# CMIP6 Model Documentation

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# Documentation Contents

# 1 Key Properties

*Ocean Biogeochemistry key properties*

## 1.1 Key Properties

*Ocean Biogeochemistry key properties*

### 1.1.1 Model Overview

*Overview of ocean biogeochemistry model*

**Spec. ID:** cmip6.ocnbgchem.key_properties.model_overview

**Is Required ?** TRUE

**Enter TEXT value:**

### 1.1.2 Model Name

*Name of ocean biogeochemistry model code (PISCES 2.0,...)*

**Spec. ID:** cmip6.ocnbgchem.key_properties.model_name

**Is Required ?** TRUE

**Enter TEXT value:**

### 1.1.3 Model Type

*Type of ocean biogeochemistry model*

**Spec. ID:** cmip6.ocnbgchem.key_properties.model_type

**Is Required ?** TRUE

**Select value:**

- ☐ Geochemical - No living compartments
- ☐ NPZD - No plankton types
- ☐ PFT - Several plankton types
- ☐ Other - please specify:

### 1.1.4 Elemental Stoichiometry

*Describe elemental stoichiometry (fixed, variable, mix of the two)*

**Spec. ID:** cmip6.ocnbgchem.key_properties.elemental_stoichiometry

**Is Required ?** TRUE

**Select value:**

- ☐ Fixed - Fixed stoichiometry

☐ Variable - Variable stoichiometry

☐ Mix of both - Both fixed and mixed stoichiometry

### 1.1.5 Elemental Stoichiometry Details

*Describe which elements have fixed/variable stoichiometry*

**Spec. ID:** cmip6.ocnbgchem.key_properties.elemental_stoichiometry_details

**Is Required ?** TRUE

**Enter TEXT value:**

### 1.1.6 Prognostic Variables

*List of all prognostic tracer variables in the ocean biogeochemistry component*

**Spec. ID:** cmip6.ocnbgchem.key_properties.prognostic_variables

**Is Required ?** TRUE

**Enter TEXT value(s):**

### 1.1.7 Diagnostic Variables

*List of all diagnotic tracer variables in the ocean biogeochemistry component*

**Spec. ID:** cmip6.ocnbgchem.key_properties.diagnostic_variables

**Is Required ?** TRUE

**Enter TEXT value(s):**

### 1.1.8 Damping

*Describe any tracer damping used (such as artificial correction or relaxation to climatology,...)*

**Spec. ID:** cmip6.ocnbgchem.key_properties.damping

**Is Required ?** FALSE

**Enter TEXT value:**

## 1.2 Passive Tracers Transport

*Time stepping method for passive tracers transport in ocean biogeochemistry*

### 1.2.1 Method

*Time stepping framework for passive tracers*

**Spec. ID:** cmip6.ocnbgchem.key_properties.time_stepping_framework.passive_tracers_transport.method

**Is Required ?** TRUE

**Select value:**

☐ Use ocean model transport time step

☐ Use specific time step

### 1.2.2 Timestep If Not From Ocean

*Time step for passive tracers (if different from ocean)*

**Spec. ID:** cmip6.ocnbgchem.key_properties.time_stepping_framework.passive_tracers_transport.timestep_if_not_from_ocean

**Is Required ?** FALSE

**Enter INTEGER value:**

## 1.3 Biology Sources Sinks

*Time stepping framework for biology sources and sinks in ocean biogeochemistry*

### 1.3.1 Method

*Time stepping framework for biology sources and sinks*

**Spec. ID:** cmip6.ocnbgchem.key_properties.time_stepping_framework.biology_sources_sinks.method

**Is Required ?** TRUE

**Select value:**

☐ Use ocean model transport time step

☐ Use specific time step

### 1.3.2 Timestep If Not From Ocean

*Time step for biology sources and sinks (if different from ocean)*

**Spec. ID:** cmip6.ocnbgchem.key_properties.time_stepping_framework.biology_sources_sinks.timestep_if_not_from_ocean

**Is Required ?** FALSE

**Enter INTEGER value:**

## 1.4 Transport Scheme

*Transport scheme in ocean biogeochemistry*

### 1.4.1 Type

*Type of transport scheme*

**Spec. ID:** cmip6.ocnbgchem.key_properties.transport_scheme.type

**Is Required ?** TRUE

**Select value:**

☐ Offline

☐ Online

### 1.4.2 Scheme

*Transport scheme used*

**Spec. ID:** cmip6.ocnbgchem.key_properties.transport_scheme.scheme

**Is Required ?** TRUE

**Select value:**

☐ Use that of ocean model

☐ Other - please specify:

### 1.4.3 Use Different Scheme

*Decribe transport scheme if different than that of ocean model*

**Spec. ID:** cmip6.ocnbgchem.key_properties.transport_scheme.use_different_scheme

**Is Required ?** FALSE

**Enter TEXT value:**

## 1.5 Boundary Forcing

*Properties of biogeochemistry boundary forcing*

### 1.5.1 Atmospheric Deposition

*Describe how atmospheric deposition is modeled*

**Spec. ID:** cmip6.ocnbgchem.key_properties.boundary_forcing.atmospheric_deposition

**Is Required ?** TRUE

**Select value:**

☐ From file (climatology)

☐ From file (interannual variations)

☐ From Atmospheric Chemistry model

### 1.5.2 River Input

*Describe how river input is modeled*

**Spec. ID:** cmip6.ocnbgchem.key_properties.boundary_forcing.river_input

**Is Required ?** TRUE

**Select value:**

☐ From file (climatology)

☐ From file (interannual variations)

☐ From Land Surface model

### 1.5.3 Sediments From Boundary Conditions

*List which sediments are speficied from boundary condition*

**Spec. ID:** cmip6.ocnbgchem.key_properties.boundary_forcing.sediments_from_boundary_conditions

**Is Required ?** FALSE

**Enter TEXT value:**

### 1.5.4 Sediments From Explicit Model

*List which sediments are speficied from explicit sediment model*

**Spec. ID:** cmip6.ocnbgchem.key_properties.boundary_forcing.sediments_from_explicit_model

**Is Required ?** FALSE

**Enter TEXT value:**

## 1.6 Gas Exchange

*Properties of gas exchange in ocean biogeochemistry*

### 1.6.1 CO2 Exchange Present

*Is CO2 gas exchange modeled xxx?*

**Spec. ID:** cmip6.ocnbgchem.key_properties.gas_exchange.co2_exchange_present

**Is Required ?** TRUE

**Select value:**

☐ True ☐ False

### 1.6.2 CO2 Exchange Type

*Describe CO2 gas exchange*

**Spec. ID:** cmip6.ocnbgchem.key_properties.gas_exchange.co2_exchange_type

**Is Required ?** FALSE

**Select value:**

☐ OMIP protocol

☐ Other - please specify:

### 1.6.3 O2 Exchange Present

*Is O2 gas exchange modeled xxx?*

**Spec. ID:** cmip6.ocnbgchem.key_properties.gas_exchange.o2_exchange_present

**Is Required ?** TRUE

**Select value:**

☐ True ☐ False

### 1.6.4 O2 Exchange Type

*Describe O2 gas exchange*

**Spec. ID:** cmip6.ocnbgchem.key_properties.gas_exchange.o2_exchange_type

**Is Required ?** FALSE

**Select value:**

☐ OMIP protocol

☐ Other - please specify:

### 1.6.5 DMS Exchange Present

*Is DMS gas exchange modeled xxx?*

**Spec. ID:** cmip6.ocnbgchem.key_properties.gas_exchange.dms_exchange_present

**Is Required ?** TRUE

**Select value:**

☐ True ☐ False

### 1.6.6 DMS Exchange Type

*Specify DMS gas exchange scheme type*

**Spec. ID:** cmip6.ocnbgchem.key_properties.gas_exchange.dms_exchange_type

**Is Required ?** FALSE

**Enter TEXT value:**

### 1.6.7 N2 Exchange Present

*Is N2 gas exchange modeled xxx?*

**Spec. ID:** cmip6.ocnbgchem.key_properties.gas_exchange.n2_exchange_present

**Is Required ?** TRUE

**Select value:**

☐ True ☐ False

### 1.6.8 N2 Exchange Type

*Specify N2 gas exchange scheme type*

**Spec. ID:** cmip6.ocnbgchem.key_properties.gas_exchange.n2_exchange_type

**Is Required ?** FALSE

**Enter TEXT value:**

### 1.6.9 N2O Exchange Present

*Is N2O gas exchange modeled xxx?*

**Spec. ID:** cmip6.ocnbgchem.key_properties.gas_exchange.n2o_exchange_present

**Is Required ?** TRUE

**Select value:**

☐ True ☐ False

### 1.6.10 N2O Exchange Type

*Specify N2O gas exchange scheme type*

**Spec. ID:** cmip6.ocnbgchem.key_properties.gas_exchange.n2o_exchange_type

**Is Required ?** FALSE

**Enter TEXT value:**

### 1.6.11 CFC11 Exchange Present

*Is CFC11 gas exchange modeled xxx?*

**Spec. ID:** cmip6.ocnbgchem.key_properties.gas_exchange.cfc11_exchange_present

**Is Required ?** TRUE

**Select value:**

☐ True ☐ False

### 1.6.12 CFC11 Exchange Type

*Specify CFC11 gas exchange scheme type*

**Spec. ID:** cmip6.ocnbgchem.key_properties.gas_exchange.cfc11_exchange_type

**Is Required ?** FALSE

**Enter TEXT value:**

### 1.6.13 CFC12 Exchange Present

*Is CFC12 gas exchange modeled xxx?*

**Spec. ID:** cmip6.ocnbgchem.key_properties.gas_exchange.cfc12_exchange_present

**Is Required ?** TRUE

**Select value:**

☐ True ☐ False

### 1.6.14 CFC12 Exchange Type

*Specify CFC12 gas exchange scheme type*

**Spec. ID:** cmip6.ocnbgchem.key_properties.gas_exchange.cfc12_exchange_type

**Is Required ?** FALSE

**Enter TEXT value:**

### 1.6.15 SF6 Exchange Present

*Is SF6 gas exchange modeled xxx?*

**Spec. ID:** cmip6.ocnbgchem.key_properties.gas_exchange.sf6_exchange_present

**Is Required ?** TRUE

**Select value:**

☐ True ☐ False

### 1.6.16 SF6 Exchange Type

*Specify SF6 gas exchange scheme type*

**Spec. ID:** cmip6.ocnbgchem.key_properties.gas_exchange.sf6_exchange_type

**Is Required ?** FALSE

**Enter TEXT value:**

### 1.6.17 13CO2 Exchange Present

*Is 13CO2 gas exchange modeled xxx?*

**Spec. ID:** cmip6.ocnbgchem.key_properties.gas_exchange.13co2_exchange_present

**Is Required ?** TRUE

**Select value:**

☐ True ☐ False

### 1.6.18 13CO2 Exchange Type

*Specify 13CO2 gas exchange scheme type*

**Spec. ID:** cmip6.ocnbgchem.key_properties.gas_exchange.13co2_exchange_type

**Is Required ?** FALSE

**Enter TEXT value:**

### 1.6.19 14CO2 Exchange Present

*Is 14CO2 gas exchange modeled xxx?*

**Spec. ID:** cmip6.ocnbgchem.key_properties.gas_exchange.14co2_exchange_present

**Is Required ?** TRUE

**Select value:**

☐ True ☐ False

### 1.6.20 14CO2 Exchange Type

*Specify 14CO2 gas exchange scheme type*

**Spec. ID:** cmip6.ocnbgchem.key_properties.gas_exchange.14co2_exchange_type

**Is Required ?** FALSE

**Enter TEXT value:**

### 1.6.21 Other Gases

*Specify any other gas exchange*

**Spec. ID:** cmip6.ocnbgchem.key_properties.gas_exchange.other_gases

**Is Required ?** FALSE

**Enter TEXT value:**

## 1.7 Carbon Chemistry

*Properties of carbon chemistry biogeochemistry*

### 1.7.1 Type

*Describe how carbon chemistry is modeled*

**Spec. ID:** cmip6.ocnbgchem.key_properties.carbon_chemistry.type

**Is Required ?** TRUE

**Select value:**

☐ OMIP protocol

☐ Other protocol

### 1.7.2 PH Scale

*If NOT OMIP protocol, describe pH scale.*

**Spec. ID:** cmip6.ocnbgchem.key_properties.carbon_chemistry.ph_scale

**Is Required ?** FALSE

**Select value:**

☐ Sea water

☐ Free

☐ Other - please specify:

### 1.7.3 Constants If Not OMIP

*If NOT OMIP protocol, list carbon chemistry constants.*

**Spec. ID:** cmip6.ocnbgchem.key_properties.carbon_chemistry.constants_if_not_omip

**Is Required ?** FALSE

**Enter TEXT value:**

# 2 Tracers

*Ocean biogeochemistry tracers*

## 2.1 Tracers

*Ocean biogeochemistry tracers*

### 2.1.1 Overview

*Overview of tracers in ocean biogeochemistry*

**Spec. ID:** cmip6.ocnbgchem.tracers.overview

**Is Required ?** TRUE

**Enter TEXT value:**

### 2.1.2 Sulfur Cycle Present

*Is sulfur cycle modeled xxx?*

**Spec. ID:** cmip6.ocnbgchem.tracers.sulfur_cycle_present

**Is Required ?** TRUE

**Select value:**

☐ True ☐ False

### 2.1.3 Nutrients Present

*List nutrient species present in ocean biogeochemistry model*

**Spec. ID:** cmip6.ocnbgchem.tracers.nutrients_present

**Is Required ?** TRUE

**Select value(s):**

☐ Nitrogen (N)

☐ Phosphorous (P)

☐ Silicium (S)

☐ Iron (Fe)

☐ Other - please specify:

### 2.1.4 Nitrous Species If N

*If nitrogen present, list nitrous species.*

**Spec. ID:** cmip6.ocnbgchem.tracers.nitrous_species_if_n

**Is Required ?** FALSE

**Select value(s):**

☐ Nitrates (NO3)

☐ Amonium (NH4)

☐ Other - please specify:

### 2.1.5 Nitrous Processes If N

*If nitrogen present, list nitrous processes.*

**Spec. ID:** cmip6.ocnbgchem.tracers.nitrous_processes_if_n

**Is Required ?** FALSE

**Select value(s):**

☐ Dentrification

☐ N fixation

☐ Other - please specify:

## 2.2 Ecosystem

*Ecosystem properties in ocean biogeochemistry*

### 2.2.1 Upper Trophic Levels Definition

*Definition of upper trophic level (e.g. based on size) xxx?*

**Spec. ID:** cmip6.ocnbgchem.tracers.ecosystem.upper_trophic_levels_definition

**Is Required ?** TRUE

**Enter TEXT value:**

### 2.2.2 Upper Trophic Levels Treatment

*Define how upper trophic level are treated*

**Spec. ID:** cmip6.ocnbgchem.tracers.ecosystem.upper_trophic_levels_treatment

**Is Required ?** TRUE

**Enter TEXT value:**

## 2.3 Phytoplankton

*Phytoplankton properties in ocean biogeochemistry*

### 2.3.1 Type

*Type of phytoplankton*

**Spec. ID:** cmip6.ocnbgchem.tracers.ecosystem.phytoplankton.type

**Is Required ?** TRUE

**Select value:**

- ☐ None
- ☐ Generic
- ☐ PFT including size based (specify both below) - Plankton functional type including size based
- ☐ Size based only (specify below)
- ☐ PFT only (specify below)

### 2.3.2 Pft

*Phytoplankton functional types (PFT) (if applicable)*

**Spec. ID:** cmip6.ocnbgchem.tracers.ecosystem.phytoplankton.pft

**Is Required ?** FALSE

**Select value(s):**

- ☐ Diatoms
- ☐ Nfixers
- ☐ Calcifiers
- ☐ Other - please specify:

### 2.3.3 Size Classes

*Phytoplankton size classes (if applicable)*

**Spec. ID:** cmip6.ocnbgchem.tracers.ecosystem.phytoplankton.size_classes

**Is Required ?** FALSE

**Select value(s):**

- ☐ Microphytoplankton
- ☐ Nanophytoplankton
- ☐ Picophytoplankton
- ☐ Other - please specify:

## 2.4 Zooplankton

*Zooplankton properties in ocean biogeochemistry*

### 2.4.1 Type

*Type of zooplankton*

**Spec. ID:** cmip6.ocnbgchem.tracers.ecosystem.zooplankton.type

**Is Required ?** TRUE

**Select value:**

☐ None

☐ Generic

☐ Size based (specify below)

☐ Other - please specify:

### 2.4.2 Size Classes

*Zooplankton size classes (if applicable)*

**Spec. ID:** cmip6.ocnbgchem.tracers.ecosystem.zooplankton.size_classes

**Is Required ?** FALSE

**Select value(s):**

☐ Microzooplankton

☐ Mesozooplankton

☐ Other - please specify:

## 2.5 Disolved Organic Matter

*Disolved organic matter properties in ocean biogeochemistry*

### 2.5.1 Bacteria Present

*Is there bacteria representation xxx?*

**Spec. ID:** cmip6.ocnbgchem.tracers.disolved_organic_matter.bacteria_present

**Is Required ?** TRUE

**Select value:**

☐ True ☐ False

### 2.5.2 Lability

*Describe treatment of lability in dissolved organic matter*

**Spec. ID:** cmip6.ocnbgchem.tracers.disolved_organic_matter.lability

**Is Required ?** TRUE

**Select value:**

- ☐ None
- ☐ Labile - Less than a few days
- ☐ Semi-labile - Few days to a few years
- ☐ Refractory - Over a few years
- ☐ Other - please specify:

## 2.6 Particules

*Particulate carbon properties in ocean biogeochemistry*

### 2.6.1 Method

*How is particulate carbon represented in ocean biogeochemistryxxx?*

**Spec. ID:** cmip6.ocnbgchem.tracers.particules.method

**Is Required ?** TRUE

**Select value:**

- ☐ Diagnostic
- ☐ Diagnostic (Martin profile)
- ☐ Diagnostic (Balast)
- ☐ Prognostic
- ☐ Other - please specify:

### 2.6.2 Types If Prognostic

*If prognostic, type(s) of particulate matter taken into account*

**Spec. ID:** cmip6.ocnbgchem.tracers.particules.types_if_prognostic

**Is Required ?** FALSE

**Select value(s):**

- ☐ POC
- ☐ PIC (calcite)
- ☐ PIC (aragonite
- ☐ BSi
- ☐ Other - please specify:

### 2.6.3 Size If Prognostic

*If prognostic, describe if a particule size spectrum is used to represent distribution of particules in water volume*

**Spec. ID:** cmip6.ocnbgchem.tracers.particules.size_if_prognostic

**Is Required ?** FALSE

**Select value:**

☐ No size spectrum used

☐ Full size spectrum

☐ Discrete size classes (specify which below)

### 2.6.4 Size If Discrete

*If prognostic and discrete size, describe which size classes are used*

**Spec. ID:** cmip6.ocnbgchem.tracers.particules.size_if_discrete

**Is Required ?** FALSE

**Enter TEXT value:**

### 2.6.5 Sinking Speed If Prognostic

*If prognostic, method for calculation of sinking speed of particules*

**Spec. ID:** cmip6.ocnbgchem.tracers.particules.sinking_speed_if_prognostic

**Is Required ?** FALSE

**Select value:**

☐ Constant

☐ Function of particule size

☐ Function of particule type (balast)

☐ Other - please specify:

## 2.7 Dic Alkalinity

*DIC and alkalinity properties in ocean biogeochemistry*

### 2.7.1 Carbon Isotopes

*Which carbon isotopes are modelled (C13, C14)xxx?*

**Spec. ID:** cmip6.ocnbgchem.tracers.dic_alkalinity.carbon_isotopes

**Is Required ?** TRUE

**Select value(s):**

☐ C13

☐ C14)

### 2.7.2 Abiotic Carbon

*Is abiotic carbon modelled xxx?*

**Spec. ID:** cmip6.ocnbgchem.tracers.dic_alkalinity.abiotic_carbon

**Is Required ?** TRUE

**Select value:**

☐ True ☐ False

### 2.7.3 Alkalinity

*How is alkalinity modelled xxx?*

**Spec. ID:** cmip6.ocnbgchem.tracers.dic_alkalinity.alkalinity

**Is Required ?** TRUE

**Select value:**

☐ Prognostic

☐ Diagnostic)