CMIP6 Model Documentation

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Documentation Contents

1 Key Properties

Ocean key properties

1.1.1 Top level properties

Ocean key properties

1.1.1.1 Name *

Name of ocean model code

NEMO : Nucleus for European Modelling of the Ocean version 3.6 (OPA)

1.1.1.2 Keywords *

Keywords associated with ocean model code

Enter COMMA SEPARATED list:

1.1.1.3 Overview *

Overview of ocean model.

The ocean component of CNRM-CM6-1/CNRM-ESM2-1 is based on the version 3.6 of NEMO (Nucleus for European Models of the Ocean ; Madec, 2016). It is based on the NOCS-ORCA1 configuration described in details in Danabasoglu et al. (2014). Main differences are highlighted below. In CNRM-CM6-1, NEMO is run on eORCA1 horizontal grid, which is an extension of the ORCA1 tripolar grid already used in CNRM-CM5.1. The eORCA family differs from the ORCA family by the use of two quasi-isotropic bipolar grids south of 67S instead of the former Mercator grid, which allows for a more realistic representation of the contours of Antarctic ice shelves (Mathiot et al., 2017). In eORCA1, a nominal resolution of 1 is chosen to which a latitudinal grid refinement of 1/3 is added in the tropics. CNRM-CM6-1 resolves ocean dynamics on 75 vertical levels using a vertical z-coordinate with partial step bathymetry formulation (Barnier et al., 2006). The level thickness increases from 1m near the surface to 200 m at a depth of 6000 m. The time step is 30 minutes. At the surface, the model uses the split-explicit non-linear free surface formulation proposed by Shchepetkin and McWilliams (2005), with a variable volume. Seawater thermodynamics uses the equation of state defined in the Thermodynamic Equation of State 2010 (TEOS-10, IOC et al., 2010), with conservative temperature and absolute salinity being then the prognostic variables. Radiative transfer in the water column is resolved using a chlorophyll-dependent three-waveband scheme as described in Lengaigne et al. (2007) and Mignot et al. (2013), using a seasonal climatology of surface chlorophyll concentration derived from a former 60-year long simulation run with NEMO-PISCES (e.g. Lee et al., 2016). A vertical profile of chlorophyll concentration is extrapolated from surface concentrations. Lateral diffusivity and viscosity are parameterized as in NOCS-ORCA1 (Danabasoglu et al., 2014). Parameterization of vertical mixing is also similar, with two notable exceptions in CNRM-CM6-1: mixing induced by breaking internal waves is parameterized following de Lavergne et al. (2016) and the Fox-Kemper et al. (2011) submesoscale mixed layer restratification scheme is activated.

1.1.1.4 Model Family *

Type of ocean model.

- [x] OGCM
- [ ] Slab ocean
- [ ] Mixed layer ocean

- [ ] Other - please specify:

1.1.1.5 Basic Approximations *

Basic approximations made in the ocean.

- [x] Primitive equations
- [ ] Non-hydrostatic
- [x] Boussinesq
- [ ] Other - please specify:

1.1.1.6 Prognostic Variables *

List of prognostic variables in the ocean component.

- [ ] Potential temperature
- [x] Conservative temperature
- [x] Salinity
- [x] U-velocity
- [x] V-velocity
- [ ] W-velocity
- [ ] SSH - Sea Surface Height
- [ ] Other - please specify:

1.2.1 Seawater Properties

Physical properties of seawater in ocean

1.2.1.1 Eos Type *

Type of EOS for sea water

- [ ] Linear
- [ ] Wright, 1997
- [ ] Mc Dougall et al.
- [ ] Jackett et al. 2006
- [x] TEOS 2010
- [ ] Other - please specify:

1.2.1.2 Eos Functional Temp *

Temperature used in EOS for sea water

☐ Potential temperature

☒ Conservative temperature

1.2.1.3 Eos Functional Salt *

Salinity used in EOS for sea water

☐ Practical salinity Sp

☒ Absolute salinity Sa

1.2.1.4 Eos Functional Depth *

Depth or pressure used in EOS for sea water ?

☐ Pressure (dbars)

☒ Depth (meters)

1.2.1.5 Ocean Freezing Point *

Equation used to compute the freezing point (in deg C) of seawater, as a function of salinity and pressure

☐ TEOS 2010

☐ Other - please specify:

1.2.1.6 Ocean Specific Heat *

Specific heat in ocean (cpocean) in J/(kg K)

3991.87

1.2.1.7 Ocean Reference Density *

Boussinesq reference density (rhozero) in kg / m3

1026

1.3.1 Bathymetry

Properties of bathymetry in ocean

1.3.1.1 Reference Dates *

Reference date of bathymetry

☒ Present day

☐ 21000 years BP

☐ 6000 years BP

☐ LGM - Last Glacial Maximum

☐ Pliocene

☐ Other - please specify:

1.3.1.2 Type *

Is the bathymetry fixed in time in the ocean ?

☐ True ☐ False

1.3.1.3 Ocean Smoothing *

Describe any smoothing or hand editing of bathymetry in ocean

Enter TEXT:

1.3.1.4 Source *

Describe source of bathymetry in ocean

Enter TEXT:

1.4.1 Nonoceanic Waters

Non oceanic waters treatement in ocean

1.4.1.1 Isolated Seas

Describe if/how isolated seas is performed

The isolated sea are not represented in the ocean model. They are considered as lakes and dealt with the FLAKE scheme. The FLAKE scheme is implemented in the SURFEX platform embedded in the atmospheric model which calculates the surface fluxes.

1.4.1.2 River Mouth

Describe if/how river mouth mixing or estuaries specific treatment is performed

Kz increase near river mouth (top 20 m)

1.5.1 Software Properties

Software properties of ocean code

1.5.1.1 Repository

Location of code for this component.

Https://www.nemo-ocean.eu/

1.5.1.2 Code Version

Code version identifier.

V3.6

1.5.1.3 Code Languages

Code language(s).

Fortran

1.6.1 Resolution

Resolution in the ocean grid

1.6.1.1 Name *

This is a string usually used by the modelling group to describe the resolution of this grid, e.g. ORCA025, N512L180, T512L70 etc.

EORCA1L75

1.6.1.2 Canonical Horizontal Resolution *

Expression quoted for gross comparisons of resolution, eg. 50km or 0.1 degrees etc.

1

1.6.1.3 Range Horizontal Resolution *

Range of horizontal resolution with spatial details, eg. 50(Equator)-100km or 0.1-0.5 degrees etc.

1-0.3 in the tropics

1.6.1.4 Number Of Horizontal Gridpoints *

Total number of horizontal (XY) points (or degrees of freedom) on computational grid.

105704

1.6.1.5 Number Of Vertical Levels *

Number of vertical levels resolved on computational grid.

75

1.6.1.6 Is Adaptive Grid *

Default is False. Set true if grid resolution changes during execution.

☐ True ☐ False

1.6.1.7 Thickness Level 1 *

Thickness of first surface ocean level (in meters)

1

1.7.1 Tuning Applied

Tuning methodology for ocean component

1.7.1.1 Description *

General overview description of tuning: explain and motivate the main targets and metrics retained. Document the relative weight given to climate performance metrics versus process oriented metrics, and on the possible conflicts with parameterization level tuning. In particular describe any struggle with a parameter value that required pushing it to its limits to solve a particular model deficiency.

The ocean has been tuned in ocean forced mode.

1.7.1.2 Global Mean Metrics Used

List set of metrics of the global mean state used in tuning model/component

Enter COMMA SEPARATED list:

1.7.1.3 Regional Metrics Used

List of regional metrics of mean state (e.g THC, AABW, regional means etc) used in tuning model/component

Enter COMMA SEPARATED list:

1.7.1.4 Trend Metrics Used

List observed trend metrics used in tuning model/component

Enter COMMA SEPARATED list:

1.8.1 Conservation

Conservation in the ocean component

1.8.1.1 Description *

Brief description of conservation methodology

Enter TEXT:

1.8.1.2 Scheme *

Properties conserved in the ocean by the numerical schemes

Select MULTIPLE options:

- [ ] Energy
- [ ] Enstrophy
- [ ] Salt
- [ ] Volume of ocean
- [ ] Momentum
- [ ] Other - please specify:

1.8.1.3 Consistency Properties

Any additional consistency properties (energy conversion, pressure gradient discretisation, ...)?

Enter COMMA SEPARATED list:

1.8.1.4 Corrected Conserved Prognostic Variables

*Set of variables which are conserved by *more* than the numerical scheme alone.*

Enter COMMA SEPARATED list:

1.8.1.5 Was Flux Correction Used

Does conservation involve flux correction ?

Select either TRUE or FALSE:

☐ True ☐ False

2 Grid

Ocean grid

2.1.1 Top level properties

Ocean grid

2.1.1.1 Name

Name of grid in ocean model.

EORCA1L75

2.1.1.2 Overview

Overview of grid in ocean model.

See Matthiot et al. 2017

2.1.2 Vertical

Properties of vertical discretisation in ocean

2.1.2.1 Coordinates *

Type of vertical coordinates in ocean

- ☐ Z-coordinate
- ☒ Z*-coordinate
- ☐ S-coordinate
- ☐ Isopycnic - sigma 0 - Density referenced to the surface
- ☐ Isopycnic - sigma 2 - Density referenced to 2000 m
- ☐ Isopycnic - sigma 4 - Density referenced to 4000 m
- ☐ Isopycnic - other - Other density-based coordinate
- ☐ Hybrid / Z+S
- ☐ Hybrid / Z+isopycnic
- ☐ Hybrid / other
- ☐ Pressure referenced (P)
- ☐ P*
- ☐ Z**
- ☐ Other - please specify:

2.1.2.2 Partial Steps *

Using partial steps with Z or Z vertical coordinate in ocean ?*

☐ True ☐ False

2.1.3 Horizontal

Type of horizontal discretisation scheme in ocean

2.1.3.1 Type *

Horizontal grid type

☐ Lat-lon

☐ Rotated north pole

☒ Two north poles (ORCA-style)

☐ Other - please specify:

2.1.3.2 Staggering

Horizontal grid staggering type

☐ Arakawa B-grid

☒ Arakawa C-grid

☐ Arakawa E-grid

☐ N/a

☐ Other - please specify:

2.1.3.3 Scheme *

Horizontal discretisation scheme in ocean

Select SINGLE option:

☐ Finite difference

☐ Finite volumes

☐ Finite elements

☐ Unstructured grid

☐ Other - please specify:

3 Timestepping Framework

Ocean Timestepping Framework

3.1.1 Top level properties

Ocean Timestepping Framework

3.1.1.1 Name

Commonly used name for the timestepping framework in ocean model.

Leap-frog

3.1.1.2 Overview

Overview of ocean timestepping framework in ocean model.

Enter TEXT:

3.1.1.3 Diurnal Cycle *

Diurnal cycle type

- [ ] None - No diurnal cycle in ocean
- [ ] Via coupling - Diurnal cycle via coupling frequency
- [ ] Specific treatment - Specific treament
- [ ] Other - please specify:

3.2.1 Tracers

Properties of tracers time stepping in ocean

3.2.1.1 Scheme *

Tracers time stepping scheme

- [ ] Leap-frog + Asselin filter - Leap-frog scheme with Asselin filter
- [ ] Leap-frog + Periodic Euler - Leap-frog scheme with Periodic Euler
- [ ] Predictor-corrector - Predictor-corrector scheme
- [ ] Runge-Kutta 2 - Runge-Kutta 2 scheme
- [ ] AM3-LF - AM3-LF such as used in ROMS
- [ ] Forward-backward - Forward-backward scheme
- [ ] Forward operator - Forward operator scheme
- [ ] Other - please specify:

3.2.1.2 Time Step *

Tracers time step (in seconds)

1800

3.3.1 Baroclinic Dynamics

Baroclinic dynamics in ocean

3.3.1.1 Type *

Baroclinic dynamics type

Select SINGLE option:

☐ Preconditioned conjugate gradient

☐ Sub cyling - Sub cycling relative to tracers

☐ Other - please specify:

3.3.1.2 Scheme *

Baroclinic dynamics scheme

☐ Leap-frog + Asselin filter - Leap-frog scheme with Asselin filter

☐ Leap-frog + Periodic Euler - Leap-frog scheme with Periodic Euler

☐ Predictor-corrector - Predictor-corrector scheme

☐ Runge-Kutta 2 - Runge-Kutta 2 scheme

☐ AM3-LF - AM3-LF such as used in ROMS

☐ Forward-backward - Forward-backward scheme

☐ Forward operator - Forward operator scheme

☐ Other - please specify:

3.3.1.3 Time Step

Baroclinic time step (in seconds)

1800

3.4.1 Barotropic

Barotropic time stepping in ocean

3.4.1.1 Splitting *

Time splitting method

☐ None

☒ Split explicit

☐ Implicit

☐ Other - please specify:

3.4.1.2 Time Step

Barotropic time step (in seconds)

Enter INTEGER value:

3.5.1 Vertical Physics

Vertical physics time stepping in ocean

3.5.1.1 Method *

Details of vertical time stepping in ocean

Enter TEXT:

4 Advection

Ocean advection

4.1.1 Top level properties

Ocean advection

4.1.1.1 Name

Commonly used name for the advection in ocean model.

TVD

4.1.1.2 Overview

Overview of ocean advection in ocean model.

Enter TEXT:

4.2.1 Momentum

Properties of lateral momemtum advection scheme in ocean

4.2.1.1 Type *

Type of lateral momemtum advection scheme in ocean

☐ Flux form

☒ Vector form

4.2.1.2 Scheme Name *

Name of ocean momemtum advection scheme

Total Variance Dissipation (TVD)

4.2.1.3 ALE

Using ALE for vertical advection ? (if vertical coordinates are sigma)

☐ True ☐ False

4.3.1 Lateral Tracers

Properties of lateral tracer advection scheme in ocean

4.3.1.1 Order *

Order of lateral tracer advection scheme in ocean

2

4.3.1.2 Flux Limiter *

Monotonic flux limiter for lateral tracer advection scheme in ocean ?

☐ True ☐ False

4.3.1.3 Effective Order *

Effective order of limited lateral tracer advection scheme in ocean

2

4.3.1.4 Name *

Descriptive text for lateral tracer advection scheme in ocean (e.g. MUSCL, PPM-H5, PRATHER,...)

Total Variance Dissipation (TVD)

4.3.1.5 Passive Tracers

Passive tracers advected

Select MULTIPLE options:

☐ Ideal age

☐ CFC 11

☐ CFC 12

☐ SF6

☐ Other - please specify:

4.3.1.6 Passive Tracers Advection

Is advection of passive tracers different than active ? if so, describe.

No

4.4.1 Vertical Tracers

Properties of vertical tracer advection scheme in ocean

4.4.1.1 Name *

Descriptive text for vertical tracer advection scheme in ocean (e.g. MUSCL, PPM-H5, PRATHER,...)

TVD

4.4.1.2 Flux Limiter *

Monotonic flux limiter for vertical tracer advection scheme in ocean ?

Select either TRUE or FALSE:

☐ True ☐ False

5 Lateral Physics

Ocean lateral physics

5.1.1 Top level properties

Ocean lateral physics

5.1.1.1 Name

Commonly used name for the lateral physics in ocean model.

Laplacian viscosity

5.1.1.2 Overview

Overview of ocean lateral physics in ocean model.

Enter TEXT:

5.1.1.3 Scheme *

Type of transient eddy representation in ocean

☐ None - No transient eddies in ocean

☐ Eddy active - Full resolution of eddies

☐ Eddy admitting - Some eddy activity permitted by resolution

5.1.2 Operator

Properties of lateral physics operator for momentum in ocean

5.1.2.1 Direction *

Direction of lateral physics momemtum scheme in the ocean

☒ Horizontal

☐ Isopycnal

☐ Isoneutral

☐ Geopotential

☐ Iso-level

☐ Other - please specify:

5.1.2.2 Order *

Order of lateral physics momemtum scheme in the ocean

- ☐ Harmonic - Second order
- ☐ Bi-harmonic - Fourth order
- ☐ Other - please specify:

5.1.2.3 Discretisation *

Discretisation of lateral physics momemtum scheme in the ocean

- ☐ Second order - Second order
- ☐ Higher order - Higher order
- ☐ Flux limiter
- ☐ Other - please specify:

5.1.3 Eddy Viscosity Coeff

Properties of eddy viscosity coeff in lateral physics momemtum scheme in the ocean

5.1.3.1 Type *

Lateral physics momemtum eddy viscosity coeff type in the ocean

- ☒ Constant
- ☐ Space varying
- ☐ Time + space varying (Smagorinsky)
- ☐ Other - please specify:

5.1.3.2 Constant Coefficient

If constant, value of eddy viscosity coeff in lateral physics momemtum scheme (in m2/s)

20000

5.1.3.3 Variable Coefficient

If space-varying, describe variations of eddy viscosity coeff in lateral physics momemtum scheme

Enter TEXT:

5.1.3.4 Coeff Background *

Describe background eddy viscosity coeff in lateral physics momemtum scheme (give values in m2/s)

20000

5.1.3.5 Coeff Backscatter *

Is there backscatter in eddy viscosity coeff in lateral physics momemtum scheme ?

☐ True ☐ False

5.2.1 Tracers

Properties of lateral physics for tracers in ocean

5.2.1.1 Mesoscale Closure *

Is there a mesoscale closure in the lateral physics tracers scheme ?

☐ True ☐ False

5.2.1.2 Submesoscale Mixing *

Is there a submesoscale mixing parameterisation (i.e Fox-Kemper) in the lateral physics tracers scheme ?

☐ True ☐ False

5.2.2 Operator

Properties of lateral physics operator for tracers in ocean

5.2.2.1 Direction *

Direction of lateral physics tracers scheme in the ocean

☐ Horizontal

☐ Isopycnal

☒ Isoneutral

☐ Geopotential

☐ Iso-level

☐ Other - please specify:

5.2.2.2 Order *

Order of lateral physics tracers scheme in the ocean

☐ Harmonic - Second order

☐ Bi-harmonic - Fourth order

☐ Other - please specify:

5.2.2.3 Discretisation *

Discretisation of lateral physics tracers scheme in the ocean

☐ Second order - Second order

☐ Higher order - Higher order

☐ Flux limiter

☐ Other - please specify:

5.2.3 Eddy Diffusity Coeff

Properties of eddy diffusity coeff in lateral physics tracers scheme in the ocean

5.2.3.1 Type *

Lateral physics tracers eddy diffusity coeff type in the ocean

☒ Constant

☐ Space varying

☐ Time + space varying (Smagorinsky)

☐ Other - please specify:

5.2.3.2 Constant Coefficient

If constant, value of eddy diffusity coeff in lateral physics tracers scheme (in m2/s)

2000

5.2.3.3 Variable Coefficient

If space-varying, describe variations of eddy diffusity coeff in lateral physics tracers scheme

Enter TEXT:

5.2.3.4 Coeff Background *

Describe background eddy diffusity coeff in lateral physics tracers scheme (give values in m2/s)

2000

5.2.3.5 Coeff Backscatter *

Is there backscatter in eddy diffusity coeff in lateral physics tracers scheme ?

☐ True ☐ False

5.2.4 Eddy Induced Velocity

Properties of eddy induced velocity (EIV) in lateral physics tracers scheme in the ocean

5.2.4.1 Type *

Type of EIV in lateral physics tracers in the ocean

- ☐ GM - Gent and McWilliams
- ☐ Other - please specify:

5.2.4.2 Constant Val

If EIV scheme for tracers is constant, specify coefficient value (M2/s)

2000

5.2.4.3 Flux Type *

Type of EIV flux (advective or skew)

Advective flux

5.2.4.4 Added Diffusivity *

Type of EIV added diffusivity (constant, flow dependent or none)

Enter TEXT:

6 Vertical Physics

Ocean Vertical Physics

6.1.1 Top level properties

Ocean Vertical Physics

6.1.1.1 Name

Commonly used name for the vertical physics in ocean model.

Turbulent closure TKE, Convection, Tidal mixing, bottom boundary layer

6.1.1.2 Overview

Overview of ocean vertical physics in ocean model.

Enter TEXT:

6.1.2 Details

Properties of vertical physics in ocean

6.1.2.1 Langmuir Cells Mixing *

Is there Langmuir cells mixing in upper ocean ?

☐ True ☐ False

6.1.3 Tracers

Properties of boundary layer (BL) mixing on tracers in the ocean

6.1.3.1 Type *

Type of boundary layer mixing for tracers in ocean

☐ Constant value

☒ Turbulent closure - TKE

☐ Turbulent closure - KPP

☐ Turbulent closure - Mellor-Yamada

☐ Turbulent closure - Bulk Mixed Layer

☐ Richardson number dependent - PP

☐ Richardson number dependent - KT

☐ Imbeded as isopycnic vertical coordinate

☐ Other - please specify:

6.1.3.2 Closure Order

If turbulent BL mixing of tracers, specific order of closure (0, 1, 2.5, 3)

Enter FLOAT value:

6.1.3.3 Constant

If constant BL mixing of tracers, specific coefficient (m2/s)

Enter INTEGER value:

6.1.3.4 Background *

Background BL mixing of tracers coefficient, (schema and value in m2/s - may by none)

Enter TEXT:

6.1.4 Momentum

Properties of boundary layer (BL) mixing on momentum in the ocean

6.1.4.1 Type *

Type of boundary layer mixing for momentum in ocean

- [ ] Constant value
- [x] Turbulent closure - TKE
- [ ] Turbulent closure - KPP
- [ ] Turbulent closure - Mellor-Yamada
- [ ] Turbulent closure - Bulk Mixed Layer
- [ ] Richardson number dependent - PP
- [ ] Richardson number dependent - KT
- [ ] Imbeded as isopycnic vertical coordinate
- [ ] Other - please specify:

6.1.4.2 Closure Order

If turbulent BL mixing of momentum, specific order of closure (0, 1, 2.5, 3)

Enter FLOAT value:

6.1.4.3 Constant

If constant BL mixing of momentum, specific coefficient (m2/s)

Enter INTEGER value:

6.1.4.4 Background *

Background BL mixing of momentum coefficient, (schema and value in m2/s - may by none)

Enter TEXT:

6.1.5 Details

Properties of interior mixing in the ocean

6.1.5.1 Convection Type *

Type of vertical convection in ocean

- [ ] Non-penetrative convective adjustment
- [x] Enhanced vertical diffusion
- [ ] Included in turbulence closure
- [ ] Other - please specify:

6.1.5.2 Tide Induced Mixing *

Describe how tide induced mixing is modelled (barotropic, baroclinic, none)

Baroclinic tides

6.1.5.3 Double Diffusion *

Is there double diffusion

- [ ] True
- [ ] False

6.1.5.4 Shear Mixing *

Is interior shear mixing explicitly parameterised ?

- [ ] True
- [ ] False

6.1.6 Tracers

Properties of interior mixing on tracers in the ocean

6.1.6.1 Type *

Type of interior mixing for tracers in ocean

- ☐ Constant value
- ☒ Turbulent closure / TKE
- ☐ Turbulent closure - Mellor-Yamada
- ☐ Richardson number dependent - PP
- ☐ Richardson number dependent - KT
- ☐ Imbeded as isopycnic vertical coordinate
- ☐ Other - please specify:

6.1.6.2 Constant

If constant interior mixing of tracers, specific coefficient (m2/s)

Enter INTEGER value:

6.1.6.3 Profile *

Is the background interior mixing using a vertical profile for tracers (i.e is NOT constant) ?

☐ True ☐ False

6.1.6.4 Background *

Background interior mixing of tracers coefficient, (schema and value in m2/s - may by none)

Set to molecular value (resp. 1e-7m/s and 1e-9m/s for T and S), and managed within the tidal mixing parametrization

6.1.7 Momentum

Properties of interior mixing on momentum in the ocean

6.1.7.1 Type *

Type of interior mixing for momentum in ocean

- ☐ Constant value
- ☒ Turbulent closure / TKE
- ☐ Turbulent closure - Mellor-Yamada
- ☐ Richardson number dependent - PP
- ☐ Richardson number dependent - KT
- ☐ Imbeded as isopycnic vertical coordinate

☐ Other - please specify:

6.1.7.2 Constant

If constant interior mixing of momentum, specific coefficient (m2/s)

Enter INTEGER value:

6.1.7.3 Profile *

Is the background interior mixing using a vertical profile for momentum (i.e is NOT constant) ?

No

6.1.7.4 Background *

Background interior mixing of momentum coefficient, (schema and value in m2/s - may by none)

Enter TEXT:

7 Uplow Boundaries

Ocean upper / lower boundaries

7.1.1 Top level properties

Ocean upper / lower boundaries

7.1.1.1 Name

Commonly used name for the uplow boundaries in ocean model.

Enter TEXT:

7.1.1.2 Overview

Overview of ocean upper / lower boundaries in ocean model.

Enter TEXT:

7.2.1 Free Surface

Properties of free surface in ocean

7.2.1.1 Scheme *

Free surface scheme in ocean

- [ ] Linear implicit
- [ ] Linear filtered
- [ ] Linear semi-explicit
- [ ] Non-linear implicit
- [ ] Non-linear filtered
- [ ] Non-linear semi-explicit
- [x] Fully explicit
- [ ] Other - please specify:

7.2.1.2 Embeded Seaice *

Is the sea-ice embeded in the ocean model (instead of levitating) ?

- [ ] True
- [ ] False

7.3.1 Bottom Boundary Layer

Properties of bottom boundary layer in ocean

7.3.1.1 Overview *

Overview of bottom boundary layer in ocean

Enter TEXT:

7.3.1.2 Type Of Bbl *

Type of bottom boundary layer in ocean

- [x] Diffusive
- [ ] Acvective
- [ ] Other - please specify:

7.3.1.3 Lateral Mixing Coef

If bottom BL is diffusive, specify value of lateral mixing coefficient (in m2/s)

1000

7.3.1.4 Sill Overflow *

Describe any specific treatment of sill overflows

Enter TEXT:

8 Boundary Forcing

Ocean boundary forcing

8.1.1 Top level properties

Ocean boundary forcing

8.1.1.1 Name

Commonly used name for the boundary forcing in ocean model.

ECUME

8.1.1.2 Overview

Overview of ocean boundary forcing in ocean model.

Enter TEXT:

8.1.1.3 Surface Pressure *

Describe how surface pressure is transmitted to ocean (via sea-ice, nothing specific,...)

Not transmitted (only dynamic sea level intervenes in the surface pressure force)

8.1.1.4 Momentum Flux Correction

Describe any type of ocean surface momentum flux correction and, if applicable, how it is applied and where.

No

8.1.1.5 Tracers Flux Correction

Describe any type of ocean surface tracers flux correction and, if applicable, how it is applied and where.

Enter TEXT:

8.1.1.6 Wave Effects *

Describe if/how wave effects are modelled at ocean surface.

Enter TEXT:

8.1.1.7 River Runoff Budget *

Describe how river runoff from land surface is routed to ocean and any global adjustment done.

Continental runoff are routed to the ocean by the CTRIP river runoff model. Then an interpolation is done from the river outlet to the ocean nerby grid points. There is afterwards a global conservation procedure applied to ensure a global conservation as the interpolation is not conservative locally.

8.1.1.8 Geothermal Heating *

Describe if/how geothermal heating is present at ocean bottom.

Climatological map of geothermal heating applied at the lowermost ocean level of each water column.

8.1.2 Bottom Friction

Properties of momentum bottom friction in ocean

8.1.2.1 Type *

Type of momentum bottom friction in ocean

- [x] Linear
- [ ] Non-linear
- [ ] Non-linear (drag function of speed of tides)
- [ ] Constant drag coefficient
- [ ] None
- [ ] Other - please specify:

8.1.3 Lateral Friction

Properties of momentum lateral friction in ocean

8.1.3.1 Type *

Type of momentum lateral friction in ocean

- [ ] None
- [ ] Free-slip
- [x] No-slip
- [ ] Other - please specify:

8.1.4 Sunlight Penetration

Properties of sunlight penetration scheme in ocean

8.1.4.1 Scheme *

Type of sunlight penetration scheme in ocean

- [ ] 1 extinction depth
- [ ] 2 extinction depth
- [x] 3 extinction depth

☐ Other - please specify:

8.1.4.2 Ocean Colour *

Is the ocean sunlight penetration scheme ocean colour dependent ?

☐ True ☐ False

8.1.4.3 Extinction Depth Description

Describe extinctions depths for sunlight penetration scheme (if applicable).

Enter TEXT:

8.1.4.4 Extinction Depths

List extinctions depths for sunlight penetration scheme (if applicable).

Enter COMMA SEPARATED list:

8.1.5 Fresh Water Forcing

Properties of surface fresh water forcing in ocean

8.1.5.1 From Atmopshere *

Type of surface fresh water forcing from atmos in ocean

Select SINGLE option:

☐ Freshwater flux

☐ Virtual salt flux

☐ Other - please specify:

8.1.5.2 From Sea Ice *

Type of surface fresh water forcing from sea-ice in ocean

Select SINGLE option:

☐ Freshwater flux

☐ Virtual salt flux

☐ Real salt flux

☐ Other - please specify:

8.1.5.3 Forced Mode Restoring *

Type of surface salinity restoring in forced mode (OMIP)

Enter TEXT: