

Northumbria Research Link

Citation: Zipf, Lars, Pelletier, Charles, Haubner, Konstanze, Sun, Sainan and Pattyn, Frank (2021) Ice sheet response to sub-shelf melt rates in coupled and uncoupled peri-Antarctic ice-sheet model simulations. In: EGU General Assembly 2021 : Gather Online, vEGU21, 19-30 Apr 2021, Virtual.

URL: <https://doi.org/10.5194/egusphere-egu21-12417>
<<https://doi.org/10.5194/egusphere-egu21-12417>>

This version was downloaded from Northumbria Research Link:
<http://nrl.northumbria.ac.uk/id/eprint/47255/>

Northumbria University has developed Northumbria Research Link (NRL) to enable users to access the University's research output. Copyright © and moral rights for items on NRL are retained by the individual author(s) and/or other copyright owners. Single copies of full items can be reproduced, displayed or performed, and given to third parties in any format or medium for personal research or study, educational, or not-for-profit purposes without prior permission or charge, provided the authors, title and full bibliographic details are given, as well as a hyperlink and/or URL to the original metadata page. The content must not be changed in any way. Full items must not be sold commercially in any format or medium without formal permission of the copyright holder. The full policy is available online: <http://nrl.northumbria.ac.uk/policies.html>

This document may differ from the final, published version of the research and has been made available online in accordance with publisher policies. To read and/or cite from the published version of the research, please visit the publisher's website (a subscription may be required.)



Northumbria
University
NEWCASTLE



UniversityLibrary

EGU21-12417

<https://doi.org/10.5194/egusphere-egu21-12417>

EGU General Assembly 2021

© Author(s) 2021. This work is distributed under the Creative Commons Attribution 4.0 License.



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

Lars Zipf¹, Charles Pelletier², Konstanze Haubner¹, Sainan Sun¹, and Frank Pattyn¹

¹Université libre de Bruxelles, Laboratoire de Glaciologie, Bruxelles, Belgium

²UCLouvain, 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.