Seifert et al., 2023:
Interaction matters: Bottom-up driver interdependencies alter the projected response of phytoplankton communities to climate change

This dataset provides output of model simulations with the global ocean biogeochemical model FESOM1.4-REcoM-2-M.

File "Seifert2023_mesh_FESOM_REcoM": Provides information (latitude, longitude, depth, grid cell area and volume, bottom topography) on the mesh used in all simulations. The other output files follow this mesh setup.
All other files: 5-year means of global phytoplankton biomass, chlorophyll, net primary production, growth rates, limitations, carbonate system parameters (dissolved inorganic carbon, CO2 partial pressure, total alkalinity), temperature, photosynthetically active radiation, and mixed layer depths. See file descriptions for depth layers and related model simulation. Model simulations (PR_CTRL, PR_INTER, FU_CTRL, FU_INTER, PR_CT, PR_CL, FU_CT, FU_CL) are described in Table 4 and Text S.2 of the paper. In contrast to the other simulations which were run for 32 years, depth-integrated biomass of sensitivity simulations was analyzed after 19 years of simulation.

File names refer to the Figures and Tables in the paper where the respective data are used. See below for detailed information on the individual files.

Additionally, following published dataset was used for the analysis of our model data:
Fay & McKinley, 2014: Global Ocean Biomes: Mean and time-varying maps (NetCDF 7.8 MB). PANGAEA, https://doi.org/10.1594/PANGAEA.828650
Used as masks for the regional representation of the FESOM-REcoM model results.

Please contact the corresponding author for further questions (Miriam Seifert, miriam.seifert@awi.de).

List of files:

- Seifert2023_mesh_FESOM_REcoM.nc
- Seifert2023_Figure_4_5_6_S2_S8_Biomass_depth_integrated.nc
- Seifert2023_Figure_6_Limitations_growth.nc
- Seifert2023_Figure_7_Growth_all_depth_layers.nc
- Seifert2023_Figure_S3_S7_Biomass_PAR_monthly_all_depth_layers.nc
- Seifert2023_Figure_S4_NPP_depth_integrated.nc
- Seifert2023_Figure_S5_T_Chl_DIC_Alk_surface.nc
- Seifert2023_Figure_S6_MLD_T_PAR_pCO2.nc

Detailed information on each file:

Seifert2023_mesh_FESOM_REcoM.nc
Information on the mesh of the FESOM-REcoM setup used in this publication regarding latitude, longitude, bottom topography, cell area in m^2, cell volume in m^3, and depth levels.

Seifert2023_Figure_4_5_6_S2_S8_Biomass_depth_integrated.nc
Annual means of global coccolithophore, diatom, and small phytoplankton biomass integrated over the entire water column in the PR_CTRL, PR_INTER, FU_CTRL, FU_INTER as well as the sensitivity simulations.

Seifert2023_Figure_6_Limitations_growth.nc
Annual means of global coccolithophore, diatom, and small phytoplankton limitation terms (light, nutrient, CO_2, temperature) and growth rates, averaged over the 1% PAR depth in the PR_CTRL, PR_INTER, FU_CTRL, and FU_INTER simulations. See file "Seifert2023_Figure_S3_S7_Biomass_PAR_monthly_all_depth_layers.nc" for monthly PAR values in all depth layers, which was used for the computation of depth-layer averages.

Seifert2023_Figure_7_Growth_all_depth_layers.nc
Annual means of global coccolithophore, diatom, and small phytoplankton growth rates in all depth layers in the PR_CTRL, PR_INTER, FU_CTRL, FU_INTER, PR_CT, PR_CL, FU_CT, and FU_CL simulations used to compute the spatial distribution of the dominating interaction.

Seifert2023_Figure_S3_S7_Biomass_PAR_monthly_all_depth_layers.nc
Monthly global coccolithophore, diatom, and small phytoplankton biomass in all depth layers as well as photosynthetically active radiation for all months and depth layers in the PR_ CTRL, PR_INTER, FU_CTRL, and FU_INTER simulations.

Seifert2023_Figure_S4_NPP_depth_integrated.nc
Annual means of global coccolithophore, diatom, and small phytoplankton net primary production integrated over the entire water column in the PR_CTRL, PR_INTER, FU_CTRL, and FU_INTER simulations.

Seifert2023_Figure_S5_T_Chl_DIC_Alk_surface.nc
Annual means of global sea surface temperature, chlorophyll a concentration (sum over all phytoplankton groups), dissolved inorganic carbon, and total alkalinity in the PR_CTRL simulation. Chlorophyll a concentrations are also given for the PR_INTER simulation, as this is the only parameter in this list that differs slightly between the control and the interaction simulation.

Seifert2023_Figure_S6_MLD_T_PAR_pCO2.nc
Global mixed-layer depths for March and September as well as annual means of mixed-layer averaged temperature, photosynthetically active radiation, and CO2 partial pressure in the PR_CTRL and the FU_CTRL simulation.