

Miniaturization of absolute gravimeter by means of the throw-up method

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When carrying out the field survey of movement of magma in a volcano, change of gravity acceleration provides very important information. We are studying miniaturization of an absolute gravimeter.

Absolute gravimeters are equipment which can measure gravity acceleration in the accuracy of 8 to 9 digits. They can observe not only static gravity field but also groundwater flow and movement of magma which provide significant information of volcanic activities. Absolute gravimeters are accurate, but the equipment is too large and heavy for field observation. As a result, for volcanic observations, a gravity value is usually measured by an absolute gravimeter at a reference point of foot, and then a gravity value of an observation point can be obtained from the gravity difference of a reference point and an observation point measured with the relative gravimeter. Therefore such an observation is troublesome, and time resolution was bad. Furthermore it is dangerous to observe at reference point when a volcano erupts. In order to improve these situations, Araya et al. (2007) has developed a compact absolute gravimeter. If this equipment put to volcanic body, we will find out information when the volcano is active. By observing with absolute gravimeters which are arranged simultaneously as a multi-point network, we will be able to analyze magma activity as 2D gravity changes. By installation to a deep borehole or the deep sea of a plate subduction zone, the seismic activity and plate motion of the deep underground can be investigated using gravity. In conclusion, miniaturization of absolute gravimeters will enable various applications and offer the different observation techniques. Since the present equipment had the problem in rapid measurements because of a fall method, I am studying throw-up method.

Our new equipment throws up a corner cube mirror approximately 3mm high by a flexure-based piezoelectric actuator. It generates small vibration because of short raising distance without using a motor. Current equipment took time to lift the corner cube 10cm up to the release point. By the new one with the throw-up mechanism consecutive measurements become possible within a short time. The equipment need to throw vertically without rotating the corner cube mirror.

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