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Reprocessing of Shirase shipboarne gravity data

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In order to create consistent data sets of JARE (Japanese Antarctic Research Expedition) shipborne gravity data, we applied drift and offset corrections using the latest satellite altimetric gravity model as the reference for all the data sets so far obtained.

JARE has been conducting gravity measurements on board Ice breaker Shirase since 27th expedition (JARE-27) except JARE-31, 35, 36 and 50. The data sets obtained are divided into two groups, namely those obtained by the former Shirase during JARE27-49 and those obtained by the new Shirase after JARE 51. On board former Shirase, NIPRORI-1 surface ship gravity meter was employed for JARE-27 and 28 and NIPRORI-2 was employed after JARE-29. In addition, several improvements in the navigation system and instruments were conducted during the period.

Konishi et al. (2006) already conducted drift and offset corrections for the data before JARE-46 so that the shipborne data fitted to those of satellite altimetric gravity data of grav.img.11.1 (Sandwell and Smith, 2004). However the data sets after JARE-47 have been left unprocessed and they may contain drift and/or offset errors. On the other hand, after the release of grav.img.11.1, recent satellite altimetric gravity fields have been improved drastically by including CryoSat, Envisat and other satellite data and the newly released EGM2008 Earth gravity model. Therefore, in this study, we carried out drift and bias corrections again for all the shipborne gravity data obtained by JARE using the latest altimetric gravity model of grav.img.20.1 (Sandwell and Smith, 2012).

Practically, following Konishi et al. (2006), we first extracted the gravity values from grav.img.20.1 along the ship tracks, and then compared the values with those of shipborne gravity data. From the comparisons, we found some large discrepancies near the turning points of the ship tracks, also found some large drifts and offsets in the data sets after JARE-47 and even in same data sets before JARE-46.

In order to correct these errors, we first removed the data with large discrepancies, and assuming polynomial functions of time for the drifts, we applied drift and offset corrections for each leg. We will report the details of the data processing, comparison results and the corrected data sets as well.

Keywords: shipborne gravity, JARE, altimeter, drift correction, Ice breaker Shirase