

Aim

To isolate the responses to the two primary climate drivers (NPP and SST) for each marine ecosystem model, in order to better understand why they respond differently.

Approach

Compare five experimental runs in which factors are modified in different combinations of pre-industrial and climate-change forcing.

Proposed model runs:

1. **Pre-industrial:** All forcings pre-industrial (1860-2100)
2. **Historical:** All forcings historical (1860-2005)
3. **RCP85:** All forcings RCP8.5 (2006-2100)
4. **Change npp (temperature control):** All forcings pre-industrial (1860-2100) *except* for NPP. For NPP use historical and rcp85 forcings one after the other (run historical 1860-2005, then RCP8.5 2006-2100)
5. **Change temperature (NPP control):** All forcings pre-industrial (1860-2100) *except* for temperature. For temperature use historical and rcp85 forcings one after the other (run historical 1860-2005, then RCP8.5 2006-2100)

GCMs: CESM (priority), GFDL (if possible)

Forcing data location:

DKRZ server at `bb0820/ISIMIP/ISIMIP2b/InputData/ocean/harmonized/`

We also have raw CESM and GFDL forcings at
`bb0820/ISIMIP/ISIMIP2b/InputData/ocean/raw/`

UPDATE: 19 July 2019

Modellers have been having trouble accessing the forcings with the above path, here is another path that works: `/mnt/lustre01/work/bb0820/ISIMIP/ISIMIP2b/InputData/ocean/`

***** Please note that we are not using IPSL forcings for this protocol. There are subfolders for the IPSL forcings on the server, however we have not finished processing them. *****

Fishing effort: None

Forcing definitions:

NPP-related forcing: includes whatever lower trophic level inputs related to Net Primary Production are used by the model (phytoplankton biomass, integrated primary production, zooplankton biomass etc.)

Temperature: all water temperature variables used by the model (sea surface, bottom, etc.)

List of model output required

For all models, the output is the first 4 rows from Table 5 in Tittensor et al. (2018) (reproduced below). (i) Total system carbon biomass; (ii) total consumer carbon biomass; (iii) carbon biomass density of consumers > 10cm; (iv) carbon biomass density of consumers > 30cm. Please let us know wet weight to carbon ratios used, if relevant.

Output variable	Variable name	Temporal resolution	Unit	Comments
Total system carbon biomass	tsb	Monthly or annual	g C m ⁻²	All primary producers and consumers
Total consumer carbon biomass density	tcb	Monthly or annual	g C m ⁻²	All consumers (trophic level >1, vertebrates and invertebrates)
Carbon biomass density of consumers > 10cm	b10cm	Monthly or annual	g C m ⁻²	If asymptotic length (L_{inf}) is > 10cm, include in > 10cm class
Carbon biomass density of consumers > 30cm	b30cm	Monthly or annual	g C m ⁻²	If asymptotic length (L_{inf}) is > 30cm, include in > 30cm class

Output data format

Depth integrated 1x1 degree grid squares at monthly resolution (yearly if model only run on annual time step). Saved as a netcdf4.

Output data naming conventions

For Runs 1,2 and 3 (preindustrial, historical and rcp85)

- Model: e.g., 'apecosm'
- Forcing GCM/reanalysis model: 'cesm1-bgc' or 'gfdl-esm2m'
- Bias correction (none): 'nobc'
- Climate Scenario: 'pre-industrial' or 'historical' or 'rcp85'
- Human impacts (fishing – none): 'nosoc'
- Default CO2 scenario: 'co2'
- Variable name (see table): e.g., 'b10cm'
- Region: 'global', or if applicable the region e.g., 'baltic-sea'
- Temporal resolution: 'monthly' or 'annual'
- First year of reporting period - Last year of reporting period: e.g., 1860-1869
- Netcdf-4: '.nc4'

Example:

apecosm_cesm1-bgc_nobc_historical_nosoc_co2_b10cm_global_monthly_1860-1869.nc4

Please upload netCDF files to the DKRZ server in the bb0820/ISIMIP/ISIMIP2b/OutputData/marine-fishery/ folder and let us know when your runs are uploaded. Contact Jan Volkholtz (volkholtz@pik-potsdam.de) if you need assistance.

For Runs 4 and 5 (NPP control, temperature control)

- Model: e.g., 'apecosm'
- Forcing GCM/reanalysis model: 'cesm1-bgc' or 'gfdl-esm2m'
- Bias correction (none): 'nobc'
- Scenario: 'npp-control' or 'temperature-control'
- Human impacts (fishing – none): 'nosoc'
- Default CO2 scenario: 'co2'
- Variable name (see table): e.g., 'b10cm'
- Region: 'global', or if applicable the region e.g., 'baltic-sea'
- Temporal resolution: 'monthly' or 'annual'
- First year of reporting period - Last year of reporting period: e.g., 1860-1869
- Netcdf-4: '.nc4'

Example:

apecosm_cesm1-bgc_nobc_npp-control_nosoc_co2_b10cm_global_monthly_1860-1869.nc4

Please upload netCDF files for these runs to the DKRZ server in the bb0820/ISIMIP/ISIMIP2b/SecondaryOutputData/marine-fishery/ folder and let us know when your runs are uploaded. Contact Jan Volkholz (volkholz@pik-potsdam.de) if you need assistance.

Output netcdf metadata and other information

- In the metadata for the output data, include lines called 'pH input used (acidification)' and 'Diazotroph input used:'.
 - > For pH input used (acidification): 'yes' or 'no'
 - > For diazotroph input used: 'no', or 'yes, diazotroph carbon', 'yes, diazotroph production', or 'yes, diazotroph carbon and production'. If you use integrated primary production and integrated phytoplankton biomass, say 'only if included with integrated phytoplankton production (and/or) biomass'
- Don't omit your default values of specifiers; always give a value

ISIMIP protocol

Runs 1-3 fall within the ISIMIP2b protocol:

https://www.isimip.org/documents/386/ISIMIP2b_protocol_Fisheries.pdf

Later in 2019, we will send out another information document like this one detailing which other simulations we will be doing for ISIMIP2b.