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Development of a free-fall interferometric gravity-gradiometer for volcanological studies in the Mt Aso area

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To improve our knowledge on the process of volcanic eruptions, it is essential to observe time and spatial variations of sub-surface density in volcanic areas. Gravity measurements, using relative and/or absolute gravimeters, are one of the widely-used methods to observe such subsurface density variations. Measured values of gravity include other effects that are not related to volcanic activities, such as influences of groundwater and diastrophism. These non-volcanic effects have to be removed by careful modellings. However, uncertainties in the modelling make it difficult to accurately identify the volcanic effects in the measured values of gravity. In order to improve the accuracy of the identification of volcanic effects, we propose to carry out measurements of vertical gravity gradients, simultaneously with gravity measurements.

A new type of gravity gradiometer that employs the method of free-fall interferometer had been developed at the Institute for Cosmic Ray Research (ICRR) of the Tokyo University from 2009 to 2012. After confirming the working principle of the gravity gradiometer, its prototype was moved to the Aso Volcanological Laboratory (AVL) of the Kyoto University. Further improvements and trial measurements have been carried out at the AVL so that it can be used for continuous observations in volcanic areas. We report the current status of the development and future prospects of the gravity-gradients measurements in the Mt Aso area.