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Glacial-isostatic adjustment in North America inferred from GRACE

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We perform a joint inversion of the gravity-field solutions from the Gravity Recovery and Climate Experiment (GRACE) for glacial-isostatic adjustment (GIA) over North America and present-day ice-mass change in Alaska and Greenland. First, we decompose the time series of Stokes potential coefficients recovered within the GRACE mission into an annual and semi-annual oscillating components, as well as into an offset and a linear trend. To reduce noise in the GRACE data, we test the statistical significance of the linear trend in each time series, and confine our investigations to the subset of GRACE coefficients with statistically reliable linear trends. Then, we adjust a forward model consisting of the signals due to GIA and present-day ice mass changes, such that the difference between GRACE data and the forward model is minimized. We determine the Alaskan and Greenlandic contributions to sea-level change from the adjusted ice-mass change models. The residual misfit over the GIA-dominated region around the Hudson Bay is interpreted with regard to the mantle viscosities beneath North America by applying forward model calculations of the GIA signal in this region. We compare our results based on satellite gravimetry with the constraints derived from sea-level indicators, absolute gravimetry, tide-gauge stations and GPS, and show their sensitivity to the GRACE release considered, as well as to the glacial history underlying the GIA forward model.