevation model) of the Aokigahara lavas with 1m resolution. To analyze the DEM data, we developed a new visualization method called RRIM (Red Relief Imaging Map).

The RRIM (applied for patent in November, 2002) processes digital elevation data in such a way that adjusts red color tones and brightness reflecting the gradient of topography and thus creates a pseud-3D geographic map. This method is much better than conventional pseud-3D methods such as a shade method because of no direction dependability.

The LIDAR acquires the XYZ coordinate of the surface of the earth side directly. The system is mounted over an opening in the aircraft floor. Laser light can be fired in the high frequency of 33,000Hz. The rangefinder scans beneath the aircraft, producing a wide swath over which the distance to the ground is measured. The angle at which the laser is scanned is also measured. To correct for the aircraft's movements, the motions of the aircraft are recorded by an inertial measurement unit for later post-processing. The laser can also be installed on a stabilized platform. A GPS receiver in the aircraft records the aircraft's position at fixed intervals. A second, ground-based receiver provides differential correction for a more accurate position estimate. In post-flight processing, the laser range, scan angle, GPS data and by an IMU(Inertial Measurement Unit) data are combined to determine the position of a point on the Earth's surface accurately.

This new visualization method of RRIM and LIDAR DEM will enable to read terrain in heavy forest as follows:

1) active fault scrape and cracks,2)slope failure and landslide,3) ancient trail and road,4) the site of old castle, 5) animal track , and useful to mountain-climbing maps.