Model

ROMS-BEC model data: Factors controlling coccolithophore biogeography in the Southern Ocean

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These data were used for the publication "**Factors controlling coccolithophore biogeography in the Southern Ocean**" (https://doi.org/ 10.5194/bg-15-6997-2018), further information on 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)

- **SO_d025_CoccoBiogeography_ROMS_BEC_baseline_PFTC_50m_mean_monthly.nc**
  Monthly top 50 m average carbon concentration of phytoplankton PFTs in Baseline simulation (note that year runs from July-June in file).
  DIATC: diatom carbon (mmol m-3)
  COCCOC: coccolithophore carbon (mmol m-3)
  SPC: small phytoplankton carbon (mmol m-3)
  DIAZC: diazotroph carbon (mmol m-3)
  time: time in months
  lat: latitude in deg N
  lon: longitude in deg E

- **SO_d025_CoccoBiogeography_ROMS_BEC_baseline_PFTchl_srf_daily.nc**
  Daily average surface chlorophyll concentration of phytoplankton PFTs in Baseline simulation (note that year runs from July-June in file).
  DIATCHL: diatom chlorophyll (mg chl m-3)
  COCCOCHL: coccolithophore chlorophyll (mg chl m-3)
  SPCHL: small phytoplankton chlorophyll (mg chl m-3)
  DIAZCHL: diazotroph chlorophyll (mg chl m-3)
  time: time in days (360 day calendar)
  lat: latitude in deg N
  lon: longitude in deg E

- **SO_d025_CoccoBiogeography_ROMS_BEC_baseline_PFTC_top200m_int_annual.nc**
  Annual mean top 200 m integrated carbon concentration of phytoplankton PFTs in Baseline simulation.
  DIATC: diatom carbon (mmol m-2)
  COCCOC: coccolithophore carbon (mmol m-2)
  SPC: small phytoplankton carbon (mmol m-2)
  DIAZC: diazotroph carbon (mmol m-2)
  lat: latitude in deg N
  lon: longitude in deg E

- **SO_d025_CoccoBiogeography_ROMS_BEC_baseline_PFTprod_vert_int_annual_int.nc**
  Annually and vertically integrated NPP of phytoplankton PFTs in Baseline simulation.
  DIAT_prod: diatom carbon (mmol m-2 yr-1)
  COCCO_prod: coccolithophore carbon (mmol m-2 yr-1)

SP_prod: small phytoplankton carbon (mmol m-2 yr-1)
DIAZ_prod: diazotroph carbon (mmol m-2 yr-1)
lat: latitude in deg N
lon: longitude in deg E

- **SO_d025_CoccoBiogeography_ROMS_BEC_baseline_PFTnutrlim_srf_annual.nc**
  Annual average surface growth limitation of phytoplankton PFTs with respect to surrounding nutrient concentrations in Baseline simulation.
  DIAT_FE_LIM: limitation of diatom growth by iron
  DIAT_N_LIM: limitation of diatom growth by nitrogen
  DIAT_P_LIM: limitation of diatom growth by phosphorus
  DIAT_SIO3_LIM: limitation of diatom growth by silicic acid
  COCCO_FE_LIM: limitation of coccolithophore growth by iron
  COCCO_N_LIM: limitation of coccolithophore growth by nitrogen
  COCCO_P_LIM: limitation of coccolithphore growth by phosphorus
  SP_FE_LIM: limitation of small phytoplankton growth by iron
  SP_N_LIM: limitation of small phytoplankton growth by nitrogen
  SP_P_LIM: limitation of small phytoplankton growth by phosphorus
  lat: latitude in deg N
  lon: longitude in deg E

- **SO_d025_CoccoBiogeography_ROMS_BEC_baseline_POC_PIC_export_100m_annual_int.nc**
  Annually and vertically integrated export of POC and PIC across 100 m in Baseline simulation.
  POC100: POC export (mmol C m-2 yr-1)
  PIC100: PIC export (mmol m-2 yr-1)
  lat: latitude in deg N
  lon: longitude in deg E

- **SO_d025_CoccoBiogeography_ROMS_BEC_baseline_validation_monthly.nc**
  Monthly average SST, MLD, SiO3 concentration, NO3 concentration, total chlorophyll (all surface) and total NPP (vertically integrated) in Baseline simulation (note that year runs from July-June in file).
  temp: sea surface temperature (°C)
  MLD: mixed layer depth (m)
  SiO3: silicic acid (mmol m-3)
  NO3: nitrate (mmol m-3)
  tot_chl: diazotroph carbon (mg chl m-3)
  tot_prod: total NPP (mmol m-2 d-1)
  time: time in months
  lat: latitude in deg N
  lon: longitude in deg E

- **SO_d025_CoccoBiogeography_ROMS_BEC_baseline_calcification_euphotic_annual.nc**
  Annual mean calcification rate from coccolithophores integrated over euphotic layer in Baseline simulation.
  Cocco_calcif: calcification rate (mg PIC C m-2 d-1)
  lat: latitude in deg N
  lon: longitude in deg E

- **SO_d025_CoccoBiogeography_ROMS_BEC_baseline_HashiokaPlots_srf_8daily.nc**
  Surface 8 daily averages of variables needed to reproduce “Hashioka” plots (Fig. 5 & 6 in manuscript, see section 3 in paper) in Baseline simulation (note that year runs from July-June in file).
  temp: sea surface temperature (°C)
  DIAT_LIGHT_LIM: limitation of diatom growth by light
  DIAT_FE_LIM: limitation of diatom growth by iron
  DIAT_N_LIM: limitation of diatom growth by nitrogen
  DIAT_P_LIM: limitation of diatom growth by phosphorus

DIAT_SIO3_LIM: limitation of diatom growth by silicic acid
COCCO_LIGHT_LIM: limitation of coccolithophore growth by light
OCCO_FE_LIM: limitation of coccolithophore growth by iron
COCCO_N_LIM: limitation of coccolithophore growth by nitrogen
COCCO_P_LIM: limitation of coccolithophore growth by phosphorus
SP_LIGHT_LIM: limitation of small phytoplankton growth by light
SP_FE_LIM: limitation of small phytoplankton growth by iron
SP_N_LIM: limitation of small phytoplankton growth by nitrogen
SP_P_LIM: limitation of small phytoplankton growth by phosphorus
DIATC: diatom carbon (mmol m-3)
COCCOC: coccolithophore carbon (mmol m-3)
SPC: small phytoplankton carbon (mmol m-3)
DIAZC: diazotroph carbon (mmol m-3)
ZOOC: zooplankton carbon (mmol m-3)
GRAZE_DIAT: grazing rate on diatoms (mmol m-3 s-1)
GRAZE_COCCO: grazing rate on coccolithophores (mmol m-3 s-1)
GRAZE_SP: grazing rate on small phytoplankton (mmol m-3 s-1)
time: time in 8-daily intervals (45 entries for one year)
lat: latitude in deg N
lon: longitude in deg E

- **SO_d025_CoccoBiogeography_ROMS_BEC_sensitivity_HashiokaPlots_LatBands_srf_annual.nc**
  Surface annual mean of variables needed to reproduce "Hashioka" plots in Baseline simulation (index 1) and all sensitivity runs (index 2-15, see Table 2 in paper for the order). The output is given in the following order for the PFTs: diatoms, coccolithophores, small phytoplankton, and diazotrophs. The output is averaged over the subareas 30-40°S (index 1), 40-50°S (index 2), 50-60°S (index 3), 60-70°S (index 4), and 70-80°S (index 5).
  temp: sea surface temperature (°C)
  DIAT_LIGHT_LIM: limitation of diatom growth by light
  DIAT_FE_LIM: limitation of diatom growth by iron
  DIAT_N_LIM: limitation of diatom growth by nitrogen
  DIAT_P_LIM: limitation of diatom growth by phosphorus
  DIAT_SIO3_LIM: limitation of diatom growth by silicic acid
  COCCO_LIGHT_LIM: limitation of coccolithophore growth by light
  OCCO_FE_LIM: limitation of coccolithophore growth by iron
  COCCO_N_LIM: limitation of coccolithophore growth by nitrogen
  COCCO_P_LIM: limitation of coccolithophore growth by phosphorus
  DIATC: diatom carbon (mmol m-3)
  COCCOC: coccolithophore carbon (mmol m-3)
  DIAZC: diazotroph carbon (mmol m-3)
  ZOOC: zooplankton carbon (mmol m-3)
  GRAZE_DIAT: grazing rate on diatoms (mmol m-3 s-1)
  GRAZE_COCCO: grazing rate on coccolithophores (mmol m-3 s-1)
  GRAZE_SP: grazing rate on small phytoplankton (mmol m-3 s-1)
  PFT_list: list of PFTs (diatoms, coccolithophores, small phytoplankton, and diazotrophs)
  subarea_list: list of subareas from 30-40°S (index 1) to 70-80°S (index 5)
  runID_list: list of runs (baseline = 1, sensitivity runs = 2-15, see Table 2 in paper)

- **SO_d025_CoccoBiogeography_ROMS_BEC_sensitivity_PFTchl_LatBands_srf_annual.nc**
  Annual mean surface chlorophyll concentration of phytoplankton PFTs in Baseline simulation (index 1) and all sensitivity runs (index 2-15, see Table 2 in paper for the order). The output is given in the following order for the PFTs: diatoms, coccolithophores, small phytoplankton, and diazotrophs. The output is averaged over the subareas 30-40°S (index 1), 40-50°S (index 2), 50-60°S (index 3), 60-70°S (index 4), and 70-80°S (index 5).
  PFTchl: chlorophyll phytoplankton PFT (mg chl m-3)
  PFT_list: list of PFTs (diatoms, coccolithophores, small phytoplankton, and diazotrophs)
  subarea_list: list of subareas from 30-40°S (index 1) to 70-80°S (index 5)
  runID_list: list of runs (baseline = 1, sensitivity runs = 2-15, see Table 2 in paper)