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About a small throw-up method absolute gravimeter under development

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The gravity measurement is used for resource exploration. The gravity map on the surface of the earth is used to estimate underground density distribution. In addition, the gravity exploration is used for investigating the magma movement of the volcano. We try to use an observed gravity change in an estimate of volcanic eruption predictions and underground density structure. For example, at first we perform absolute gravity measurements at the reference point of the foot for volcano observation. Then we measure gravity by carrying a relative gravimeter, and making a round trip to the reference point and to the observation point. This method requires great care and long time. At volcanic activity, it is dangerous to observe gravity.

Mr. Araya and others (2007) have developed a compact absolute gravimeter to improve these situations. If this compact absolute gravimeter was developed and we installed it in the volcano area, we could acquire data continuously even at the time of volcanic activity. In the future we will create the net work of absolute gravimeters, and we want to be able to observe absolute gravity at the same time. Then we come to understand a plane-like gravity change and be able to analyze activity of the magma precisely. In addition if we put it in a deep borehole and ocean bed of subduction zone, we could investigate seismic activity of deep underground and plate movement with gravity data. From these if the miniaturization of an absolute gravimeter advances, we enable various applications to an outdoor observation study and it will provide new observation technique. In existing device, we cannot measure repeatedly and quickly because the preparation for a free fall taken long time. However, in the case of a throw-up method, the measurement is enabled repeatedly because it is not necessary to lift a fall object. I replaced the free-fall device of the existing absolute gravimeter with the throw-up device which I developed. Then I checked accuracy and resolution of the measured acceleration of gravity of the throw-up device.

The throw-up device was able to detect a gravity change owing to earth tide. I realized that gravitational change resolution was 40 micro-gal. However, the absolute value of gravity has deviated from the expected one up to ?g 3mgal. This error occurred, when the reaction at the time of having thrown got across to the interferometer. In order to investigate the problem, I used different combinations of various vibration isolation materials. I expect to find a solution, when the vibration is minimized and fixed with a certain reproducibility. This should improve the accuracy of gravity measurements.

Keywords: geodesy, gravity, absolute gravimeter, throw-up method, earth tide, volcano