

Sea-level changes and crustal deformations in Greenland based on the loading histories derived from 3D ice sheet model

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We study the implications of a recently published ice sheet history in Northern hemisphere and Greenland ice sheet, derived from the 3D thermo-mechanical ice sheet model (Ice Sheet for Integrated Earth system Studies: IcIES developed by Abe-Ouchi et al. 2013). To characterize the effects of this glaciologically consistent ice sheet history, we examine the time-variations of various geophysical quantities in response to the ice and water mass redistributions. They include vertical uplift and subsidence, global patterns of sea-level change, and regional sea-level variations along the coasts of Greenland. Relative sea-level (RSL) changes in response to past ice and water load variations are obtained solving the sea-level equation, which accounts for the crustal deformation due to glacio-isostatic adjustment (GIA). In this study, we report the predictions of RSL and geodetic signals in Greenland induced by GIA process based on the glaciologically and climatologically consistent ice loading history. And also, we show the temporal and spatial characteristics of predicted geophysical signals in Greenland in comparison with these observations. We expect that using the ice sheet histories derived from IcIES as input in GIA model may put better constraints on postglacial rebound and current rates of crustal deformation.

Keywords: Greenland ice sheet, relative sea-level change, crustal deformation, isostasy