RECCAP2: Ocean Data Protocol

Overview

Version: 2021-01-14

Deadline for submission of data: Feb, 2021

The majority of this protocol is based on the [RECCAP2 model protocol](#) to ensure congruence between data sets. Thus, if in doubt, consult the modelling protocol for naming conventions, file formatting, etc. Many of the data and data products that will be used in RECCAP2 already exist. These products should be formatted to match the RECCCAP2 protocol by the relevant author/data provider if required. In addition, the data provider should add documentation as specified later in this section.

RECCAP2 ocean data will include the product categories as listed below (see the RECCAP2 ocean scoping document for details).

- Surface ocean pCO_2 products - e.g. MPI-SOMFFN by Landschützer et al. (2016)
- Ocean interior products - e.g. GLODAP mapped interior ocean carbonate system
- Biological productivity/chlorophyll products - e.g. TBD

Product specific protocols

Below we detail the protocols for each of the categories. For protocols common to all products, see the [File specifications and naming](#) section. Note that each product should also include a product description (a.k.a. README) file - requirements for this description is also listed under each product.

Surface ocean pCO_2 products

The pCO_2 product must meet the following minimum requirements to be included in the RECCAP 2 study:

- be available from 1985 to 2018
- 90% of the ice free ocean must be available for all time steps of the product (OISST sea-ice fraction will be used to determine the ice free region)
- Contain all variables that are listed as Priority 1 in the table below

We strongly encourage data submitters to also include variables that are listed as Priority 2

Variable Name	Units	Output frequency	Shape	Priority	Long name
fgco2_glob	Pg C yr^{-1}	monthly	T	1	Globally integrated air-sea CO_2 flux (positive upward)
fgco2_reg	Pg C yr^{-1}	monthly	iT	1	Regionally integrated air-sea CO_2 flux (positive upward) (using regional bounds), i: number of regions
fgco2	mol m^{-2} s^{-1}	monthly	XYT	1	Flux density of the total air-sea CO2 exchange (positive upward)
spco2	µatm	monthly	XYT	1	Surface ocean pCO2
fice	-	monthly	XYT	1	fractional ice-cover (=sea-ice concentration) used for the computation of the air-sea exchange flux [0-1]
area	m^2		XY	1	Total surface area of each grid cell
Kw	m s^{-1}	monthly	XYT	2	Air-sea piston velocity
pco2atm	µatm	monthly	XYT	2	Atmospheric pCO2 ('pco2atm' [uatm] will vary spatially, as opposed to the spatially uniform 'xco2atm' [ppm] atm CO2 forcing due to corrections for atm pressure and vapor pressure)
alpha	mol kg^{-1} atm^{-1}	monthly	XYT	2	CO2 solubility

Requirements for **README**:

- Original study citation and dataset citation if applicable
- Gas transfer velocity (*Kw*) used and the global mean thereof.
- The temperature, salinity, and wind products used to calculate *Kw* and *alpha* should be listed.
- Handling of sea-ice with respect to air-sea CO2 fluxes.
- The procedure used to calculate *pco2atm* with details of the following: xCO_2 product, interpolation, pH_2O correction used and pressure product.
- Other comments or idiosyncrasies in the dataset that will affect global or regional comparison

Ocean interior products

The ocean interior products are diverse and thus the minimum requirements are not stringent.

At least one of the following variables is required in addition to the volume per grid cell:

- Dissolved inorganic carbon (*dissic*)

- Total alkalinity (*talk*)
- Anthropogenic carbon (*cant*)

Other than that, there are no minimum requirements, except that the file formatting and naming conventions have to adhere to the table below and the [File/Grid specifications and naming](#) specifications.

Variable Name	Units	Output frequency	Shape	Priority	Long name
dissic	mol m^{-3}	monthly	XYZT	(1)	Dissolved inorganic carbon
cant	mol m^{-3}	periodic	XYZT	(1)	Anthropogenic CO2
talk	mol m^{-3}	monthly	XYZT	(1)	Total Alkalinity
volume	m^3		XYZ	1	Total volume of each grid cell
thetao	degC	monthly	XYZT	3	seawater potential temperature
so	-	monthly	XYZT	3	Salinity (PSS-78)
no3	mol m^{-3}	monthly	XYZT	3	Dissolved Nitrate Concentration
po4	mol m^{-3}	monthly	XYZT	3	Total Dissolved Inorganic Phosphorus Concentration
si	mol m^{-3}	monthly	XYZT	3	Total Dissolved Inorganic Silicic Concentration
o2	mol m^{-3}	monthly	XYZT	3	Dissolved Oxygen Concentration

Requirements of the **README**:

- Original study citation and dataset citation if applicable
- Specify explicitly the reported variable w.r.t. the following formulation:
  $$\Delta DIC = \Delta DIC_{ant}^{ss} + \Delta DIC_{ant}^{ns} + \Delta DIC_{nat}^{ss} + \Delta DIC_{nat}^{ns}$$
- Other comments or idiosyncrasies in the dataset that will affect global or regional comparison
- Does the estimate include (or try to include) riverine input of DIC?
- Can't think of anything else now

Biological productivity/chlorophyll products
No information about this category yet

File specifications
Coordinate system
Lat, Lon: 1x1 degree grid (0.5 to 359.5°E longitude, -89.5 to 89.5°N latitude) Lon in °E, Lat: in °N

Time: seconds since Jan 1, 1980, centered on the 15th 00:00:00 of each month. One file for full time-series per 2-D-variable. For 3-D variables, split in chunks as need be, but not more than one variable per file.

File naming
We propose to use a variation of the convention used by the SOCOM intercomparison as indicated below:

File name = <RECCAP-type>_<institution>_<product name>_<product version>_<start-end>.nc
RECCAP-type is

- *spco2*: surface ocean pCO2 products
- *intco2*: interior ocean interior products
- *chl/npp*: chlorophyll or primary production product

Institution name or abbreviation (up to 4 letters)
Product name: e.g. SOMFFN
Product version: release year and subversion if applicable (e.g. 2020b)
start-end: starting year and end year if applicable

Readme files

Products will be stored in a data repository with folder structure reflecting the naming convention. Apart from the data file (.nc), the readme file should sit in the same folder and carry the same name extended by _readme.txt

Instructions for data submission through MPI-BGC FTP-server

Uploading data

For RECCAP2-ocean data products, it is recommended to upload zipped or tar files using the FTP:

ftp://ftp.bgc-jena.mpg.de/pub/incoming

For FTP upload, please add a readme file with the file information: owner, version, description that should go in the file metadata (as defined under the product protocols).

Please notify abastos@bgc-jena.mpg.de and jensdaniel.mueller@usys.ethz.ch when uploading files.

For additional **information regarding data upload**, please refer to this document [link] provided by Ana Bastos.

Data access

Data uploaded by various data providers through the MPI-BGC FTP-server, will be further compiled into single files per <tar_id>. The compiled files will be made available through the following data portal:

https://www.bgc-jena.mpg.de/geodb/projects/Home.php

The download required authorization and registration. RECCAP2-ocean partners should already be authorized through their email, but still need to register upon first access. For additional information regarding registration, please refer to this document [link] provided by Ana Bastos.

Data policy

We will use the Fair Use Policy of RECCAPv2-ceans (see [here](#))