Present-day crustal motion and gravity change in East Antarctica: implications for the mantle viscosity and Holocene Antarctic Ice Sheet change inferred from GIA modeling

*Jun'ichi Okuno[1,2], Koichiro Doi[1,2], Yuichi Aoyama[1,2], Takeshige Ishiwa[1], Akihisa Hattori[2], Yoichi Fukuda[3]

1. National Institute of Polar Research, 2. SOKENDAI, 3. Kyoto University

Geodetic and geomorphological observations in the coastal part of Antarctica indicate the uplift trend associated with the removal mass of the Antarctic Ice Sheet (AIS) in the last deglaciation. The numerical calculations of crustal motion derived from the glacial isostatic adjustment (GIA) modeling have played the role of inferring the ice mass change of AIS from observations related to solid Earth deformation. The deglaciation histories of the AIS inferred from the comparisons between the geomorphological sea-level records, and GIA modeling shows the monotonic Holocene retreat for the AIS (e.g., Whitehouse et al., 2012). However, GNSS observations in some regions in the coastal part of Antarctica cannot be explained the amplitudes of the uplift by only glacial rebound due to the last deglaciation of the AIS. Also, recent studies (e.g., Kingslake et al., 2018) concerning bedrock topography in the margin of AIS inferred that some portions of the ice sheet might have re-advanced after retreating behind the present-day margin in mid-to-late Holocene. Therefore, this re-advance of AIS in Holocene may be caused to arise the mismatch between GNSS observations and numerical predictions. On the other hand, GNSS observations include not only the components of the GIA due to the last deglaciation and also elastic deformation due to present-day surface mass balance (e.g., Hattori et al., 2018). Similarly, this effect could cause a difference between the GNSS observations and the GIA calculations. In this presentation, we will show the crustal deformation rates and gravity changes calculated by the GIA modeling using the previously published deglaciation histories and the comparisons with these observations obtained from East Antarctica. We intend to discuss the influences of AIS mass changes and choice of mantle viscosity profile on the geodetic measurements in East Antarctica.

Keywords: Glacial Isostatic Adjustment, East Antarctica, GNSS, gravity change

