Glacial isostatic adjustment simulations based on the ice sheet histories derived from 3D thermo-mechanical ice sheet model IcIES

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We demonstrate the predictions of relative sea-level change and geodetic signals due to glacial isostatic adjustment (GIA) for about 400 kyrs. We use the ice sheet histories derived from the 3D thermo-mechanical ice sheet model (Ice Sheet for Integrated Earth system Studies: IcIES developed by Abe-Ouchi and Saito). Recently, Abe-Ouchi et al. (2013) showed the precise reconstruction of the Northern Hemisphere ice sheets for about 400 kyrs using comprehensive climate and ice-sheet models (MIROC-IcIES). In addition, the 100 kyr periodicity of glacial cycles was represented by numerical simulations based on the MIROC-IcIES, and indicated that the effects of insolation and internal feedbacks between the climate, the ice sheets and the lithosphere–asthenosphere system are important factors for 100 kyr periodicity. On the other hand, the observations of relative sea-level variation in late Quaternary and gravity change obtained by GRACE in polar region are dominantly associated with the GIA process. These observations usually use to constrain the change of ice sheet distributions in GIA studies. However, ice sheet histories as an input parameter of the GIA modelling are difficult to determine based on the GIA model only, because there is the trade-off between ice history and viscosity structure of the Earth (e.g., Lambeck et al., 2010). In this presentation, we investigate the dependence of viscosity structure of the Earth on the geological and geophysical signals predicted by GIA model using the glaciologically consistent model of Northern Hemisphere ice loading reconstructed by IcIES.

References

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