Proc. NIPR Symp. Antarct. Geosci., 5, 159, 1991

PRESENT STATUS OF THE SURFACE SHIP GRAVITY MEASUREMENTS ON ICEBREAKER SHIRASE (ABSTRACT)

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Since the advent of icebreaker SHIRASE for Antarctic research in 1983, the gravity measurements have been conducted on board the SHIRASE during the 25th, 27th, 28th, 29th, 30th, and 32nd Japanese Antarctic Research Expeditions (JARE). The ship-borne gravimeters which were employed for these measurements were NIPR-ORI model-I and model-II. Both gravimeters were developed under a coordination between National Institute of Polar Research and Ocaen Research Institute, University of Tokyo. The model-I was employed before JARE-28 and the model-II, which is a newly developed one, was employed after JARE-29. The model-II gravimeter is composed of mostly the same units as those of the model-I, but the specifications of the units were upgraded. As a result the accuracy of the gravity data has been improved with increasing quantity of data obtained. There still remain some problems on the NIPR-ORI model-II gravimeter. It has a rather large sensor drift. The cause of the drift is under investigation, and we hope that the problems will be overcome in the near future.

The course of the cruise is from Harumi back to Harumi, and the obtained-data cover rather wide areas not only around the Japanese Antarctic stations but also along the ship's tracks. The gravity data belonging to JARE-25 were not usable because of much irregularity caused by sensor troubles. The other data were successfully processed to be filed in the final form of gravity anomaly.

The most important part of the data processing is the Eötvös corrections. The accuracy of the Eötvös corrections depends on how accurately the ship's positions can be determined. Since the positions of the SHIRASE were determined by Navy Navigation Satellite System (NNSS), we employed a new processing method by which, using the Bayes type discrete spline function, the ship's positions between successive NNSS observations can be interpolated. Because the method takes the errors of NNSS positioning into consideration, it proved superior to the ordinary methods without the error estimation.

Although the MGD77 format is widely used for the purpose of exchanging marine geophysical data, it is not the best format to store gravity data. Thus we have modified the MGD77 format, say MGD77EX, so that gravity data can be stored effectively. The MGD77EX, which consists of MGD77 parts and additional information, can be easily converted to the original MGD77 format. All the gravity data after JARE-27 are finally converted to the MGD77EX format, and are ready for distribution.

At present, satellite altimeter data are also available for the studies of the marine gravity fields. Altimeter data are suitable for covering a wide area uniformly. Their accuracy and resolution, however, are worse than those of surface ship gravity data. Combined use of both data will become important. In the southern sea, gravity data available are still few. Thus well-planned gravity measurements on board icebreaker SHIRASE should be continued.

(Received February 20, 1991; Revised manuscript May 22, 1991)