



A study of Glacial Isostatic Adjustment in Greenland

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Glacial isostatic adjustment (GIA) is the viscoelastic response of the Earth caused by changes in ice loads during glaciations and deglaciations. Knowledge of the GIA signal is particularly important in cryospheric applications of satellite gravimetry and altimetry, where the origin of the observed changes must be separated into past and present response. Modeling the present-day GIA signal must include knowledge of both the ice loading history and the Earth's rheology. Neither of these models are well constrained in Greenland, and hence the GIA estimates here are uncertain. In this paper we implement a loading history of the Greenland Ice Sheet derived from the ice sheet model SICOPOLIS, and we study the present-day gravity changes and vertical crustal motion derived from using this ice history. The results are compared with those derived from the widely used ICE-5G ice history. For calculation of present day GIA signal, we assume the Earth's rheology to be a simplified version of the VM2 Earth model. The calculated GIA signal in Greenland, derived from the two ice loading histories are compared with geodetic measurements of vertical crustal motion from GPS time series and with repeated gravity measurements in Greenland. The free code SELEN is used for calculating the effects of the Earth model and different ice loading histories. This study is performed within the Working Group 4 of the ESF COST Action ES0701 "Improved constraints on models of Glacial Isostatic Adjustment".