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Gravity anomalies and ice mass movements around the Japanese Antarctic stations in East Antarctica

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The region from Dronning Maud Land to Enderby Land in East Antarctica, where a Japanese Antarctic station Syowa is located, is a key area for investigating the formation of Gondwana, because reconstruction models suggest a junction of the continents locates in the area. There is Shirase Glacier, one of the major glaciers in Antarctica, which controls the ice sheet floor of the area. Moreover, recent investigations using GRACE, IceSat/Envisat, and other geodetic and/or glociological measurements show the mass increase in the area. Therefore the area is also important for glaciological and GIA studies.

To contribute to these investigations as well as enhancing gravimetric networks, the Japanese Antarctic Research Expedition (JARE) has been conducting gravity measurements in the area for a long time. Combining these in-situ gravity data and GOCE EGMs recently released, gravity fields in the area have been newly determined by means of Least Squares Collocation. In addition, JARE-55 (the 55th JARE) conducted the absolute gravity measurements at a gravity base point on the Seal rock near the Asuka station in the Sor-Rondane Mountains. There results have been reported in the previous JpGU meetings and other opportunities.

In the area, JARE-28 conducted gravity measurements along a N-S traverse line from Breid bay to Sor-Rondane Mountains via Asuka station. The absolute gravity value obtained by JARE-55 was employed to reevaluate the gravity anomalies and we conducted detailed analyses of their characteristics by comparing them with the newly determined gravity anomalies, GOCE EGMs and the basement topography of the ice sheet. The result suggests that the lower gravity anomalies between the coastal area and the mountains would be due to the thick ice sheet accumulated in the area. The same structure can be found in a wide area from Dronning Maud Land to Enderby Land, and it is coincident with the area where the ice mass has increased. Although the reason is not obvious, there might be a relation between the ice sheet flow and the basement topography, in addition to the relation between the snowfall and the mountain topography.

Keywords: gravity anomalies, ice mass movements, Glacial Isostatic Adjustment, absolute gravity measurements, GOCE