Superconducting gravimeter observation in Cibinong, Indonesia

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We report the procedure of the installation and the current status of the SG observation in Cibinong, Indonesia.

Superconducting gravimeter (SG) is a spring type gravimeter in which the mechanical spring is replaced by a magnetic levitation of a superconducting sphere in the field of superconducting, persistent current coils. SG is to utilize the perfect stability of superconducting currents to create a perfectly stable spring and it is operating at ultralow temperature of 4K, at which every material is quite stable. Therefore SG provides unequaled long term stability so that instrumental noise can be either below geophysical and cultural noise or indistinguishable from it over periods ranging from years to minutes (Goodkind, 1999).

Appling these distinguished characteristics of SG to the studies of various geodynamic phenomena, an international research project, Global Geodynamic Project (GGP) has started since July 1997. At the 2003 IUGG in Sapporo it was officially integrated into the IAG structure as one of the inter-commission projects. The main purpose of GGP is to record the Earth's gravity field with high accuracy at a number of worldwide stations using SGs for the studies of various geodynamic phenomena such as Earth's free oscillations, tides, Chandler wobble as well as the surficial gravity effects of atmosphere, ocean and groundwater.

Japanese contribution to GGP is notable. A globally extended SG network, GGP-Japan, which includes Syowa (Antarctica), Canberra (Australia), Bandung (Indonesia), Ny-Alesund (Norway) as well as three stations in Japan has been established by GGP-Japan. The SG station in Bandung was established by Kyoto University in 1997. It was the unique GGP station in the equatorial region and especially expected to the studies of the phenomena with latitudal dependencies. However, the SG in Bandung was break down due to flooding which occurred in March 2004. Since then, GGP lacks the station in the equatorial region and recommencement of the SG observation in Indonesia has been desired by GGP members in abroad as well.

In these situations, it came out that a SG (CT-022) which was used in Aso Volcanological Laboratory, Kyoto University, could be repaired and used for the SG observation in Indonesia. The estimated coast is almost 1/10 compared to a new SG. On the other hand, BAKOSURTANAL (National Coordinating Agency for Surveys and Mapping) gave us an offer that it could provide facilities for the SG observation in Cibinong. The old SG station in Bandung was completely gone away due to the replacement of the building, and we decided to install the SG in Cibinong. Followings are the major events before the installation:

Jun - Dec., 2007; overhaul of CT-022 at the manufactory (GWR)
Jan. - Aug. 2008; test measurements at Tsukuba Univ.
July - Oct. 2008; construction of the new gravity observation hut at BAKOSURTANAL, Cibinong
Sep. 2008; transportation of the SG from Tsukuba Univ. to BAKOSURTANAL
Sep.-Nov. 2008; test measurements at BAKOSURTANAL
Nov. 2008; installation of the SG in the new gravity observation hut and start the SG observation.

There are still some works to be complete in the time keeping system, data acquisition system, installation of groundwater level meters. Nevertheless the SG is in good health and observation data have been accumulating without troubles. Tidal analysis of the test data shows normal drift characteristics.

The SG observation in Bandung provided the most reliable tidal factors in the equatorial region, also it proved some hydrological properties at the observation site. There are still many interesting problems remained; free oscillation of the Earth, long period tides, gravity variations due to active atmospheric and/or oceanic movements in the equatorial region, gravity changes due to tectonic activities. We expect the SG data contribute to these studies.