Airborne LiDAR Bathymetry reveals underwater topography of Lake Motosu
- The level of water raised by lava inflow -

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1. Introduction

Lake Motosu is a dammed lake located northwest of Mt. Fuji, the elevation of the lake is about 900m. Aokigahara lava flow, which is occurred by the eruption of 864 AD, flood into the lake, and the northeast lake shoreline is seen like cut off by the truncated arc. Though regarding the characteristics of this lava flow, there is a study by Obata and Unno (1999), no survey of the shallow part of the lake had been conducted. Generally, the level of lake water is the possibility of rising up by the entry of a large amount of debris or lava flows. Of course, it is not a kind of transient phenomenon like Tsunami, but the possibility to rise permanently because of the bottom of the lake getting shallow. Airborne LiDAR Bathymetry measurement was carried out in order to investigate whether the level of water of Motosu Lake changes during Aokigahara lave flow entry, and the results are as bellows.

2. Airborne LiDAR Bathymetry

Airborne LiDAR Bathymetry, as follows ALB, is a measurement method aiming to measure depth and topography of shallow water along river and coast. The equipment used in this research consists of two pair of laser ranging systems for ground measurement using NIR laser and underwater measurement using visible range (532nm). The measurable depth depends upon the transparency of the object greatly. It was expected to be measurable up to 15m depth since Lake Motosu has high transparency throughout the year and is visible around 14-16m depth. The measurement carried out on 9th September 2017. Since the area terrain is heavily rough, Helicopter, which is easy to control flight height, is used and flew 11 courses.

3. Bathymetry

For ALB measurement, the position of the aircraft is determined by kinematic GNSS survey based upon GNSS-based Control Station, objective terrain of the ground and the seafloor are measured by both the data of the initial navigation device and the two channels of laser ranging device. The density of point-clouds was 10 to 100 points/m^2 on land and 1 to 5 points/m^2 on water. The maximum water depth was measured to be 11-15m. Based on pon point-clouds data, the topography of the lake bottom is totally different between the northern and southern measurement range. On the northern side, unique irregularities of Aokigahara lava can be seen from land to underwater. There is no change between the border of the surface of the lake and reach to around 15m continuously. On the other side, the topography of the southern side of the lacustrine terrace, there can be seen slightly higher hill than the seafloor closer to the lakeshore. Not less than two stages of rectangular flat surface can be seen on the northern slope of the hill.

4. Conclusion

On the northern side of the measurement range, there found lava topography divergent like branch coral and split on the center part, and there found red oxidized portion, so it is clear that the lava landscape was deposited on land (Obata and Unno, 1999). Continuously tracking terrain similar to this topography

to 15m water depth suggests that the level of water at the time of lava flow was at least 15m lower than the current one. Underwater archeology surveys are also conducted around the southern lacustrine terrace (Kamikuissiki Village Board of Education, 1999). Relics including turtle type earthenware have been ensured so far, most of relics were identified as the age of the beginning of the early stage of Kofun Period. Many of them are completed and it seems to have been submerged since there is no inconsistency that the time is the invasion time of Aokigahara lava flow in the Heian era. It is to be wished that the detailed investigation confirms the red oxidized portion of the underwater lava topography and the research of the possibility of flat surface to be the construction of the submerged village in the future.

Reference

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