EGU21-13479
https://doi.org/10.5194/egusphere-egu21-13479
EGU General Assembly 2021

3D glacial-isostatic adjustment models using geodynamically constrained Earth structures

Meike Bagge[1], Volker Klemann[1], Bernhard Steinberger[1,2], Milena Latinović[1,3], and Maik Thomas[1,3]
[1]GFZ Potsdam, Potsdam, Germany
[2]University of Oslo, Centre for Earth Evolution and Dynamics (CEED), Oslo, Norway
[3]Freie Universität Berlin, Berlin, Germany

The interaction between ice sheets and the solid Earth plays an important role for ice-sheet stability and sea-level change and hence for global climate models. Glacial-isostatic adjustment (GIA) models enable simulation of the solid Earth response due to variations in ice-sheet and ocean loading and prediction of the relative sea-level change. Because the viscoelastic response of the solid Earth depends on both ice-sheet distribution and the Earth's rheology, independent constraints for the Earth structure in GIA models are beneficial. Seismic tomography models facilitate insights into the Earth's interior, revealing lateral variability of the mantle viscosity that allows studying its relevance in GIA modeling. Especially, in regions of low mantle viscosity, the predicted surface deformations generated with such 3D GIA models differ considerably from those generated by traditional GIA models with radially symmetric structures. But also, the conversion from seismic velocity variations to viscosity is affected by a set of uncertainties. Here, we apply geodynamically constrained 3D Earth structures. We analyze the impact of conversion parameters (reduction factor in Arrhenius law and radial viscosity profile) on relative sea-level predictions. Furthermore, we focus on exemplary low-viscosity regions like the Cascadian subduction zone and southern Patagonia, which coincide with significant ice-mass changes.