Geophysical Research Abstracts
Vol. 21, EGU2019-13938, 2019
EGU General Assembly 2019
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Sensitivity of ice loss to variations in the flow law

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The Greenland ice sheet is losing mass at an accelerating rate. Up to 60% of the overall mass loss in the past decades has been attributed to changes in climatic mass balance, while the remaining 40% were due to an increase in dynamic discharge. The flow of ice plays a key role in both processes: on the one hand, ice is transported to the grounding line and discharged into the ocean. On the other hand, ice flow transports mass from thicker and thus colder regions to ablation zones, where the ice is subject to increased melting.

Ice sheet models often use a standard parametrization for the flow of ice, called *Glen's flow law* $\dot{\epsilon} = A_0 \exp\left(-\frac{Q}{RT}\right)$. However, uncertainties in both the functional form and the empirically derived parameters of this parametrization are rarely taken into account in sea-level projections.

Here, we study the effect of uncertainties in the flow exponent n and the activation energy Q on projected ice loss under global warming. We present results for an idealized flowline setup as well as simulations of the Greenland ice sheet with the Parallel Ice Sheet Model. We find that variations of the parameters within the uncertainty ranges may lead to a 150% increase in ice loss in the idealized setup and over 30% increase in mass loss of the Greenland ice sheet.