

Continuous absolute gravity measurements with FG5 at Syowa Station

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Foreword

The team of the 42nd Japanese Antarctic Research Expedition (JARE 42) conducted the fourth observation of the absolute gravity at Syowa Station. For the measurement this time the portable absolute gravimeter FG5 (#203) was used for the second time since the time of JARE36 six years ago. The authors discuss the results of the continuous gravity observation over a period of about one month.

Summary of the measurement

The absolute gravity measurement project at Syowa Station of Antarctica constitutes a part of the research program of "Phenomenal studies on the global changes through comprehensive geodetic and geophysical observation". Starting back in 1991 at the time of JARE33 it was repeated at the time of JARE34(1992) and JARE36(1994). On the whole continent of Antarctica there are two gravity stations(A) of International Absolute Gravity Base Network (IAGBN), one at Syowa Station and the other at McMurdo Station.

The actual observation took off on December 29, 2000 following the installation and preparation of the equipments, among which a super spring and iodine stabilizing helium neon laser, in particular, required repeated fine adjustments. Data were obtained by the measurements at a fall of every ten seconds, grouping 120 falls as one set. At one time during the process of helium liquefaction of the superconductive gravimeter installed, the observation was interrupted due to a cause undetermined, when the power of the steady frequency and voltage went down. Upon recovery the observation was resumed on January 23, 2001 but again on 26 the system controller went wrong along with the analytical computer, both of which had to be dissembled and packed to be sent to Shirase for repair. The observation ended at this point. The results obtained are as follows:

Number of effective data : 84,802 (737 sets)

Absolute gravity value: 982 524.328 2 ±0/0001 mgal

s.d. : 0.0167 mgal

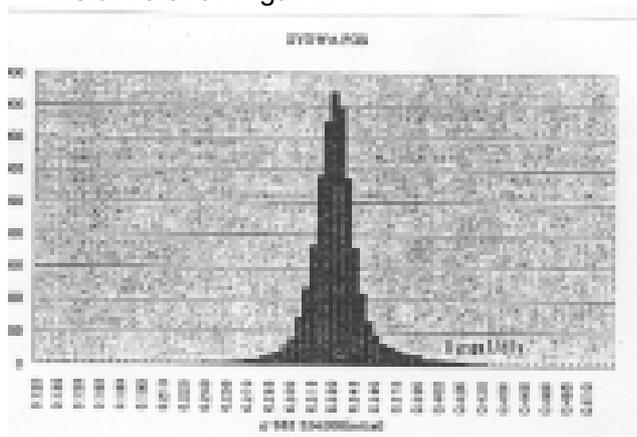


Figure1. Histogram of all the measured values

Chronological changes of gravity

Syowa Station is established on a solid ground of little vibration of any kind. The high-precision continuous observation enables an observation of the gravity change over time.

The chart below gives a comparison of the measured gravity values and those of theoretical ocean tide load. For the computation of the latter, GOTIC2(version 1999.06.09) based on the ocean tide model NAO.99b was used. Since the Syowa Station is close to the ocean, in GOTIC2 smaller mesh maps of 30" and 7.5" were referred to, where the coastal topography is represented in detail.

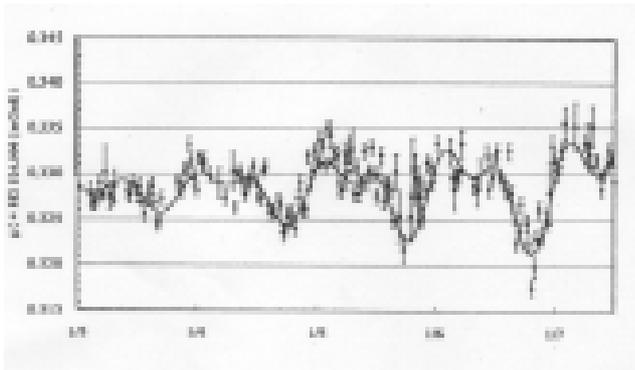


Chart Chronological changes of gravity value (partial excerpt)

Concluding remark

The authors would like to express sincere thanks to the members of 41st and 42nd expedition teams for their support in compiling this paper.