

Gravity changes around Ito campus, Kyushu University by using relative and absolute gravity measurement

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It is important to monitor the aquifer mass balance between discharge and recharge for the sustainable groundwater usage. The discharge of groundwater causes mass redistributions, which can cause measurable gravity changes. We carried out the repeat hybrid gravity measurements at some fields in order to detect the gravity changes associated with groundwater level changes. We used the instruments for the relative gravity measurement (CG-3M and CG-5 gravimeter: Scintrex Ltd.) and the absolute gravity measurement (A-10 gravimeter: Micro-g LaCoste, Inc.). The A10 absolute gravimeter is a portable absolute gravimeter produced by Micro-g LaCoste Inc. It operates on a 12V DC power supply (i.e. vehicle battery). We can measure the absolute gravity using the vehicle battery at the field.

We started repeat gravity measurement at Ito campus, Kyushu university Fukuoka city, Northern part of Kyushu, Japan, where the instrument is usually maintained, since 2008 in order to assess the A10 gravimeter's accuracy and repeatability. We measured 10 sets at each measurement, and 1 set consists of 100 drops. There are 3 groundwater level monitoring wells near the gravity station. It can be seen that there is a good correlation between gravity changes and groundwater level changes. We confirmed that the instrument is maintained good condition in general, although some bad data was included. It seems that the repeatability of A10 gravimeter is better than 10 micro gal. The A10 absolute gravimeter (Micro-g LaCoste Inc.) was introduced in order to monitor the gravity changes at base observation points since 2008. We observed seasonal gravity change (Maximum change was 26 micro gal), and we compared with the groundwater level changes. There are good correlation between the gravity changes and the groundwater level changes. We calculated the effect of groundwater level changes using Gwater-1D (Kazama et al., 2010). As a result of the calculation, we can explain the gravity seasonal changes were caused by the groundwater level changes. The gravity changes of the base observation were removed from each observation point. We can see the good correlation between the gravity changes and the groundwater level change in the almost observation point. The effect of the construction of the campus awaits future studies.

Keywords: A10 absolute gravimeter, Hybrid gravity measurement, Groundwater level monitoring, Gravity changes