

# CMIP6 Model Documentation

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# 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 diagnostic 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

*Describe 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 specified 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 specified 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 (NO<sub>3</sub>)
- ☐ Amonium (NH<sub>4</sub>)
- ☐ 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 Dissolved Organic Matter

*Dissolved organic matter properties in ocean biogeochemistry*

### 2.5.1 Bacteria Present

*Is there bacteria representation xxx?*

**Spec. ID:** cmip6.ocnbgchem.tracers.dissolved\_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.dissolved\_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 Particles

*Particulate carbon properties in ocean biogeochemistry*

### 2.6.1 Method

*How is particulate carbon represented in ocean biogeochemistryxxx?*

**Spec. ID:** cmip6.ocnbgchem.tracers.particles.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.particles.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 particle size spectrum is used to represent distribution of particles 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 particles*

**Spec. ID:** cmip6.ocnbgchem.tracers.particules.sinking\_speed\_if\_prognostic

**Is Required ?** FALSE

**Select value:**

- ☐ Constant
- ☐ Function of particle size
- ☐ Function of particle 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)