Effect of the glacial rebound on elevation changes deduced from the ice core records in Greenland ice sheet

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It is important to investigate the behavior of the Greenland ice sheet in Quaternary for elucidating the future sea-level rise due to glacial melting. In order to reconstruct the elevation changes of the Greenland ice sheet throughout the Holocene, $\delta^{18}O$ data obtained from ice cores were recently used (Vinther et al., 2009). Vinther et al. (2009) also indicated that the Greenland ice sheet elevation changes inferred from ice core records show a significantly greater elevation reduction than those output from ice sheet models. Generally, 3D ice sheet modelling incorporates the process of the bedrock deformation using local isostasy model (e.g., Abe-Ouchi et al, 2007). This assumption represents the bedrock change in the glaciated regions well, however, the local isostasy model cannot describe the crustal deformation induced by distant ice load changes. Therefore, we use the glacial isostatic adjustment (GIA) model to calculate the precise crustal deformation for reconstruction of the elevation changes of the Greenland ice sheet. The uplift correction based on the GIA model reduces the data-model differences of the elevation changes at GRIP, NGRIP, DYE-3 and Camp Century. In addition, the crustal deformation in the western part of Greenland associated with the non-Greenland ice loads is large. These results are consistent with the recent study (Simpson et al. 2009). In this presentation, we introduce the crustal deformation and elevation change inferred from the GIA model and ice sheet histories of Northern Hemisphere recently presented by IcIES (Abe-Ouchi et al., 2013), and determine the dependence of the Earth structure and influence of the previous glacial cycles on the crustal deformation in Greenland.

References

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