



Sensitivity experiments with a one-dimensional coupled plume - iceflow model

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Over the last few decades Greenland Ice sheet mass balance has become increasingly negative, caused by enhanced surface melting and speedup of the marine-terminating outlet glaciers at the ice sheet margins. Glaciers speedup has been related, among other factors, to enhanced submarine melting, which in turn is caused by warming of the surrounding ocean and less obviously, by increased subglacial discharge. While ice-ocean processes potentially play an important role in recent and future mass balance changes of the Greenland Ice Sheet, their physical understanding remains poorly understood.

In this work we performed numerical experiments with a one-dimensional plume model coupled to a one-dimensional iceflow model. First we investigated the sensitivity of submarine melt rate to changes in ocean properties (ocean temperature and salinity), to the amount of subglacial discharge and to the glacier's tongue geometry itself. A second set of experiments investigates the response of the coupled model, i.e. the dynamical response of the outlet glacier to altered submarine melt, which results in new glacier geometry and updated melt rates.