


ROMS-BEC model data: Southern Ocean phytoplankton community structure as a gatekeeper for global nutrient biogeochemistry

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ROMS-BEC model data: Southern Ocean phytoplankton community structure as a gatekeeper for global nutrient biogeochemistry

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These data were used for the publication “Southern Ocean phytoplankton community structure as a gatekeeper for global nutrient biogeochemistry” (published in Global Biogeochemical Cycles; Nissen et al., 2021). Further information on the model setup and the analysis framework can be found in the paper. More model output is available upon email request.

File list and variables contained in each file:

- **SO_d025_grid.nc**
Grid file of 0.25° Southern Ocean ROMS-BEC setup.
lat_rho: latitude in deg N (variable corresponding to “lat” in all files below)
lon_rho: longitude in deg E (variable corresponding to “lon” in all files below)
h: bathymetry
mask_rho: land sea mask
pm, pn: inverse length of each grid cell in x- and y-direction (m-1)

The following files are provided for the three model experiments in the manuscript (placeholder ****run_name**** in the filename used in this readme file): **Baseline**, **FastDissolution**, **LowSiUptake**

SOGate_ROMS_BEC_run_name**_nutrients_biological_fluxes.zip** contains the following files:

- **CN_SOGate_ROMS_BEC_**run_name**_export_fluxes.nc**
Annually integrated export fluxes of particulate organic carbon, coccolithophore calcite, and diatom opal at 100m and 1000m.
POC100: Particulate organic carbon export at 100 m (mmol m⁻² yr⁻¹)
PIC100: Calcite export at 100 m (mmol m⁻² yr⁻¹)
Opal100: Opal export at 100 m (mmol m⁻² yr⁻¹)
POC1000: Particulate organic carbon export at 1000 m (mmol m⁻² yr⁻¹)
PIC1000: Calcite export at 1000 m (mmol m⁻² yr⁻¹)
Opal1000: Opal export at 1000 m (mmol m⁻² yr⁻¹)
lat: latitude in deg N
lon: longitude in deg E
- **CN_SOGate_ROMS_BEC_**run_name**_nutrients_top100m.nc**
Annually mean and top 100m average nutrient concentrations.
NO3: Nitrate concentrations (mmol m⁻³)
SIOH4: Silicic acid concentrations (mmol m⁻³)
lat: latitude in deg N
lon: longitude in deg E
- **CN_SOGate_ROMS_BEC_**run_name**_nutrients_zonal_avg.nc**
Annually mean and zonally averaged nutrient concentrations.
NO3: Nitrate concentrations (mmol m⁻³)
SIOH4: Silicic acid concentrations (mmol m⁻³)
lat: latitude in deg N
depth: depth levels in m
- **CN_SOGate_ROMS_BEC_**run_name**_PFT_contribution_to_POC.nc**
Annually averaged relative contribution of diatoms, coccolithophores, small phytoplankton, and zooplankton to POC export at 100m.

diat_to_poc: Relative contribution of diatoms to POC export at 100m (n.d.)
cocco_to_poc: Relative contribution of coccolithophores to POC export at 100m (n.d.)
sp_to_poc: Relative contribution of small phytoplankton to POC export at 100m (n.d.)
zoo_to_poc: Relative contribution of zooplankton to POC export at 100m (n.d.)
lat: latitude in deg N
lon: longitude in deg E

- **CN_SOGate_ROMS_BEC_**run_name**_production.nc**
Annually integrated top 100m net primary production, diatom silicification, and coccolithophore calcification. The latter two are only provided for the *Baseline* simulation.
npp: Net primary production (mmol m⁻² yr⁻¹)
silicification: Calcite export at 100 m (mmol m⁻² yr⁻¹)
calcification: Opal export at 100 m (mmol m⁻² yr⁻¹)
lat: latitude in deg N
lon: longitude in deg E

SOGate_ROMS_BEC_run_name**_horizontal_fluxes_C_budget.zip** contains the following file:

- **CN_SOGate_ROMS_BEC_**run_name**_horizontal_physical_fluxes_C_budget.nc**
Annual mean horizontal physical fluxes for all carbon model tracers (DIC, DOC, DIATC, COCCOC, SPC, DIAZC, ZOOC). Note that COCCOCAL is not provided here, as this can be calculated based on COCCOC using a conversion factor of 0.2.
HorXAdvFlux_tracer: Horizontal (xi) advective flux of *tracer* (mmol s⁻¹)
HorYAdvFlux_tracer: Horizontal (eta) advective flux of *tracer* (mmol s⁻¹)

SOGate_ROMS_BEC_run_name**_vertical_fluxes_C_budget.zip** contains the following file:

- **CN_SOGate_ROMS_BEC_**run_name**_vertical_physical_fluxes_C_budget.nc**
Annual mean vertical physical fluxes for all carbon model tracers (DIC, DOC, DIATC, COCCOC, SPC, DIAZC, ZOOC). Note that COCCOCAL is not provided here, as this can be calculated based on COCCOC using a conversion factor of 0.2.
VertAdvFlux_tracer: Vertical advective flux of *tracer* (mmol s⁻¹)
VertDiffFlux_tracer: Vertical diffusive flux of *tracer* (mmol s⁻¹)

SOGate_ROMS_BEC_run_name**_horizontal_fluxes_Si_N_budget.zip** contains the following file:

- **CN_SOGate_ROMS_BEC_**run_name**_horizontal_physical_fluxes_Si_N_budget.nc**
Annual mean horizontal physical fluxes for all silicon and nitrogen model tracers (NO₃, NH₄, DON, DONR, SiO₃, DIATSI).
HorXAdvFlux_tracer: Horizontal (xi) advective flux of *tracer* (mmol s⁻¹)
HorYAdvFlux_tracer: Horizontal (eta) advective flux of *tracer* (mmol s⁻¹)

SOGate_ROMS_BEC_run_name**_vertical_fluxes_Si_N_budget.zip** contains the following file:

- **CN_SOGate_ROMS_BEC_**run_name**_vertical_physical_fluxes_Si_N_budget.nc**
Annual mean vertical physical fluxes for all silicon and nitrogen model tracers (NO₃, NH₄, DON, DONR, SiO₃, DIATSI).
VertAdvFlux_tracer: Vertical advective flux of *tracer* (mmol s⁻¹)
VertDiffFlux_tracer: Vertical diffusive flux of *tracer* (mmol s⁻¹)