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Modelling the outlet glaciers terminating in Godthåb fjord

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The mass loss of the Greenland ice sheet is mainly caused by direct melting on the surface and ice flow through the numerous outlet glaciers. The largest outlet glaciers, like Jabobshavn Isbræ, are studied in great detail, however, processes leading to their behaviour such as calving and basal melting are not well understood.
In this study we focus on the glaciers terminating in Godthåb fjord, where the main contributor is the outlet glacier Kangiata Nunaata Sermia (KNS). The fjord is unique considering several outlet glaciers terminate in the complex fjord system contributing to the total fresh water flux into the fjord.

Here, we aim to describe the present behaviour of KNS. The key parameters are a detailed fjord bathymetry and bedrock topography underneath the terminus of the glacier, recently acquired by the Greenland Climate Research Centre and CReSIS respectively.

The parallel ice sheet model (PISM, developed at UAF) is used for the regional modelling applied to the identified KNS drainage basin. Recently, PISM demonstrated its regional modelling capability on the largest outlet glacier Jakobshavn Isbræ.
Initially, PISM is used with untuned parameters on a 5 km grid with standard SEARISE forcing. The results show that PISM is able to model the surface velocity pattern of KNS that are sufficiently in agreement with InSAR observations. Hereafter, PISM is forced with HIRHAM high resolution regional climate model data provided by DMI.

Combining the known geometry and the HIRHAM output, PISM will provide a accurate model of the region. It can support the melt water estimate that enters the fjord as fresh water, which can be compared to the fjord model and comprehensive observations.

This study is conducted in affiliation with the Greenland Climate Research Centre in Nuuk.