

An interpretation of the mass trend revealed by GRACE in Enderby Land, Antarctica

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Satellite gravity mission GRACE (Gravity Recovery and Climate Experiment) provides the information of the temporal mass variation on the Earth as the monthly gravity field solutions, and enables us to monitor the ice sheet mass changes. Especially, GRACE can reveal continental scale total mass variations, which closely connect to the global sea level changes. On the contrary, we have to distinguish various sources of the mass variations to derive the ice sheet mass changes from the GRACE data. In Antarctica, it is well known that Post Glacial Rebound (PGR) also causes large mass trend.

In Antarctica, 3 areas with striking interannual mass trend have been revealed by the GRACE monthly solutions. Among them, the large positive trend in Enderby Land, East Antarctica (50-60E) has not been well interpreted yet. As Chen et al. (2006) pointed out, it was not consistent with the ones estimated from the recent surface mass balance nor the latest ice model. They suggested that unquantified snow accumulation or, more likely, unmodelled PGR would be the source of the trend.

To avoid various estimation errors and to derive reliable ice sheet mass trend, understanding of the trend sources is essentially important. Therefore, in this study, we mainly concentrate our discussion on the sources of the regional mass trend in Enderby Land. We compare the GRACE mass trend with landwater and PGR estimation by the models, Ice Cloud and land Elevation Satellite (ICESat) laser altimeter data and in-situ surface snow accumulation data measured with snow-stakes method by Japanese Antarctic Research Expedition (JARE), discuss the sources of the mass trend in the region and conclude that the main part of the mass trend can be explained by the snow accumulation.