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Investigations on gravity data processing in airborne and shipborne gravimetry

Biao Lu, Franz Barthelmes, Svetozar Petrovic, Christoph Förste, Sinem Ince, and Frank Flechtner
GFZ German Research Centre for Geosciences, Geodesy and Remote Sensing, Potsdam, Germany (foer@gfz-potsdam.de)

Nowadays, airborne and shipborne gravimetry are very important methods to improve our knowledge about the Earth gravity field. The gravimeter Chekan-AM onboard the German High Altitude and Long Range (HALO) aircraft anables gravimetry at hardly accessible places like the polar regions of the Earth. One preparatory campaign on HALO has been carried out over Italy in 2012 to test the performance of the gravimeter Chekan-AM onboard such a jet aircraft. Specifically, the processing strategy of data achieved with this gravimeter has been studied. To investigate how future airborne gravity campaigns could be designed over regions like Antarctica, a dedicated flight track during the GEOHALO experiment had been run two times at different heights and velocities of the aircraft. These two flight paths are investigated and the results show that the equipment worked well also at higher altitude and speed. Comparisons with the global gravity field model EIGEN-6C4 and an analysis of the gravity differences at the crossover points show that the accuracy of this campaign is approximately 1 mGal. For geodetic purpose, a local geoid is computed by combining point mass modelling and the remove-compute-restore technique which is also taking into account the topography effect.

Shipborne gravimetry can provide us high accurate and high resolution information of the Earth gravity field. Four campaigns of shipborne gravimetry by using the Chekan-AM on different research vessels have been conducted within the framework of the ongoing project “Finalising Surveys for the Baltic Motorways of the Sea” (FAMOS) since 2015. It turned out that problems due to influences of stormy sea and an abnormal drift behavior of the instrument at some parts of these campaigns need some additional investigations. The current processing of these gravity campaigns results in RMS of gravity differences at crossover points of about 0.5 mGal. Further investigations will continue to improve these results. Lastly, a high quality regional geoid will be built in the future based on the gravity data collected in this project and already existing gravity data.