New method relates Greenland ice sheet changes to sea-level rise

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Climate models are not yet able to include full models of the Greenland and Antarctic ice sheets and to dynamically simulate how ice sheet changes influence sea level. Early schemes failed to accurately account

for both mass increase due to snowfall and mass loss due to snow melt. These increases and losses depend on ice sheet elevation and region. A new method that includes the effects of elevation and region was developed using a detailed regional model of the Greenland ice sheet.

Using the new scheme on different models with different climate warming conditions , developed jointly by several ice sheet research groups, including two funded by the U.S. Department of Energy, improves the ability of the models to assess sea-level rise. The results provide insights to guide ongoing development of fully dynamic coupled ice sheet models.

The team used the new scheme in five ice sheet models and forced them with climate warming conditions taken from two different climate models. Including the elevation effects in the model increases the estimated sea-level rise by a small but significant amount (5% enhancement of melt by 2100 and 10% by 2200 for a climate warming scenario). By 2100, the choice of driving climate model conditions dominates the uncertainty, but by 2200, the uncertainty in the ice sheet model and the elevation scheme are larger.

More information: "Probabilistic parameterisation of the surface mass balance–elevation feedback in regional climate model simulations of the Greenland ice sheet." *The Cryosphere* 8, 181–194 (2014a). DOI: 10.5194/tc-8-181-2014

"Effect of uncertainty in surface mass balance elevation feedback on projections of the future sea level contribution of the Greenland ice sheet—Part 2: Projections" *The Cryosphere* 8, 195–208 (2014b). DOI: 10.5194/tc-8-195-2014