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Gravity field determination around the Japanese Antarctic stations by combining GOCE and in-situ gravity data

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GOCE (Gravity field and steady-state Ocean Circulation Explorer) satellite launched in March 2009 by ESA (European Space Agency) aims at improving static gravity fields, in particular at short wavelengths. In addition to its low-altitude orbit (250km), the sensitive gravity gradiometer installed is expected to reveal 1 mgal gravity anomaly and 1cm geoid at the spatial resolution of 100km (half wavelength). On the other hand, due to instrumental drifts, lack of reference points, and other reasons, the accuracy of in-situ gravity data (land, surface ship and airborne gravity data) is decreasing toward the longer wavelength more than several tens km. In particular in Antarctica where very few gravity reference points are available, the long wavelength accuracy and/or consistency among the data sets are quite limited. The Japanese Antarctic Research Expedition (JARE) has been conducting in-situ gravity measurements around the Japanese Antarctic stations for a long period. These measurements also suffered from such bad influence and they cause large errors in the long wavelength gravity fields, and, consequently, errors in geophysical and geodetic applications. This study aims at improveing the accuracy of the JARE gravity data using GOCE gravity models (level 2 EGMs). There are three different approaches for estimating the GOCE gravity models, namely, direct solution (DIR), time-wise solution (TIM) and space-wise solution (SPW). Among these, TIM never uses any a-priori information other than GOCE. Therefore we mainly employed TIM models (RL 1-3). We also employed EGM2008 as a reference. We show the comparisons between the gravity models and each of in-situ gravity data sets, and a preliminary result of the improved gravity field around Japanese Antarctic stations.