Investigating the climate predictability in the Southern Ocean using global and regional coupled models

E. Moreno-Chamarro[1], D. Verfaillie[1,2], H. Goosse[2], P. Ortega[1], T. Fichefet[2], F. Massonnet[2], F. Klein[2], C. Pelletier[2], and G. Van Achter[2]

[1] Earth Sciences Dept, Barcelona Supercomputing Center (BSC), Barcelona, Spain

[2] Université catholique de Louvain (UCL), Earth and Life Institute (ELI), Georges Lemaître Centre for Earth and Climate Research (TECLIM), Louvain-la-Neuve, Belgium

EGU 2020, Session CL3.2 - *6 May 2020*

PARAMOUR

EOS THE EXCELLENCE OF SCIENCE

fnrs | fwo

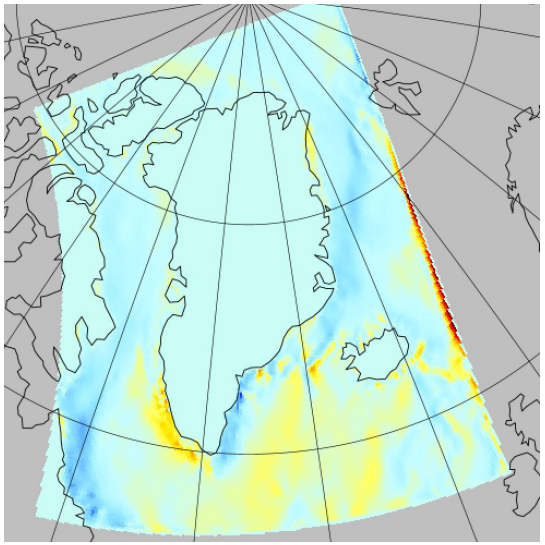
The PARAMOUR project (2019-2022)

Decadal Predictability and vAriability of polar climate: the Role of AtMosphere-Ocean-cryosphere mUltiscale inteRactions

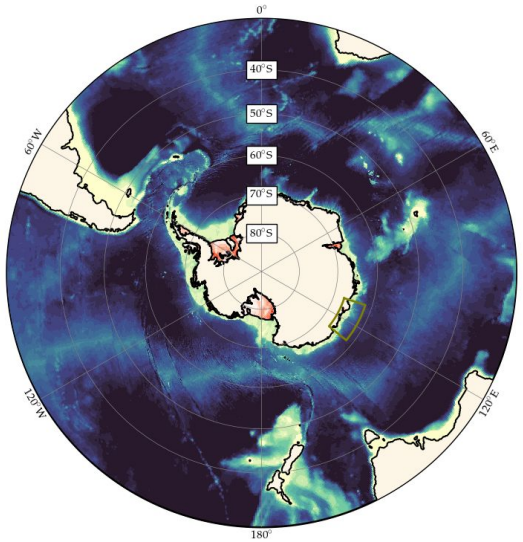
Main goals: 1. reveal fundamental drivers of **climate variability**
2. assess **decadal predictability** in polar regions

→ Using **coupled atmosphere-ocean-sea ice-ice sheet regional climate models (RCMs)** driven by global climate models (GCMs) over **3 domains**

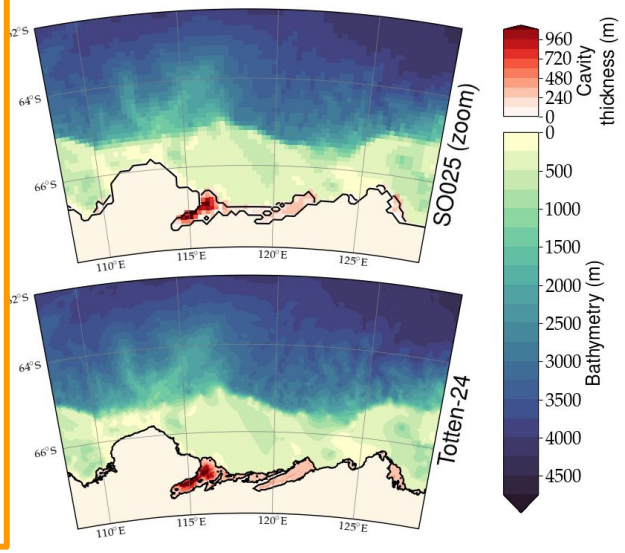
Greenland & N. Atlantic



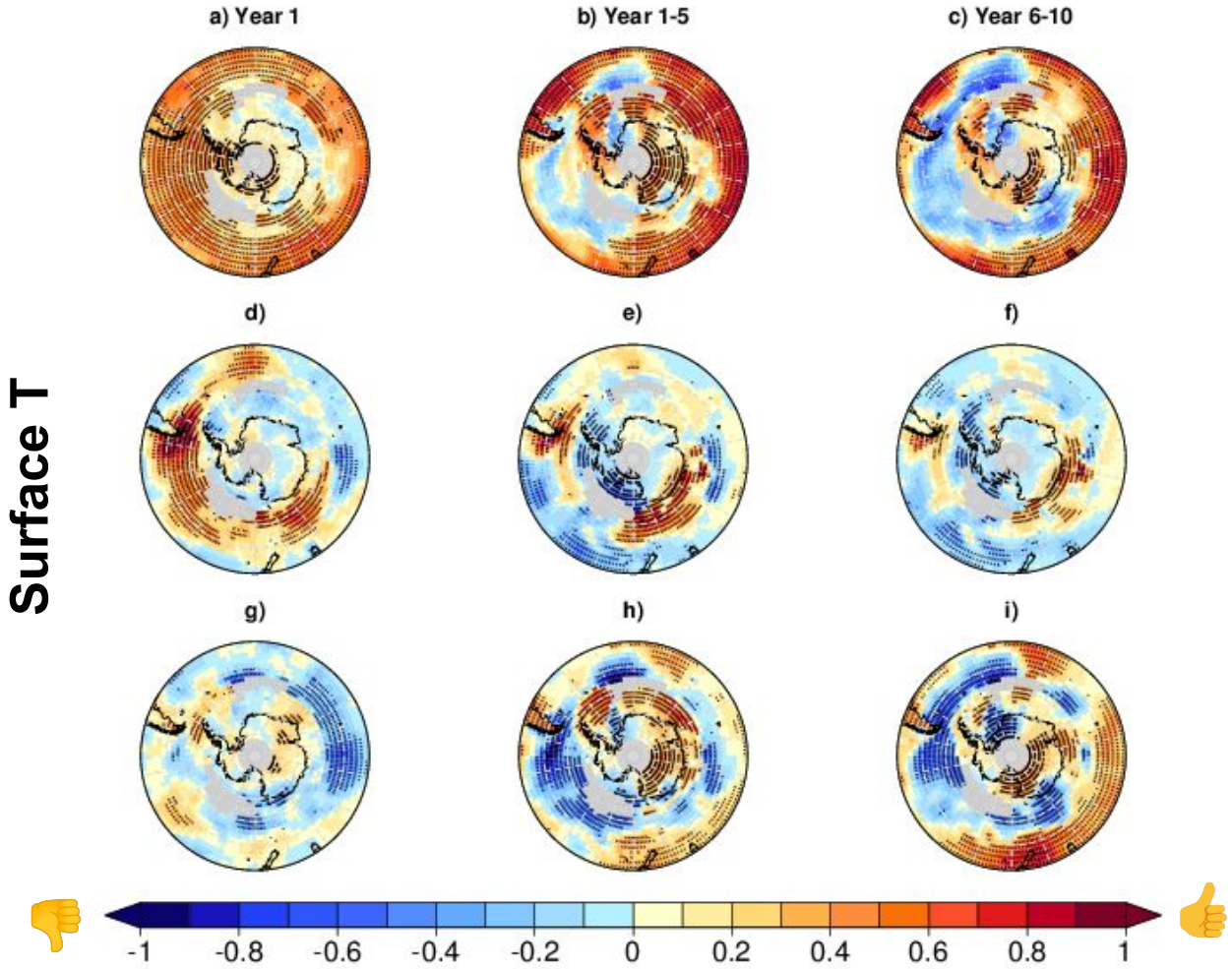
Southern Ocean & Antarctica



Totten Glacier



Results: predictability in the EC-Earth GCM (DCPP)



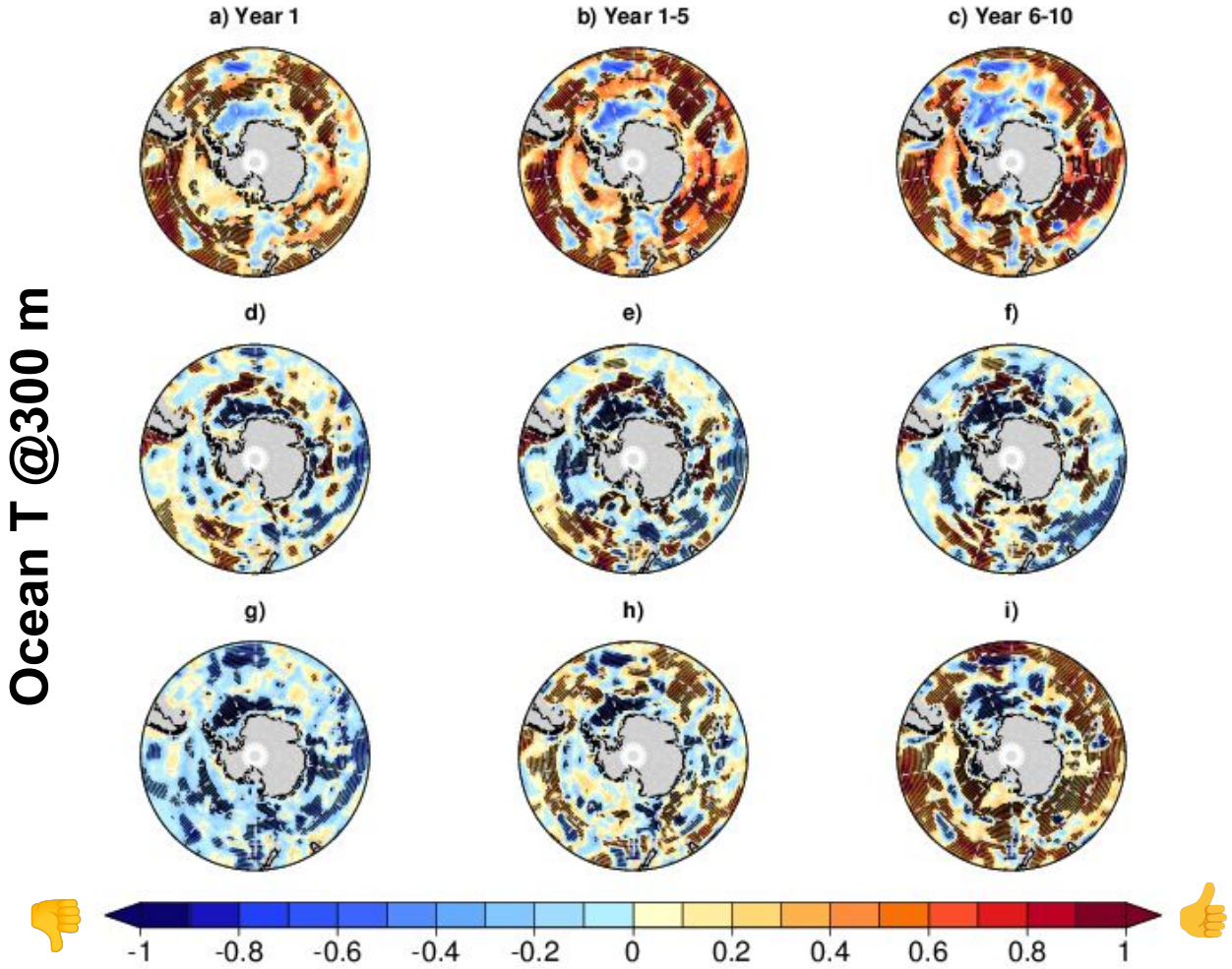
→ **significant skill** in some regions, also for long forecast times

→ some **added-value** of DCPP over historical runs

→ some **skill beyond persistence**, especially for long forecast times

Anomaly Correlation Coefficient (ACC) of model ensemble mean vs GHCN-ERSST-GISS surface temperature (combined SST-SAT) for the Southern Ocean (south of 40°S) evaluated over the period 1961-2018 using annual means. a-c) ACC of DCPP. d-f) ACC difference of DCPP with the historical simulations (DCPP-historical). g-i) ACC difference of DCPP with a simple persistence forecast (DCPP-persistence). Dots indicate significant correlation (a-c) and significant difference of correlations (d-i) at 95% level. Missing values in observations are masked in grey.

Results: predictability in the EC-Earth GCM (DCPP)



→ patchy **significant skill** in some regions

→ potential **impact on ice-shelf predictability**?

→ some **added-value** of DCPP over historical runs

→ some **skill beyond persistence**, especially for long forecast times

Anomaly Correlation Coefficient (ACC) of model ensemble mean vs EN4 potential ocean temperature at 300 m depth for the Southern Ocean (south of 40°S) evaluated over the period 1960-2016 using annual means. a-c) ACC of DCPP. d-f) ACC difference of DCPP with the historical simulations (DCPP-historical). g-i) ACC difference of DCPP with a simple persistence forecast (DCPP-persistence). Dots indicate significant correlation (a-c) and significant difference of correlations (d-i) at 95% level. Missing values in observations are masked in grey.

Work in progress

- Coupled atmosphere-ocean-sea ice-ice sheet RCM development over the Southern Ocean and Antarctica
  → Session CR5.4, EGU2020-5647

A circumpolar coupled ocean – Antarctic ice sheet configuration for investigating recent changes in Southern Ocean heat content

Charles Pelletier[1], Lars Zipf[2], Konstanze Haubner[2], Hugues Goosse[1], Frank Pattyn[2], and Pierre Mathiot[3]
[1]UCLouvain, Earth and Life Institute, Centre de Recherches sur la Terre et le Climat Georges Lemaître, Louvain-la-Neuve, Belgium
[2]Université libre de Bruxelles, Laboratoire de Glaciologie, Bruxelles, Belgium
[3]Met Office, Exeter, United Kingdom

- Totten Glacier configuration
  → Session OS1.13, EGU2020-8075 (not presented)

Investigating the climate variability in the Totten area using NEMO-LIM regional model.

Guillian Van Achter, Charles Pelletier, and Thierry Fichefet
Université Catholique de Louvain, Earth and Life Institute, Earth and Climate, Belgium (guillian.vanachter@uclouvain.be)

Preliminary conclusions

- Some **skill** in EC-Earth DCPP in predicting **T° at the surface and in the ocean at depth**, in some regions, for short and long forecast times
  → Potential impact on the **predictability of sea ice and ice shelves**
- **Added-value** in some regions compared to uninitialised runs and persistence
  → **impact of initialisation and specific physical processes/feedbacks**
- Further analyses are required, especially using **coupled RCM simulations**

Thanks!

deborah.verfaillie@uclouvain.be