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## The influence of LIA-induced viscoelastic deformations on geodetic observations in Greenland

The Greenland Ice Sheet (GrIS) is currently undergoing substantial mass loss, with major consequences for both the Earth system and human societies, including a significant contribution to the ongoing acceleration of global mean sea level rise. Accurately estimating the GrIS mass balance therefore represents a major focus of current research. However, it remains challenging and, to date, still imprecise.

One of the main reasons is Glacial Isostatic Adjustment (GIA) - the viscoelastic response of the solid Earth to the growth and decay of ice sheets at its surface. Because geodetic observations are among the most used tools to quantify ice mass changes, robust estimates of GIA corrections are essential for the accurate interpretation of these measurements.

This study focuses on deformations induced by ice mass loss since the Little Ice Age (LIA) and their impact on present-day vertical land motion inferred from GNSS observations. Using a reconstructed history of the GrIS and its peripheral glaciers, we model LIA-driven viscoelastic deformations assuming different Earth models, exploring a range of values for two rheological parameters: the lithosphere thickness and the upper mantle viscosity. These simulations, combined with corrections for GIA associated with the last glacial maximum and the elastic response to contemporary ice melting, are compared against GNSS observations. Our results explain the uplift rates at most of the GNSS stations and are consistent with existing literature, with LIA-induced vertical land motion best accounted for by a 160 km thick lithosphere and an upper mantle viscosity of  $2.73 \times 10^{19}$  Pa·s.

As we explore the rheological structure beneath Greenland, we pay particular attention to the southeastern region, where uplift rates are unusually high. Southeastern Greenland exhibits significant lateral variations in mantle viscosity and lithospheric thickness, likely related to the track of soft material left by the Iceland hotspot. Our simulations support the presence of a low viscosity/thin lithosphere zone in this region, and we further investigate its effects by adding to our modeling an asthenospheric layer within the upper mantle.

Overall, this study demonstrates that deformations induced by the LIA constitute a non-negligible contribution to present-day geodetic signals. Accounting for this component is therefore essential to reduce uncertainties in ice mass balance estimates and to better understand Greenland's contribution to global sea level rise.

### Speaker information

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