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Modelling near field regional uplift patterns in West Greenland/Disko Bay with plane-Earth finite element models.

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Relative sea level data, primarily obtained through isolation basin analysis in western Greenland and on Disko Island, indicates asynchronous rates of uplift during the Early Holocene with larger rates of uplift in southern Disko Bay compared to the northern part of the bay. Similar short-wavelength variations can be inferred from the Holocene marine limit as observations on the north and south side of Disko Island differ by as much as 60 m.

While global isostatic adjustment models are needed to account for far field
contributions to the relative sea level and for the calculation of accurate ocean functions, they are generally not suited for a detailed analysis of the short-wavelength uplift patterns observed close to present ice margins. This is in part due to the excessive computational cost required for sufficient resolution, and because these models generally ignore regional lateral heterogeneities in mantle and lithosphere rheology.

To mitigate this problem, we perform sensitivity tests to investigate the effects of near field loading on a regional plane-Earth finite element model of the lithosphere and mantle of the Disko Bay area, where the global isostatic uplift chronology is well documented. By loading the model area through detailed regional ocean function and ice models, and by including a high resolution topography model of the area, we seek to assess the isostatic rebound generated by surface processes with wavelengths similar to those of the observed rebound signal. We also investigate possible effects of varying lithosphere and mantle rheology, which may play an important role in explaining the rebound signal. We use the abundance of relative sea level curves obtained in the region primarily through isolation basin analysis on Disko Island to constrain the
parameters of the Earth model.