

Absolute gravity measurements in New Zealand

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Although absolute gravimetry based on the measurements of length and time is an ideal tool for monitoring phenomena with long term stability, only a few countries possess absolute gravimeters. New Zealand (NZ) does not possess an absolute gravimeter, and all the absolute gravity measurements so far made were carried out by foreign institutions. Among them, the majority of the measurements, including the NZ first absolute gravity measurement in 1995, were carried out by US or French groups at Christchurch on the way to McMurdo Station in Antarctica.

A remarkable measurement was carried out by Colorado University and Otago University at NZ South Alps in 2000. NZ South Alps locates at the southeastern side of Alpine fault which divides Pacific sea plate and Australian plate. The formation of South Alps was considered to be caused by large scale uplift along the transform fault. Therefore the absolute gravity measurement was aimed at revealing the formation mechanism.

Except the measurements at Christchurch, absolute gravity measurements in NZ had not been carried out for a long time afterwards, particularly, no measurement was carried out in North Island. In February 2015, Geological and Nuclear Science (GNS) and Land Information New Zealand (LINZ), collaborating with Geoscience Australia(GA), were carried out absolute measurements by using FG5-237 of GA at three existing absolute gravity points in South Island and five newly established gravity points in North Island (Stagpoole et al., 2015). In addition, Colorado University and Otago University carried out absolute gravity measurements in South Alps by using FG5-111 during the period of December 2014 and January 2015 after an interval of 15 years (Bilham et al., submitted). As mentioned above, several absolute gravity measurements have been recently carried out. However the results obtained are not enough for the studies, and the importance of the absolute gravity measurements in NZ including the measurements in South Alps is unchanged. Moreover NZ collaborators desire to continue the repeated measurements. Therefore, collaborating with the NZ researcher, we are going to push forward the research along the proposed plan. The following is a summary of the absolute gravity measurements conducted in January and March 2016.

The absolute gravimeter employed in this study was FG5-210 of Kyoto University. It was shipped from Japan in middle of December 2015, finished the import procedure to NZ by the end of December 2015, and derived at the gravity station at Warkworth VLBI observatory of Auckland University of Technology (AUT) on January 11, 2016.

In the case of trouble during the transportation, we divided the measurement schedule into two periods, namely, January and March. In January, we vacuumed the dropping chamber, tested and aligned the instruments, and conducted the measurements until January 16. Although there were some small problems, we finally obtained 33 sets (3300 drops) of data. The preliminary obtained gravity value was only 2.80 μgal larger than that obtained by GA in last year. It suggests the measurement was successful. The instrument was kept in high vacuum condition until March. It will be checked in Warkworth and employed for the measurements at the gravity points in North Island and carried to South Island via Wellington for the measurements in Christchurch and South Alps as well.

In this presentation, we report the results of these measurements and the outline of the future observation plan.

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