

# 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 Name \*

*Name of ocnbgchem model code*

**Enter TEXT:**

### 1.1.2 Keywords \*

*Keywords associated with ocnbgchem model code*

**Enter COMMA SEPERATED list:**

### 1.1.3 Overview \*

*Overview of ocnbgchem model.*

**Enter TEXT:**

### 1.1.4 Model Type \*

*Type of ocean biogeochemistry model*

**Select SINGLE option:**

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

### 1.1.5 Elemental Stoichiometry \*

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

**Select SINGLE option:**

- ☐ Fixed - Fixed stoichiometry
- ☐ Variable - Variable stoichiometry
- ☐ Mix of both - Both fixed and mixed stoichiometry

### 1.1.6 Elemental Stoichiometry Details \*

*Describe which elements have fixed/variable stoichiometry*

**Enter COMMA SEPERATED list:**

### 1.1.7 Prognostic Variables \*

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

**Enter COMMA SEPERATED list:**

### 1.1.8 Diagnostic Variables \*

*List of all diagnostic tracer variables in the ocean biogeochemistry component (derived from prognostic variables)*

**Enter COMMA SEPERATED list:**

### 1.1.9 Damping

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

**Enter TEXT:**

## 1.2 Time Stepping Framework

*Time stepping framework for ocean biogeochemistry*

### 1.2.1 Overview

*Overview of time stepping framework for ocean biogeochemistry in ocnbgchem model.*

**Enter TEXT:**

## 1.3 Passive Tracers Transport

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

### 1.3.1 Method \*

*Time stepping framework for passive tracers*

**Select SINGLE option:**

- ☐ Use ocean model transport time step
- ☐ Use specific time step

### 1.3.2 Timestep If Not From Ocean

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

**Enter INTEGER value:**

## 1.4 Biology Sources Sinks

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

#### 1.4.1 Method \*

*Time stepping framework for biology sources and sinks*

Select **SINGLE** option:

- ☐ Use ocean model transport time step
- ☐ Use specific time step

#### 1.4.2 Timestep If Not From Ocean

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

Enter **INTEGER** value:

### 1.5 Transport Scheme

*Transport scheme in ocean biogeochemistry*

#### 1.5.1 Overview

*Overview of transport scheme in ocean biogeochemistry in ocnbgchem model.*

Enter **TEXT**:

#### 1.5.2 Type \*

*Type of transport scheme*

Select **SINGLE** option:

- ☐ Offline
- ☐ Online

#### 1.5.3 Scheme \*

*Transport scheme used*

Select **SINGLE** option:

- ☐ Use that of ocean model
- ☐ Other - please specify:

#### 1.5.4 Use Different Scheme

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

Enter **TEXT**:

### 1.6 Boundary Forcing

*Properties of biogeochemistry boundary forcing*

### 1.6.1 Overview

*Overview of properties of biogeochemistry boundary forcing in ocnbgchem model.*

**Enter TEXT:**

### 1.6.2 Atmospheric Deposition \*

*Describe how atmospheric deposition is modeled*

**Select SINGLE option:**

- ☐ From file (climatology)
- ☐ From file (interannual variations)
- ☐ From Atmospheric Chemistry model

### 1.6.3 River Input \*

*Describe how river input is modeled*

**Select SINGLE option:**

- ☐ From file (climatology)
- ☐ From file (interannual variations)
- ☐ From Land Surface model

### 1.6.4 Sediments From Boundary Conditions

*List which sediments are specified from boundary condition*

**Enter COMMA SEPERATED list:**

### 1.6.5 Sediments From Explicit Model

*List which sediments are specified from explicit sediment model*

**Enter COMMA SEPERATED list:**

## 1.7 Gas Exchange

*Properties of gas exchange in ocean biogeochemistry*

### 1.7.1 Overview

*Overview of properties of gas exchange in ocean biogeochemistry in ocnbgchem model.*

**Enter TEXT:**

### 1.7.2 CO2 Exchange Present \*

*Is CO2 gas exchange modeled ?*

**Select either TRUE or FALSE:**

- ☐ True
- ☐ False

### 1.7.3 CO2 Exchange Type

*Describe CO2 gas exchange*

Select SINGLE option:

- ☐ OMIP protocol
- ☐ Other - please specify:

### 1.7.4 O2 Exchange Present \*

*Is O2 gas exchange modeled ?*

Select either TRUE or FALSE:

- ☐ True      ☐ False

### 1.7.5 O2 Exchange Type

*Describe O2 gas exchange*

Select SINGLE option:

- ☐ OMIP protocol
- ☐ Other - please specify:

### 1.7.6 DMS Exchange Present \*

*Is DMS gas exchange modeled ?*

Select either TRUE or FALSE:

- ☐ True      ☐ False

### 1.7.7 DMS Exchange Type

*Specify DMS gas exchange scheme type*

Enter TEXT:

### 1.7.8 N2 Exchange Present \*

*Is N2 gas exchange modeled ?*

Select either TRUE or FALSE:

- ☐ True      ☐ False

### 1.7.9 N2 Exchange Type

*Specify N2 gas exchange scheme type*

Enter TEXT:

#### 1.7.10 N2O Exchange Present \*

*Is N2O gas exchange modeled ?*

Select either TRUE or FALSE:

☐ True ☐ False

#### 1.7.11 N2O Exchange Type

*Specify N2O gas exchange scheme type*

Enter TEXT:

#### 1.7.12 CFC11 Exchange Present \*

*Is CFC11 gas exchange modeled ?*

Select either TRUE or FALSE:

☐ True ☐ False

#### 1.7.13 CFC11 Exchange Type

*Specify CFC11 gas exchange scheme type*

Enter TEXT:

#### 1.7.14 CFC12 Exchange Present \*

*Is CFC12 gas exchange modeled ?*

Select either TRUE or FALSE:

☐ True ☐ False

#### 1.7.15 CFC12 Exchange Type

*Specify CFC12 gas exchange scheme type*

Enter TEXT:

#### 1.7.16 SF6 Exchange Present \*

*Is SF6 gas exchange modeled ?*

Select either TRUE or FALSE:

☐ True ☐ False

#### 1.7.17 SF6 Exchange Type

*Specify SF6 gas exchange scheme type*

Enter TEXT:



### 1.7.18 $^{13}\text{CO}_2$ Exchange Present \*

*Is  $^{13}\text{CO}_2$  gas exchange modeled ?*

Select either TRUE or FALSE:

☐ True ☐ False

### 1.7.19 $^{13}\text{CO}_2$ Exchange Type

*Specify  $^{13}\text{CO}_2$  gas exchange scheme type*

Enter TEXT:

### 1.7.20 $^{14}\text{CO}_2$ Exchange Present \*

*Is  $^{14}\text{CO}_2$  gas exchange modeled ?*

Select either TRUE or FALSE:

☐ True ☐ False

### 1.7.21 $^{14}\text{CO}_2$ Exchange Type

*Specify  $^{14}\text{CO}_2$  gas exchange scheme type*

Enter TEXT:

### 1.7.22 Other Gases

*Specify any other gas exchange*

Enter TEXT:

## 1.8 Carbon Chemistry

*Properties of carbon chemistry biogeochemistry*

### 1.8.1 Overview

*Overview of properties of carbon chemistry biogeochemistry in ocnbgchem model.*

Enter TEXT:

### 1.8.2 Type \*

*Describe how carbon chemistry is modeled*

Select SINGLE option:

☐ OMIP protocol  
☐ Other protocol

### 1.8.3 Ph Scale

*If NOT OMIP protocol, describe pH scale.*

**Select SINGLE option:**

- ☐ Sea water
- ☐ Free
- ☐ Other - please specify:

### 1.8.4 Constants If Not OMIP

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

**Enter COMMA SEPERATED list:**

## 2 Tracers

*Ocean biogeochemistry tracers*

### 2.1 Tracers

*Ocean biogeochemistry tracers*

#### 2.1.1 Name

*Commonly used name for the tracers in ocnbgchem model.*

**Enter TEXT:**

#### 2.1.2 Overview

*Overview of ocean biogeochemistry tracers in ocnbgchem model.*

**Enter TEXT:**

#### 2.1.3 Sulfur Cycle Present \*

*Is sulfur cycle modeled ?*

**Select either TRUE or FALSE:**

☐ True ☐ False

#### 2.1.4 Nutrients Present \*

*List nutrient species present in ocean biogeochemistry model*

**Select MULTIPLE options:**

- ☐ Nitrogen (N)
- ☐ Phosphorous (P)
- ☐ Silicium (S)
- ☐ Iron (Fe)
- ☐ Other - please specify:

#### 2.1.5 Nitrous Species If N

*If nitrogen present, list nitrous species.*

**Select MULTIPLE options:**

- ☐ Nitrates (NO<sub>3</sub>)
- ☐ Amonium (NH<sub>4</sub>)
- ☐ Other - please specify:

### 2.1.6 Nitrous Processes If N

*If nitrogen present, list nitrous processes.*

**Select MULTIPLE options:**

- ☐ Dentrification
- ☐ N fixation
- ☐ Other - please specify:

## 2.2 Ecosystem

*Ecosystem properties in ocean biogeochemistry*

### 2.2.1 Overview

*Overview of ecosystem properties in ocean biogeochemistry in ocnbgchem model.*

**Enter TEXT:**

### 2.2.2 Upper Trophic Levels Definition \*

*Describe how upper trophic levels are defined in model (e.g. based on size)*

**Enter TEXT:**

### 2.2.3 Upper Trophic Levels Treatment \*

*Describe how upper trophic levels are treated in model*

**Enter TEXT:**

## 2.3 Phytoplankton

*Phytoplankton properties in ocean biogeochemistry*

### 2.3.1 Type \*

*Type of phytoplankton*

**Select SINGLE option:**

- ☐ 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)*

**Select MULTIPLE options:**

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

### 2.3.3 Size Classes

*Phytoplankton size classes (if applicable)*

**Select MULTIPLE options:**

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

## 2.4 Zooplankton

*Zooplankton properties in ocean biogeochemistry*

### 2.4.1 Type \*

*Type of zooplankton*

**Select SINGLE option:**

- ☐ None
- ☐ Generic
- ☐ Size based (specify below)
- ☐ Other - please specify:

### 2.4.2 Size Classes

*Zooplankton size classes (if applicable)*

**Select MULTIPLE options:**

- ☐ Microzooplankton
- ☐ Mesozooplankton
- ☐ Other - please specify:

## 2.5 Dissolved Organic Matter

*Dissolved organic matter properties in ocean biogeochemistry*

### 2.5.1 Overview

*Overview of dissolved organic matter properties in ocean biogeochemistry in ocnbgchem model.*

**Enter TEXT:**

### 2.5.2 Bacteria Present \*

*Is there bacteria representation ?*

**Select either TRUE or FALSE:**

☐ True ☐ False

### 2.5.3 Lability \*

*Describe treatment of lability in dissolved organic matter*

**Select SINGLE option:**

- ☐ 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 Overview

*Overview of particulate carbon properties in ocean biogeochemistry in ocnbgchem model.*

**Enter TEXT:**

### 2.6.2 Method \*

*How is particulate carbon represented in ocean biogeochemistry?*

**Select MULTIPLE options:**

- ☐ Diagnostic
- ☐ Diagnostic (Martin profile)
- ☐ Diagnostic (Balast)
- ☐ Prognostic

☐ Other - please specify:

### 2.6.3 Types If Prognostic

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

Select **MULTIPLE** options:

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

### 2.6.4 Size If Prognostic

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

Select **SINGLE** option:

- ☐ No size spectrum used
- ☐ Full size spectrum
- ☐ Discrete size classes (specify which below)

### 2.6.5 Size If Discrete

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

Enter **TEXT**:

### 2.6.6 Sinking Speed If Prognostic

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

Select **SINGLE** option:

- ☐ Constant
- ☐ Function of particle size
- ☐ Function of particle type (ballast)
- ☐ Other - please specify:

## 2.7 Dic Alkalinity

*DIC and alkalinity properties in ocean biogeochemistry*

### 2.7.1 Overview

*Overview of dic and alkalinity properties in ocean biogeochemistry in ocnbgchem model.*

**Enter TEXT:**

### 2.7.2 Carbon Isotopes \*

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

**Select MULTIPLE options:**

☐ C13

☐ C14)

### 2.7.3 Abiotic Carbon \*

*Is abiotic carbon modelled ?*

**Select either TRUE or FALSE:**

☐ True

☐ False

### 2.7.4 Alkalinity \*

*How is alkalinity modelled ?*

**Select SINGLE option:**

☐ Prognostic

☐ Diagnostic)