EGU21-12417
https://doi.org/10.5194/egusphere-egu21-12417
EGU General Assembly 2021

Ice sheet response to sub-shelf melt rates in coupled and uncoupled peri-Antarctic ice-sheet model simulations

Lars Zipf[1], Charles Pelletier[2], Konstanze Haubner[1], Sainan Sun[1], and Frank Pattyn[1]
[1]Université libre de Bruxelles, Laboratoire de Glaciologie, Bruxelles, Belgium
[2]UCLouvain, Earth and Life Institute, Centre de Recherches sur la Terre et le Climat Georges Lemaître, Louvain-la-Neuve, Belgium

Sub-shelf melting is the main driver of Antarctica's ice sheet mass loss. However, sub-shelf melt rate parameterizations for standalone ice models lack the capability to capture complex ocean circulation within ice shelf cavities. To overcome drawbacks of standalone models and to improve melt parameterizations, high resolution coupling of ice sheet and ocean models are capable of hindcasting past decennia and be compared to observations.

Here, we present first results of a hindcast (1985-2018) of the new circumpolar coupled Southern Ocean – Antarctic ice sheet configuration, developed within the framework of the PARAMOUR project. The configuration is based on the ocean and sea ice model NEMO3.6-LIM3 and the ice sheet model f.ETISh v1.7. The coupling routine facilitates exchange of monthly sub-shelf melt rates (from ocean to ice model) and evolving ice shelf cavity geometry (from ice to ocean model).

We investigate the impact of the coupling frequency (more precisely, the frequency of updating the ice shelf cavity geometry within the ocean model) on the sub-shelf melt rates and its feedback on the ice dynamics. We further compare the sub-shelf melt rates of the coupled setup to those of the standalone ice sheet model with different sub-shelf melt rate parametrizations (ISMIP6, plume, PICO, PICOP) and investigate the sensitivity of the response of the ice sheet for the different basal melt rate patterns on decadal time scales.