# FESOM-REcoM model data: A regime shift on Weddell Sea continental shelves with local and remote physical-biogeochemical implications is avoidable in a 2°C scenario

(Nissen et al., 2023; Journal of Climate, https://doi.org/10.1175/JCLI-D-22-0926.1)

*This data set includes the minimal data necessary to reproduce the findings of Nissen et al. (2023). Output of model simulations with the global ocean biogeochemical model FESOM1.4-REcoM2 is provided. In particular, besides information on the model grid, the data set includes annual mean water mass properties (temperature, salinity, density, oxygen, pH) and freshwater fluxes from sea ice and ice shelves and decadal averages of air-sea CO2 fluxes and deep-ocean carbon accumulation rates. Model results are provided from 1980-2100 for the four emission scenarios SSP1-2.6, SSP2-4.5, SSP3-7.0, and SSP5-8.5 (sorted from low emission to high emission).*

For full model output or analysis scripts, please send an email to the corresponding author (cara.nissen@awi.de or cara.nissen@colorado.edu).

Data of last update of this readme: **July 26, 2023**

***Overview of files belonging to this data set:***

- Nissen2023_FESOM_REcoM_mesh_information.nc
- Nissen2023_FESOM_REcoM_timeSeries_data_at_transects.nc
- Nissen2023_FESOM_REcoM_timeSeries_sea_ice_growth_basal_melt.nc
- Nissen2023_FESOM_REcoM_timeSeries_density_difference_across_shelf_break.nc
- Nissen2023_FESOM_REcoM_bottom_fields.tar.gz
- Nissen2023_FESOM_REcoM_decadal_avg_CO2_fluxes.nc
- Nissen2023_FESOM_REcoM_decadal_avg_carbon_fluxes_deep_ocean.nc

***Details on each file in the data set:***

**Nissen2023_FESOM_REcoM_mesh_information.nc**

- This mesh information file contains information regarding longitude, latitude, and depth of all 2D and 3D nodes of the model setup. Additionally, the file provides the grid cell area, grid cell volume, bottom topography, and the cavity flag of the 2D nodes (0=outside of cavity, 1=inside cavity).
- This file also provides masks for the subregions used in the study, namely the areas “south of the transect SR4” and “south of the shelf break” (0=outside of region, 1=within region).

**Nissen2023_FESOM_REcoM_timeSeries_data_at_transects.nc**

- Temperature, salinity, density, oxygen concentrations, and cross-section velocities at different transects used in this study (1=Amundsen Sea, 2=northwestern Weddell Sea, 3=southern Weddell Sea, 4=eastern Weddell Sea, 5=Filchner Trough sill).
- For Transects 1-4, the decadal average for the 1990s is provided for temperature and oxygen.
- For Transect 5, monthly data are given between 1990-2100 in *simA-ssp126, simA-ssp245, simA-ssp370, and simA-ssp585*.
- For each transect, information on latitude, longitude, depth, and the grid cell area are also provided.

**Nissen2023_FESOM_REcoM_timeSeries_sea_ice_growth_basal_melt.nc**

- Annual mean sea-ice growth and basal melt rates between 1980-2100 averaged over the area south of the shelf-break transect (see mesh information file) in *simA-ssp126, simA-ssp245, simA-ssp370, simA-ssp585* and the control simulation *simB*.

**Nissen2023_FESOM_REcoM_timeSeries_density_difference_across_shelf_break.nc**

- Annual mean density difference across the shelf break in the southern Weddell Sea between 1980-2100 in *simA-ssp126, simA-ssp245, simA-ssp370,* and *simA-ssp585*. The density difference is calculated as the density at 700m in the open ocean minus the bottom density at the shelf break.

**Nissen2023_FESOM_REcoM_bottom_fields.tar.gz**

- This archive contains netcdf files with bottom-water properties in the Weddell Sea. Extract with “tar -zxf Nissen2023_FESOM_REcoM_bottom_fields.tar.gz”.
- For the control simulation, averages for the 1990s and 2090s of bottom potential temperature, bottom salinity, bottom density (sigma2), bottom oxygen, and bottom pH are provided.
- For the four emission scenarios (ssp126, ssp245, ssp370, ssp585), time series between 1980-2100 are given for the annual mean bottom potential temperature, bottom salinity, bottom density (sigma2), bottom oxygen, and bottom pH.

**Nissen2023_FESOM_REcoM_decadal_avg_CO2_fluxes.nc**

- Air-sea $CO_2$ flux (pos=upward) averaged over each decade between 1990-2100 in *simA-ssp126, simA-ssp245, simA-ssp370, simA-ssp585* and the control simulation *simB*.

**Nissen2023_FESOM_REcoM_decadal_avg_carbon_fluxes_deep_ocean.nc**

- Deep-ocean accumulation of carbon averaged over each decade between 1990-2100 and integrated over the area south of the transect SR4 (see mesh information file) in *simA-ssp126, simA-ssp245, simA-ssp370,* and *simA-ssp585*. In the file, both total fluxes and biological fluxes area provided, the physical fluxes can be obtained as the difference between the two.