



Ensemble simulations of Greenland outlet glaciers into the 21st century

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Greenland ice sheet contribution to sea level rise can be partitioned between increased surface melting and enhanced dynamic discharge in the ocean, via its outlet glaciers. Marine-terminating, outlet glaciers are challenging to include in conventional Greenland-wide ice sheet models because of the large variation in scale between model grid size (typically 10 km) and outlet glacier width (typically 1-5km), making it a subgrid scale feature. A possible approach to tackle this problem is to use one-dimensional flowline models for the individual glaciers (e.g. Nick et al., 2013, Nature), as used in the IPCCAR5, but data are scarce and results are sensitive to model formulation (Enderlin et al 2013a,b, The Cryosphere).

Here, we perform an extensive uncertainty analysis of projections into the 21st century with a flowline model by generating an ensemble of simulations for some of the largest Greenland outlet glaciers. Geometry, boundary conditions and forcing are systematically varied within the range of observational uncertainty and to reflect our physical understanding of processes, while remaining consistent with present-day geometry and observed changes. Dominant sources of uncertainty are analyzed and compared between the glaciers.