

Projections of Winter Polynyas and Their Biophysical Impacts in the Ross Sea Antarctica

Alice K. DuVivier^{1*}, Maria J. Molina^{2,1}, Marika M.
Holland¹, Laura Landrum¹, Kristen Krumhardt¹
and Stephanie Jenouvrier³

¹*Climate and Global Dynamics, National Center for
Atmospheric Research, Boulder, CO, USA.

²Department of Atmospheric and Oceanic Science, University of
Maryland, College Park, MD, USA.

³Woods Hole Oceanographic Institution, Falmouth, MA, USA.

*Corresponding author(s). E-mail(s): duvivier@ucar.edu;

1 Description

This supplementary information contains 15 figures that provide additional
information for the manuscript listed above, but are not essential for the
analysis.

Supplementary Figures

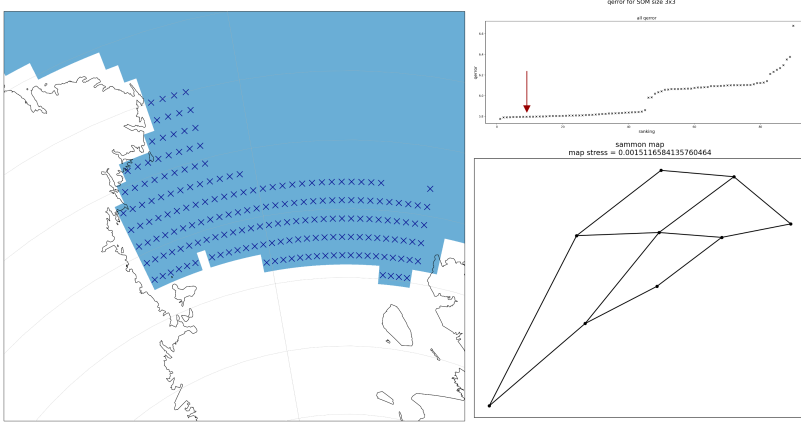


Fig. S1 Ice grid points in the southern Ross Sea that were used in training the SOM are shown as 'X's on the map in panel a. The error for the winning SOM combination is shown by the arrow in panel b. The sammon map for the winning SOM combination is shown in panel c. Training: daily ice concentration. 3x3 with parameters: sig=1.0, lr=0.005, iter=100,000

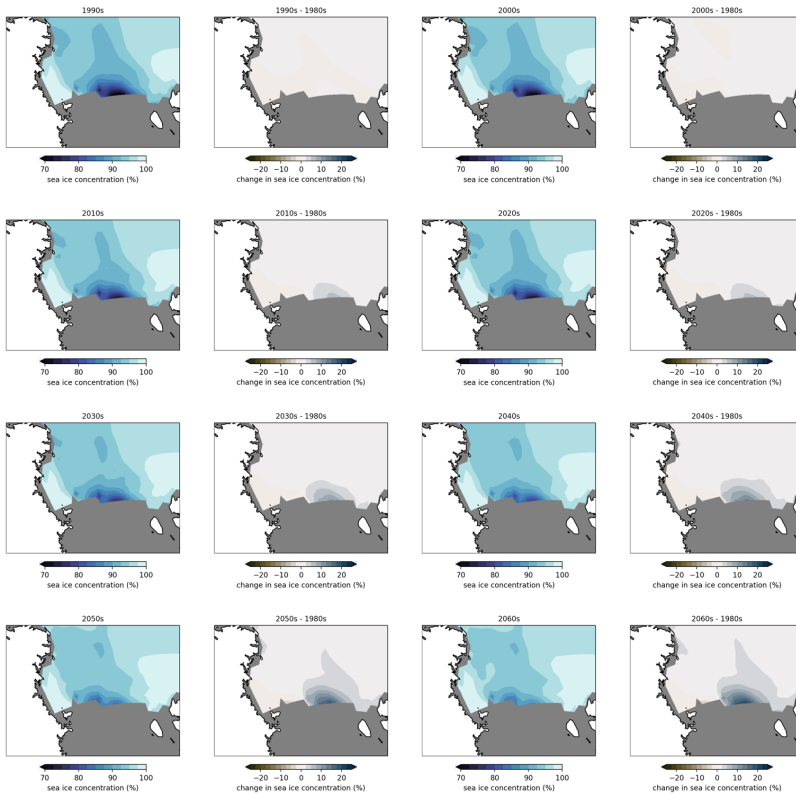


Fig. S2 Winter sea ice concentration (%) in the Ross Sea for each decade 1990s-2070s (blue shading) and difference from 1980s (brown and blue shading).

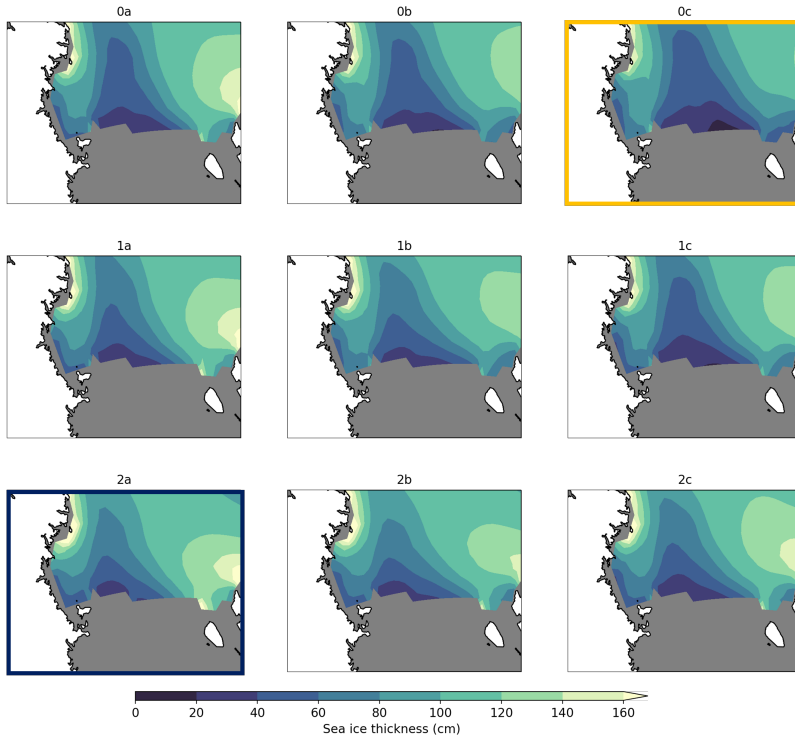
4 *Winter sea ice projections in the Ross Sea*

Fig. S3 Composite sea ice thickness (cm) for each of the nine patterns identified by the SOM. Pattern 0c (gold border) and 2a (dark blue border) indicate the patterns that will be analyzed in more detail.

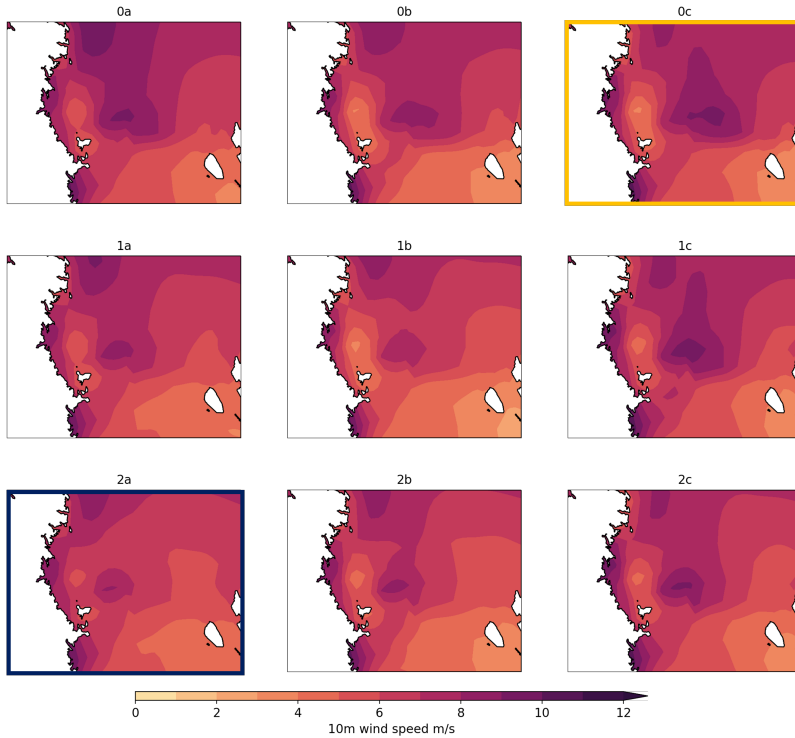


Fig. S4 Composite wind speed (m/s) for each of the nine patterns identified by the SOM. Pattern 0c (gold border) and 2a (dark blue border) indicate the patterns that will be analyzed in more detail.

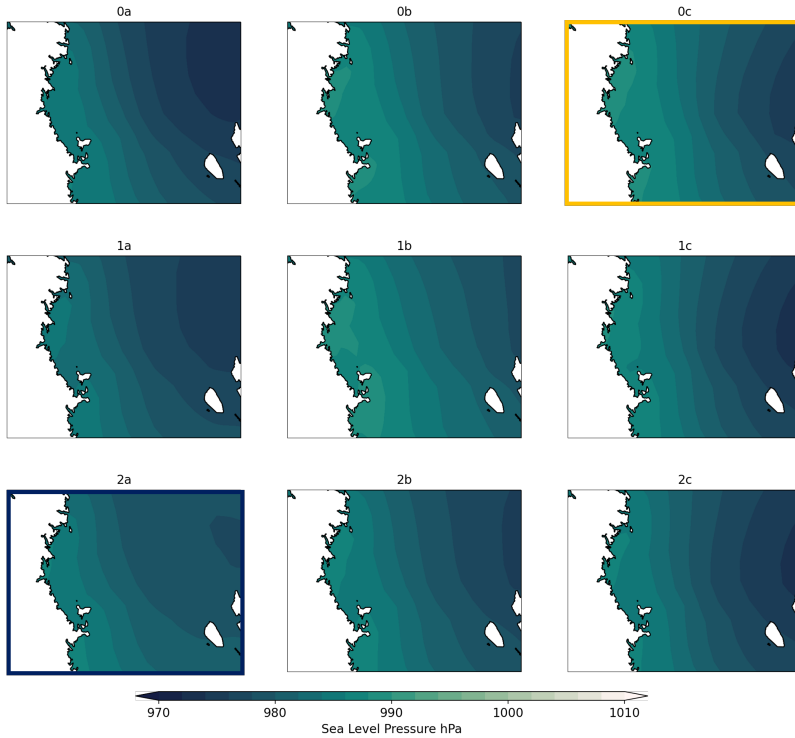


Fig. S5 Composite mean sea level pressure (hPa) for each of the nine patterns identified by the SOM. Pattern 0c (gold border) and 2a (dark blue border) indicate the patterns that will be analyzed in more detail.

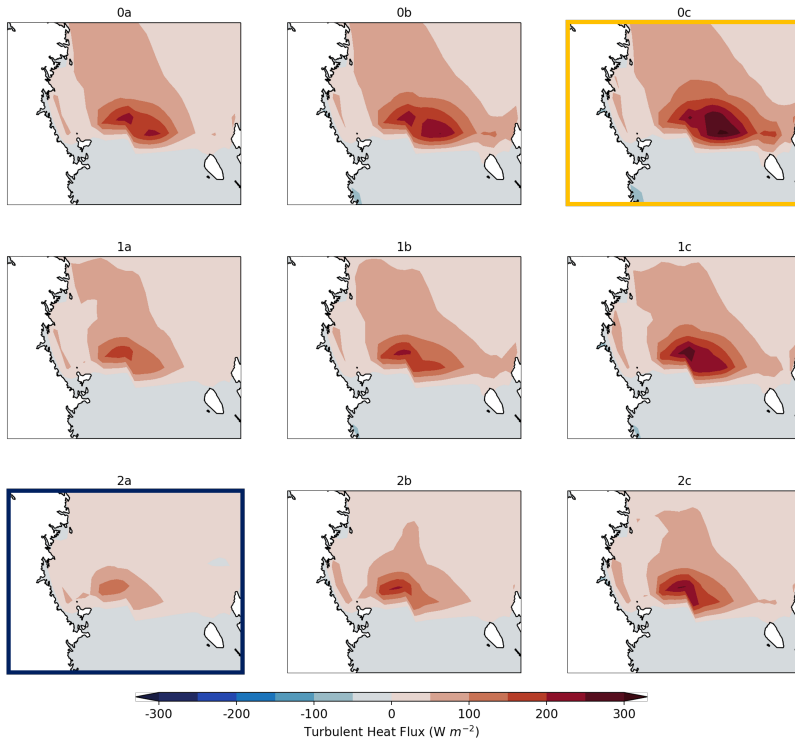


Fig. S6 Composite mean total turbulent heat flux (W/m^2) for each of the nine patterns identified by the SOM. Pattern 0c (gold border) and 2a (dark blue border) indicate the patterns that will be analyzed in more detail.

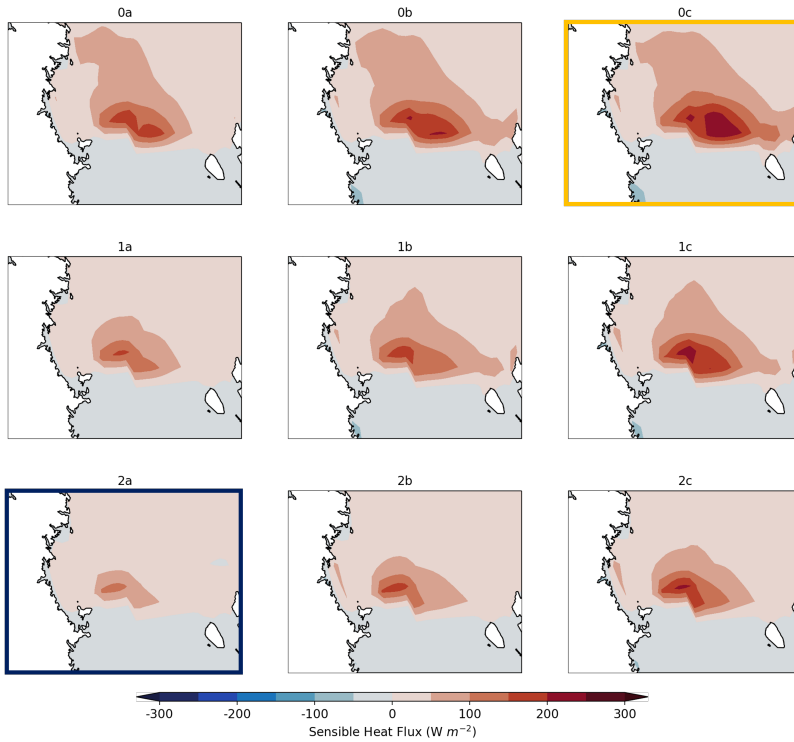


Fig. S7 Composite mean sensible heat flux (W m^{-2}) for each of the nine patterns identified by the SOM. Pattern 0c (gold border) and 2a (dark blue border) indicate the patterns that will be analyzed in more detail.

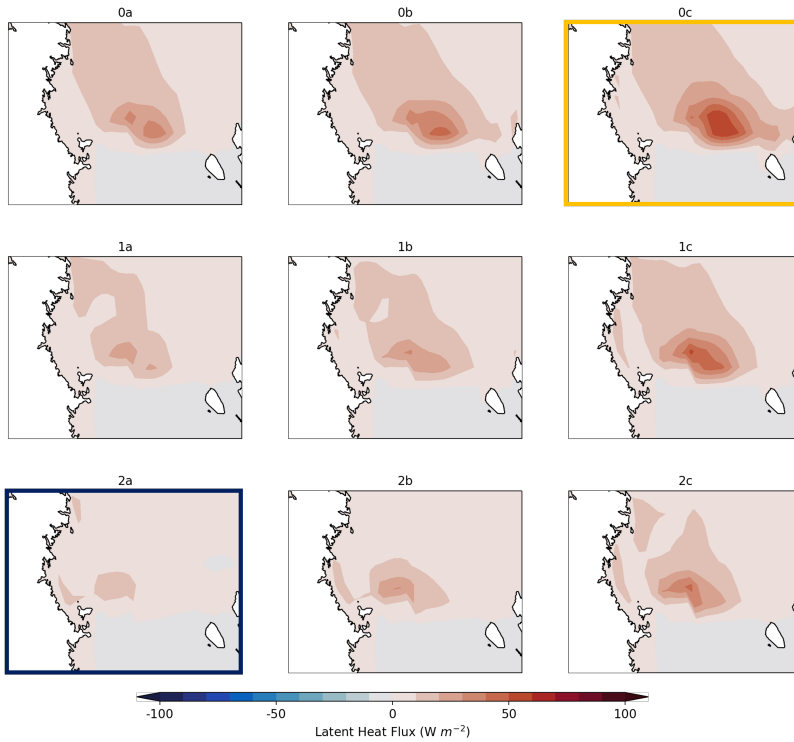


Fig. S8 Composite mean latent heat flux (W/m^2) for each of the nine patterns identified by the SOM. Pattern 0c (gold border) and 2a (dark blue border) indicate the patterns that will be analyzed in more detail.

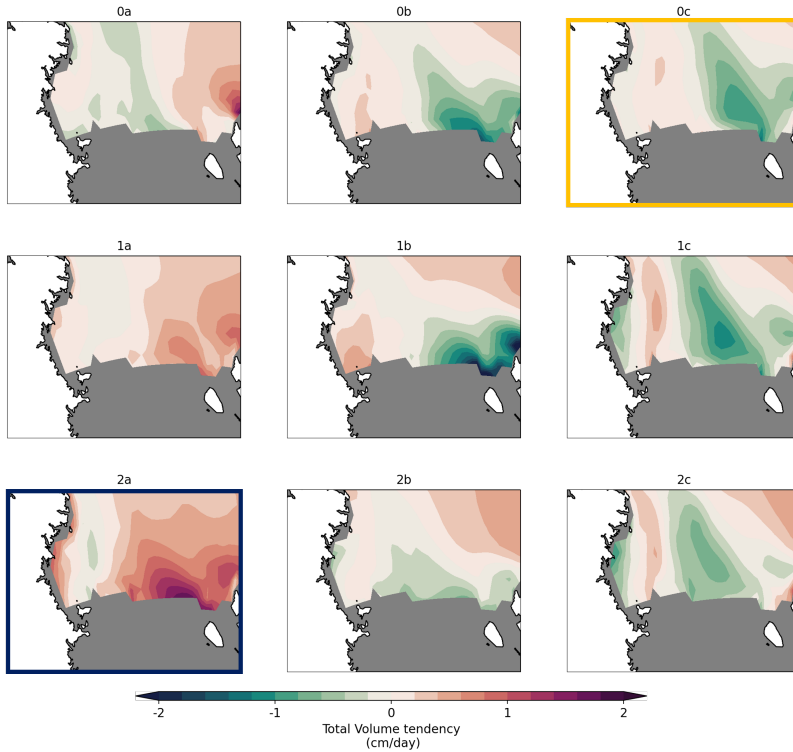


Fig. S9 Composite mean total sea ice volume tendency (cm/day) for each of the nine patterns identified by the SOM. Pattern 0c (gold border) and 2a (dark blue border) indicate the patterns that will be analyzed in more detail.

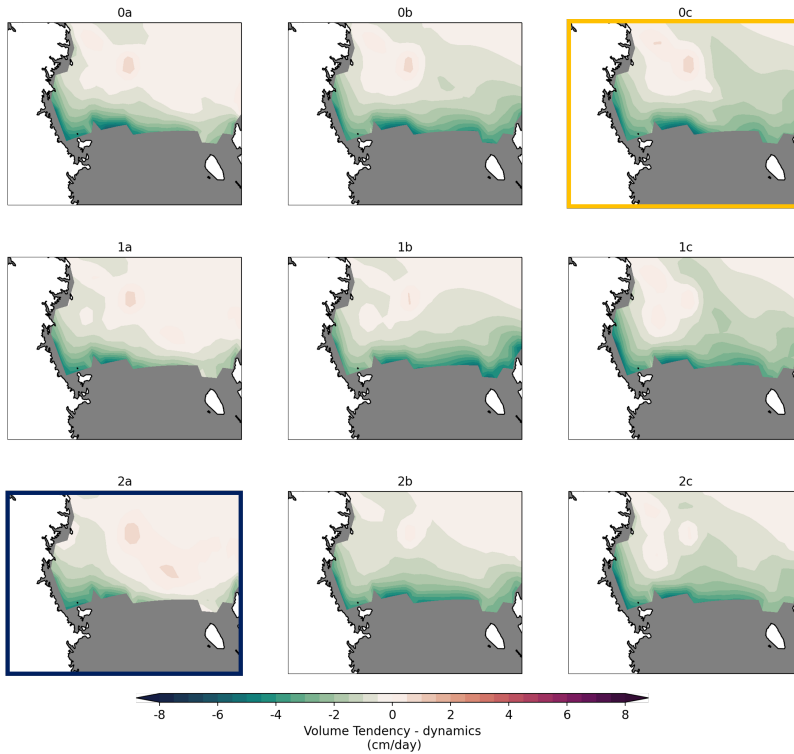


Fig. S10 Composite mean dynamic contribution to the total sea ice volume tendency (cm/day) for each of the nine patterns identified by the SOM. Pattern 0c (gold border) and 2a (dark blue border) indicate the patterns that will be analyzed in more detail.

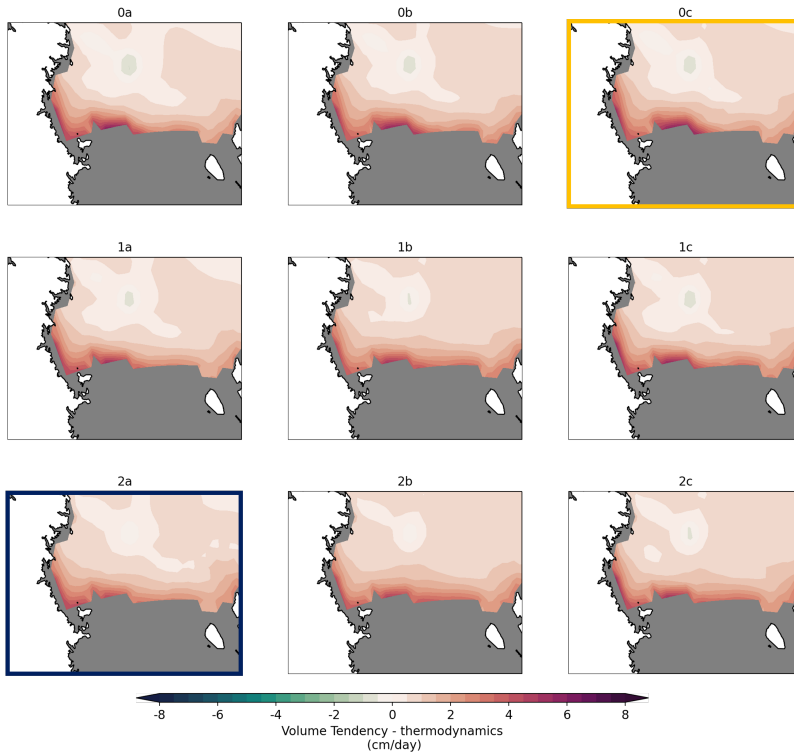


Fig. S11 Composite mean thermodynamic contribution to the total sea ice volume tendency (cm/day) for each of the nine patterns identified by the SOM. Pattern 0c (gold border) and 2a (dark blue border) indicate the patterns that will be analyzed in more detail.

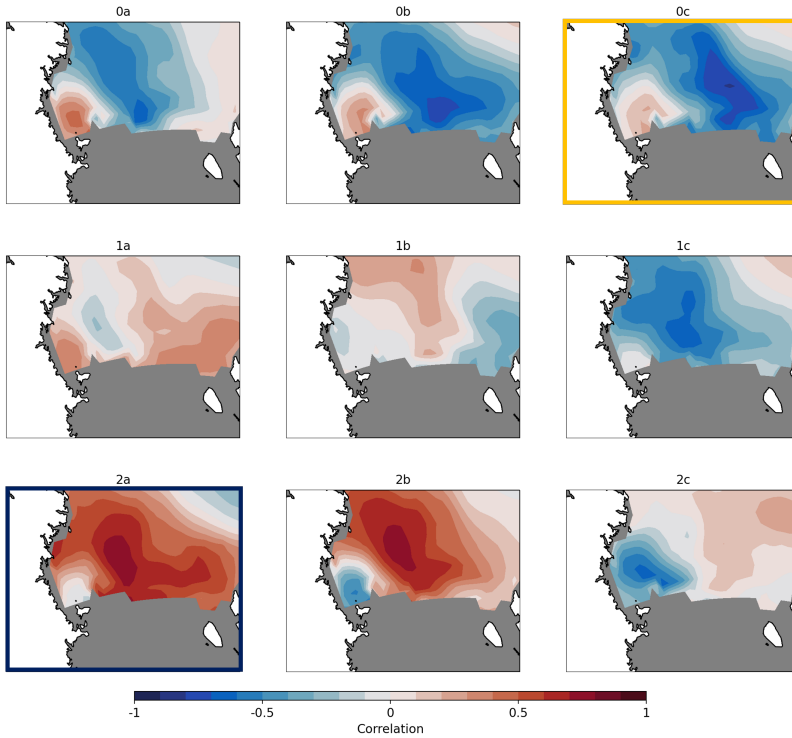


Fig. S12 Correlation of winter mean ice-ocean heat flux with SOM pattern frequencies. Pattern 0c (gold border) and 2a (dark blue border) indicate the patterns that will be analyzed in more detail.

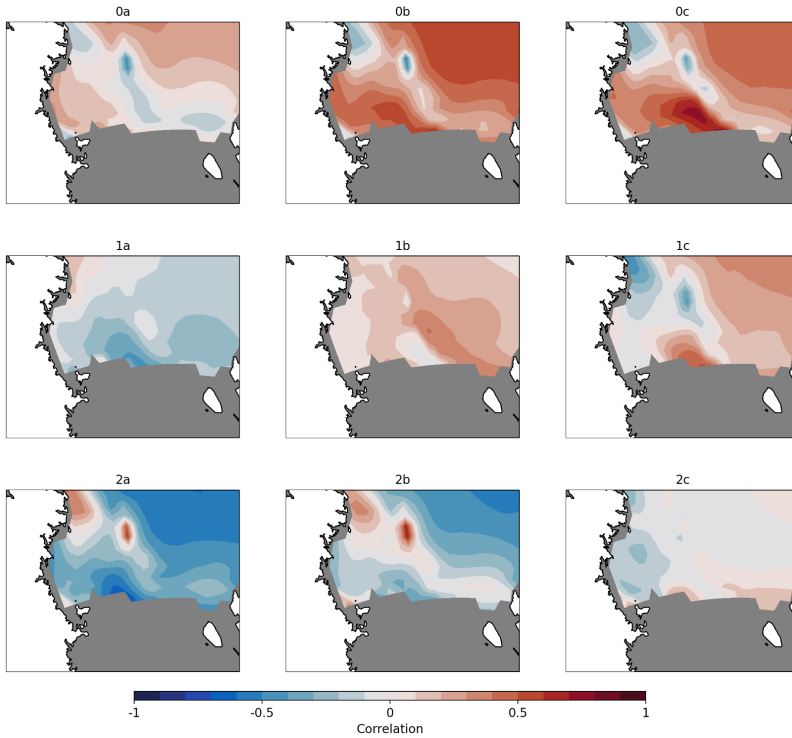


Fig. S13 Correlation of September (end of winter) ocean mixed layer depth with SOM pattern frequencies. Pattern 0c (gold border) and 2a (dark blue border) indicate the patterns that will be analyzed in more detail.

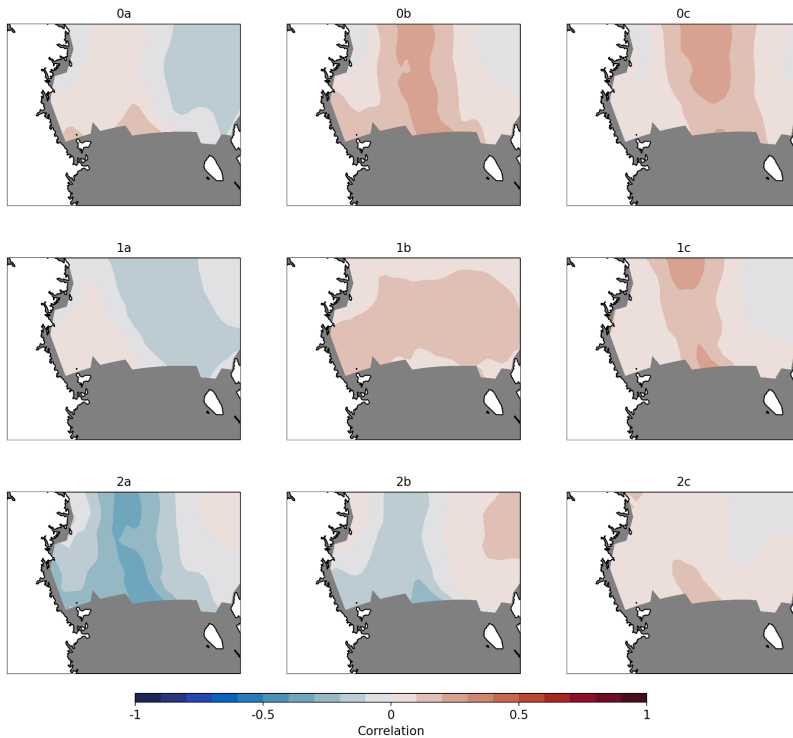


Fig. S14 Correlation of following summer total marine net primary productivity with SOM pattern frequencies. Pattern 0c (gold border) and 2a (dark blue border) indicate the patterns that will be analyzed in more detail.

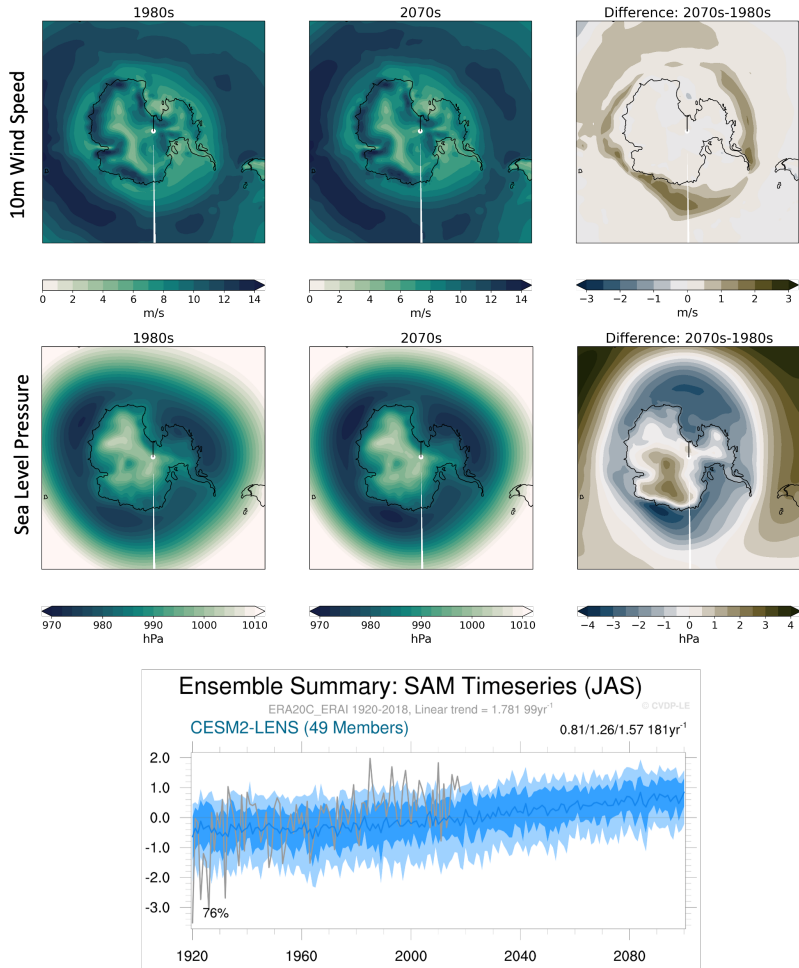


Fig. S15 Mean winter wind speed and sea level pressure and difference 1980s and 2070s. A timeseries of the Southern Annular Mode (SAM) from the CESM2-LE and reanalysis is shown below the maps.