

# CMIP6 Model Documentation

<b>Institute:</b>	MOHC
<b>Model:</b>	HADGEM3-GC31-MM
<b>Topic:</b>	Sea Ice
<b>Doc. Generated:</b>	2018-02-15
<b>Doc. Seeded From:</b>	N/A
<b>Specialization Version:</b>	1.0.0
<b>Further Info:</b>	<a href="https://es-doc.org/cmip6">https://es-doc.org/cmip6</a> <a href="https://specializations.es-doc.org/cmip6">https://specializations.es-doc.org/cmip6</a>

# Documentation Contents

<b>1</b>	<b>Key Properties</b>	<b>1</b>
1.1	Model . . . . .	1
1.2	Variables . . . . .	1
1.3	Seawater Properties . . . . .	2
1.4	Resolution . . . . .	2
1.5	Tuning Applied . . . . .	3
1.6	Key Parameter Values . . . . .	4
1.7	Assumptions . . . . .	4
1.8	Conservation . . . . .	5
<b>2</b>	<b>Grid</b>	<b>7</b>
2.1	Horizontal . . . . .	7
2.2	Vertical . . . . .	8
2.3	Seaice Categories . . . . .	9
2.4	Snow On Seaice . . . . .	10
<b>3</b>	<b>Dynamics</b>	<b>12</b>
3.1	Dynamics . . . . .	12
<b>4</b>	<b>Thermodynamics</b>	<b>14</b>
4.1	Energy . . . . .	14
4.2	Mass . . . . .	15
4.3	Salt . . . . .	16
4.4	Mass Transport . . . . .	17
4.5	Thermodynamics . . . . .	18
4.6	Ice Thickness Distribution . . . . .	18
4.7	Ice Floe Size Distribution . . . . .	19
4.8	Melt Ponds . . . . .	19
4.9	Snow Processes . . . . .	20
<b>5</b>	<b>Radiative Processes</b>	<b>22</b>
5.1	Radiative Processes . . . . .	22

# 1 Key Properties

*Sea Ice key properties*

## 1.1 Model

*Name of seaice model used.*

### 1.1.1 Model Overview

*Overview of sea ice model.*

**Spec. ID:** cmip6.seaice.key\_properties.model.model\_overview

**Is Required ?** TRUE

**Enter TEXT value:**

### 1.1.2 Model Name

*Name of sea ice model code (e.g. CICE 4.2, LIM 2.1, etc.)*

**Spec. ID:** cmip6.seaice.key\_properties.model.model\_name

**Is Required ?** TRUE

**Enter TEXT value:**

## 1.2 Variables

*List of prognostic variable in the sea ice model.*

### 1.2.1 Prognostic

*List of prognostic variables in the sea ice component.*

**Spec. ID:** cmip6.seaice.key\_properties.variables.prognostic

**Is Required ?** TRUE

**Select value(s):**

- ☐ Sea ice temperature
- ☐ Sea ice concentration
- ☐ Sea ice thickness
- ☐ Sea ice volume per grid cell area
- ☐ Sea ice u-velocity
- ☐ Sea ice v-velocity
- ☐ Sea ice enthalpy
- ☐ Internal ice stress

- ☐ Salinity
- ☐ Snow temperature - Snow on ice temperature
- ☐ Snow depth - Snow on ice thickness
- ☐ Other - please specify:

## 1.3 Seawater Properties

*Properties of seawater relevant to sea ice*

### 1.3.1 Ocean Freezing Point

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

**Spec. ID:** cmip6.seaice.key\_properties.seawater\_properties.ocean\_freezing\_point

**Is Required ?** TRUE

**Select value:**

- ☐ TEOS-10 - Thermodynamic equation of seawater 2010
- ☐ Constant - Constant value of seawater freezing point is used.
- ☐ Other - please specify:

### 1.3.2 Ocean Freezing Point Value

*If using a constant seawater freezing point, specify this value.*

**Spec. ID:** cmip6.seaice.key\_properties.seawater\_properties.ocean\_freezing\_point\_value

**Is Required ?** FALSE

**Enter FLOAT value:**

## 1.4 Resolution

*Resolution of the sea ice grid*

### 1.4.1 Name

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

**Spec. ID:** cmip6.seaice.key\_properties.resolution.name

**Is Required ?** TRUE

**Enter TEXT value:**

### 1.4.2 Canonical Horizontal Resolution

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

**Spec. ID:** cmip6.seaice.key\_properties.resolution.canonical\_horizontal\_resolution

**Is Required ?** TRUE

**Enter TEXT value:**

### 1.4.3 Number Of Horizontal Gridpoints

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

**Spec. ID:** cmip6.seaice.key\_properties.resolution.number\_of\_horizontal\_gridpoints

**Is Required ?** TRUE

**Enter INTEGER value:**

## 1.5 Tuning Applied

*Tuning applied to sea ice model component*

### 1.5.1 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.*

**Spec. ID:** cmip6.seaice.key\_properties.tuning\_applied.description

**Is Required ?** TRUE

**Enter TEXT value:**

### 1.5.2 Target

*What was the aim of tuning, e.g. correct sea ice minima, correct seasonal cycle.*

**Spec. ID:** cmip6.seaice.key\_properties.tuning\_applied.target

**Is Required ?** TRUE

**Enter TEXT value:**

### 1.5.3 Simulations

*Which simulations had tuning applied, e.g. all, not historical, only pi-controlxxx?*

**Spec. ID:** cmip6.seaice.key\_properties.tuning\_applied.simulations

**Is Required ?** TRUE

**Enter TEXT value:**

#### 1.5.4 Metrics Used

*List any observed metrics used in tuning model/parameters*

**Spec. ID:** cmip6.seaice.key\_\_properties.tuning\_\_applied.metrics\_\_used

**Is Required ?** TRUE

**Enter TEXT value:**

#### 1.5.5 Variables

*Which variables were changed during the tuning processxxx?*

**Spec. ID:** cmip6.seaice.key\_\_properties.tuning\_\_applied.variables

**Is Required ?** FALSE

**Enter TEXT value:**

### 1.6 Key Parameter Values

*Values of key parameters*

#### 1.6.1 Typical Parameters

*What values were specified for the following parameters if usedxxx?*

**Spec. ID:** cmip6.seaice.key\_\_properties.key\_\_parameter\_\_values.typical\_\_parameters

**Is Required ?** FALSE

**Select value(s):**

- ☐ Ice strength (P\*) in units of N m<sup>-2</sup>
- ☐ Snow conductivity (ks) in units of W m<sup>-1</sup> K<sup>-1</sup>
- ☐ Minimum thickness of ice created in leads (h0) in units of m
- ☐ Other - please specify:

#### 1.6.2 Additional Parameters

*If you have any additional parameterised values that you have used (e.g. minimum open water fraction or bare ice albedo), please provide them here as a comma separated list*

**Spec. ID:** cmip6.seaice.key\_\_properties.key\_\_parameter\_\_values.additional\_\_parameters

**Is Required ?** FALSE

**Enter TEXT value(s):**

### 1.7 Assumptions

*Assumptions made in the sea ice model*

### 1.7.1 Description

*General overview description of any \*key\* assumptions made in this model.*

**Spec. ID:** cmip6.seaice.key\_properties.assumptions.description

**Is Required ?** TRUE

**Enter TEXT value(s):**

### 1.7.2 On Diagnostic Variables

*Note any assumptions that specifically affect the CMIP6 diagnostic sea ice variables.*

**Spec. ID:** cmip6.seaice.key\_properties.assumptions.on\_diagnostic\_variables

**Is Required ?** TRUE

**Enter TEXT value(s):**

### 1.7.3 Missing Processes

*List any \*key\* processes missing in this model configurationxxx? Provide full details where this affects the CMIP6 diagnostic sea ice variablesxxx?*

**Spec. ID:** cmip6.seaice.key\_properties.assumptions.missing\_processes

**Is Required ?** TRUE

**Enter TEXT value(s):**

## 1.8 Conservation

*Conservation in the sea ice component*

### 1.8.1 Description

*Provide a general description of conservation methodology.*

**Spec. ID:** cmip6.seaice.key\_properties.conservations.description

**Is Required ?** TRUE

**Enter TEXT value:**

### 1.8.2 Properties

*Properties conserved in sea ice by the numerical schemes.*

**Spec. ID:** cmip6.seaice.key\_properties.conservations.properties

**Is Required ?** TRUE

**Select value(s):**

☐ Energy

☐ Mass

☐ Salt

☐ Other - please specify:

### 1.8.3 Budget

*For each conserved property, specify the output variables which close the related budgets. as a comma separated list. For example: Conserved property, variable1, variable2, variable3*

**Spec. ID:** cmip6.seaice.key\_properties.conservations.budget

**Is Required ?** TRUE

**Enter TEXT value:**

### 1.8.4 Was Flux Correction Used

*Does conservation involved flux correctionxxx?*

**Spec. ID:** cmip6.seaice.key\_properties.conservations.was\_flux\_correction\_used

**Is Required ?** TRUE

**Select value:**

☐ True ☐ False

### 1.8.5 Corrected Conserved Prognostic Variables

*List any variables which are conserved by \*more\* than the numerical scheme alone.*

**Spec. ID:** cmip6.seaice.key\_properties.conservations.corrected\_conserved\_prognostic\_variables

**Is Required ?** TRUE

**Enter TEXT value:**



## 2 Grid

### *Sea Ice grid*

#### 2.1 Horizontal

##### *Sea ice discretisation in the horizontal*

###### 2.1.1 Grid

*Grid on which sea ice is horizontal discretisedxxx?*

**Spec. ID:** cmip6.seaice.grid.discretisation.horizontal.grid

**Is Required ?** TRUE

**Select value:**

- ☐ Ocean grid - Sea ice is horizontally discretised on the ocean grid
- ☐ Atmosphere Grid - Sea ice is horizontally discretised on the atmospheric grid
- ☐ Own Grid - Sea ice is horizontally discretised on its own independent grid
- ☐ Other - please specify:

###### 2.1.2 Grid Type

*What is the type of sea ice gridxxx?*

**Spec. ID:** cmip6.seaice.grid.discretisation.horizontal.grid\_type

**Is Required ?** TRUE

**Select value:**

- ☐ Structured grid
- ☐ Unstructured grid
- ☐ Adaptive grid - Computational grid changes during the run
- ☐ Other - please specify:

###### 2.1.3 Scheme

*What is the advection schemexxx?*

**Spec. ID:** cmip6.seaice.grid.discretisation.horizontal.scheme

**Is Required ?** TRUE

**Select value:**

- ☐ Finite differences
- ☐ Finite elements

- ☐ Finite volumes
- ☐ Other - please specify:

#### 2.1.4 Thermodynamics Time Step

*What is the time step in the sea ice model thermodynamic component in seconds.*

**Spec. ID:** cmip6.seaice.grid.discretisation.horizontal.thermodynamics\_time\_step

**Is Required ?** TRUE

**Enter INTEGER value:**

#### 2.1.5 Dynamics Time Step

*What is the time step in the sea ice model dynamic component in seconds.*

**Spec. ID:** cmip6.seaice.grid.discretisation.horizontal.dynamics\_time\_step

**Is Required ?** TRUE

**Enter INTEGER value:**

#### 2.1.6 Additional Details

*Specify any additional horizontal discretisation details.*

**Spec. ID:** cmip6.seaice.grid.discretisation.horizontal.additional\_details

**Is Required ?** FALSE

**Enter TEXT value:**

### 2.2 Vertical

*Sea ice vertical properties*

#### 2.2.1 Layering

*What type of sea ice vertical layers are implemented for purposes of thermodynamic calculationsxxx?*

**Spec. ID:** cmip6.seaice.grid.discretisation.vertical.layering

**Is Required ?** TRUE

**Select value(s):**

- ☐ Zero-layer - Simulation has no internal ice thermodynamics.
- ☐ Two-layers - Simulation uses two layers (i.e. one ice and one snow layer).
- ☐ Multi-layers - Simulation uses more than two layers
- ☐ Other - please specify:

### 2.2.2 Number Of Layers

*If using multi-layers specify how many.*

**Spec. ID:** cmip6.seaice.grid.discretisation.vertical.number\_of\_layers

**Is Required ?** TRUE

**Enter INTEGER value:**

### 2.2.3 Additional Details

*Specify any additional vertical grid details.*

**Spec. ID:** cmip6.seaice.grid.discretisation.vertical.additional\_details

**Is Required ?** FALSE

**Enter TEXT value:**

## 2.3 Seaice Categories

*What method is used to represent sea ice categories ?*

### 2.3.1 Has Multiple Categories

*Set to true if the sea ice model has multiple sea ice categories.*

**Spec. ID:** cmip6.seaice.grid.seaice\_categories.has\_multiple\_categories

**Is Required ?** TRUE

**Select value:**

☐ True      ☐ False

### 2.3.2 Number Of Categories

*If using sea ice categories specify how many.*

**Spec. ID:** cmip6.seaice.grid.seaice\_categories.number\_of\_categories

**Is Required ?** TRUE

**Enter INTEGER value:**

### 2.3.3 Category Limits

*If using sea ice categories specify each of the category limits.*

**Spec. ID:** cmip6.seaice.grid.seaice\_categories.category\_limits

**Is Required ?** TRUE

**Enter TEXT value:**

### 2.3.4 Ice Thickness Distribution Scheme

*Describe the sea ice thickness distribution scheme*

**Spec. ID:** cmip6.seaice.grid.seaice\_categories.ice\_thickness\_distribution\_scheme

**Is Required ?** TRUE

**Enter TEXT value:**

### 2.3.5 Other

*If the sea ice model does not use sea ice categories specify any additional details. For example models that parameterise the ice thickness distribution ITD (i.e there is no explicit ITD) but there is assumed distribution and fluxes are computed accordingly.*

**Spec. ID:** cmip6.seaice.grid.seaice\_categories.other

**Is Required ?** FALSE

**Enter TEXT value:**

## 2.4 Snow On Seaice

*Snow on sea ice details*

### 2.4.1 Has Snow On Ice

*Is snow on ice represented in this modelxxx?*

**Spec. ID:** cmip6.seaice.grid.snow\_on\_seaice.has\_snow\_on\_ice

**Is Required ?** TRUE

**Select value:**

☐ True ☐ False

### 2.4.2 Number Of Snow Levels

*Number of vertical levels of snow on icexxx?*

**Spec. ID:** cmip6.seaice.grid.snow\_on\_seaice.number\_of\_snow\_levels

**Is Required ?** TRUE

**Enter INTEGER value:**

### 2.4.3 Snow Fraction

*Describe how the snow fraction on sea ice is determined*

**Spec. ID:** cmip6.seaice.grid.snow\_on\_seaice.snow\_fraction

**Is Required ?** TRUE

**Enter TEXT value:**

#### 2.4.4 Additional Details

*Specify any additional details related to snow on ice.*

**Spec. ID:** cmip6.seaice.grid.snow\_\_on\_\_seaice.additional\_details

**Is Required ?** FALSE

**Enter TEXT value:**

## 3 Dynamics

### *Sea Ice Dynamics*

#### 3.1 Dynamics

##### *Sea Ice Dynamics*

##### 3.1.1 Horizontal Transport

*What is the method of horizontal advection of sea ice?*

**Spec. ID:** cmip6.seaice.dynamics.horizontal\_transport

**Is Required ?** TRUE

**Select value:**

- ☐ Incremental Re-mapping - (including Semi-Lagrangian)
- ☐ Prather
- ☐ Eulerian
- ☐ Other - please specify:

##### 3.1.2 Transport In Thickness Space

*What is the method of sea ice transport in thickness space (i.e. in thickness categories)?*

**Spec. ID:** cmip6.seaice.dynamics.transport\_in\_thickness\_space

**Is Required ?** TRUE

**Select value:**

- ☐ Incremental Re-mapping - (including Semi-Lagrangian)
- ☐ Prather
- ☐ Eulerian
- ☐ Other - please specify:

##### 3.1.3 Ice Strength Formulation

*Which method of sea ice strength formulation is used?*

**Spec. ID:** cmip6.seaice.dynamics.ice\_strength\_formulation

**Is Required ?** TRUE

**Select value:**

- ☐ Hibler 1979
- ☐ Rothrock 1975

☐ Other - please specify:

#### 3.1.4 Redistribution

*Which processes can redistribute sea ice (including thickness)xxx?*

**Spec. ID:** cmip6.seaice.dynamics.redistribution

**Is Required ?** TRUE

**Select value(s):**

☐ Rafting

☐ Ridging

☐ Other - please specify:

#### 3.1.5 Rheology

*Rheology, what is the ice deformation formulationxxx?*

**Spec. ID:** cmip6.seaice.dynamics.rheology

**Is Required ?** TRUE

**Select value:**

☐ Free-drift

☐ Mohr-Coloumb

☐ Visco-plastic - VP

☐ Elastic-visco-plastic - EVP

☐ Elastic-anisotropic-plastic

☐ Granular

☐ Other - please specify:

## 4 Thermodynamics

### *Sea Ice Thermodynamics*

#### 4.1 Energy

*Processes related to energy in sea ice thermodynamics*

##### 4.1.1 Enthalpy Formulation

*What is the energy formulationxxx?*

**Spec. ID:** cmip6.seaice.thermodynamics.energy.enthalpy\_formulation

**Is Required ?** TRUE

**Select value:**

- ☐ Pure ice latent heat (Semtner 0-layer)
- ☐ Pure ice latent and sensible heat
- ☐ Pure ice latent and sensible heat + brine heat reservoir (Semtner 3-layer)
- ☐ Pure ice latent and sensible heat + explicit brine inclusions (Bitz and Lipscomb)
- ☐ Other - please specify:

##### 4.1.2 Thermal Conductivity

*What type of thermal conductivity is usedxxx?*

**Spec. ID:** cmip6.seaice.thermodynamics.energy.thermal\_conductivity

**Is Required ?** TRUE

**Select value:**

- ☐ Pure ice
- ☐ Saline ice
- ☐ Other - please specify:

##### 4.1.3 Heat Diffusion

*What is the method of heat diffusionxxx?*

**Spec. ID:** cmip6.seaice.thermodynamics.energy.heat\_diffusion

**Is Required ?** TRUE

**Select value:**

- ☐ Conduction fluxes
- ☐ Conduction and radiation heat fluxes



- ☐ Conduction, radiation and latent heat transport
- ☐ Other - please specify:

#### 4.1.4 Basal Heat Flux

*Method by which basal ocean heat flux is handledxxx?*

**Spec. ID:** cmip6.seaice.thermodynamics.energy.basal\_heat\_flux

**Is Required ?** TRUE

**Select value:**

- ☐ Heat Reservoir - Brine inclusions treated as a heat reservoir
- ☐ Thermal Fixed Salinity - Thermal properties depend on S-T (with fixed salinity)
- ☐ Thermal Varying Salinity - Thermal properties depend on S-T (with varying salinity)
- ☐ Other - please specify:

#### 4.1.5 Fixed Salinity Value

*If you have selected Thermal properties depend on S-T (with fixed salinity), supply fixed salinity value for each sea ice layer.*

**Spec. ID:** cmip6.seaice.thermodynamics.energy.fixed\_salinity\_value

**Is Required ?** FALSE

**Enter FLOAT value:**

#### 4.1.6 Heat Content Of Precipitation

*Describe the method by which the heat content of precipitation is handled.*

**Spec. ID:** cmip6.seaice.thermodynamics.energy.heat\_content\_of\_precipitation

**Is Required ?** TRUE

**Enter TEXT value:**

#### 4.1.7 Precipitation Effects On Salinity

*If precipitation (freshwater) that falls on sea ice affects the ocean surface salinity please provide further details.*

**Spec. ID:** cmip6.seaice.thermodynamics.energy.precipitation\_effects\_on\_salinity

**Is Required ?** FALSE

**Enter TEXT value:**

### 4.2 Mass

*Processes related to mass in sea ice thermodynamics*

#### 4.2.1 New Ice Formation

*Describe the method by which new sea ice is formed in open water.*

**Spec. ID:** cmip6.seaice.thermodynamics.mass.new\_ice\_formation

**Is Required ?** TRUE

**Enter TEXT value:**

#### 4.2.2 Ice Vertical Growth And Melt

*Describe the method that governs the vertical growth and melt of sea ice.*

**Spec. ID:** cmip6.seaice.thermodynamics.mass.ice\_vertical\_growth\_and\_melt

**Is Required ?** TRUE

**Enter TEXT value:**

#### 4.2.3 Ice Lateral Melting

*What is the method of sea ice lateral meltingxxx?*

**Spec. ID:** cmip6.seaice.thermodynamics.mass.ice\_lateral\_melting

**Is Required ?** TRUE

**Select value:**

- ☐ Floe-size dependent (Bitz et al 2001)
- ☐ Virtual thin ice melting (for single-category)
- ☐ Other - please specify:

#### 4.2.4 Ice Surface Sublimation

*Describe the method that governs sea ice surface sublimation.*

**Spec. ID:** cmip6.seaice.thermodynamics.mass.ice\_surface\_sublimation

**Is Required ?** TRUE

**Enter TEXT value:**

#### 4.2.5 Frazil Ice

*Describe the method of frazil ice formation.*

**Spec. ID:** cmip6.seaice.thermodynamics.mass.frazil\_ice

**Is Required ?** TRUE

**Enter TEXT value:**

### 4.3 Salt

*Processes related to salt in sea ice thermodynamics.*

#### 4.3.1 Has Multiple Sea Ice Salinities

*Does the sea ice model use two different salinities: one for thermodynamic calculations; and one for the salt budgetxxx?*

**Spec. ID:** cmip6.seaice.thermodynamics.salt.has\_multiple\_sea\_ice\_salinities

**Is Required ?** TRUE

**Select value:**

☐ True ☐ False

#### 4.3.2 Sea Ice Salinity Thermal Impacts

*Does sea ice salinity impact the thermal properties of sea icexxx?*

**Spec. ID:** cmip6.seaice.thermodynamics.salt.sea\_ice\_salinity\_thermal\_impacts

**Is Required ?** TRUE

**Select value:**

☐ True ☐ False

### 4.4 Mass Transport

*Mass transport of salt*

#### 4.4.1 Salinity Type

*How is salinity determined in the mass transport of salt calculationxxx?*

**Spec. ID:** cmip6.seaice.thermodynamics.salt.mass\_transport.salinity\_type

**Is Required ?** TRUE

**Select value:**

- ☐ Constant
- ☐ Prescribed salinity profile
- ☐ Prognostic salinity profile
- ☐ Other - please specify:

#### 4.4.2 Constant Salinity Value

*If using a constant salinity value specify this value in PSUxxx?*

**Spec. ID:** cmip6.seaice.thermodynamics.salt.mass\_transport.constant\_salinity\_value

**Is Required ?** FALSE

**Enter FLOAT value:**

#### 4.4.3 Additional Details

*Describe the salinity profile used.*

**Spec. ID:** cmip6.seaice.thermodynamics.salt.mass\_transport.additional\_details

**Is Required ?** FALSE

**Enter TEXT value:**

### 4.5 Thermodynamics

*Salt thermodynamics*

#### 4.5.1 Salinity Type

*How is salinity determined in the thermodynamic calculationxxx?*

**Spec. ID:** cmip6.seaice.thermodynamics.salt.thermodynamics.salinity\_type

**Is Required ?** TRUE

**Select value:**

- ☐ Constant
- ☐ Prescribed salinity profile
- ☐ Prognostic salinity profile
- ☐ Other - please specify:

#### 4.5.2 Constant Salinity Value

*If using a constant salinity value specify this value in PSUxxx?*

**Spec. ID:** cmip6.seaice.thermodynamics.salt.thermodynamics.constant\_salinity\_value

**Is Required ?** FALSE

**Enter FLOAT value:**

#### 4.5.3 Additional Details

*Describe the salinity profile used.*

**Spec. ID:** cmip6.seaice.thermodynamics.salt.thermodynamics.additional\_details

**Is Required ?** FALSE

**Enter TEXT value:**

### 4.6 Ice Thickness Distribution

*Ice thickness distribution details.*

#### 4.6.1 Representation

*How is the sea ice thickness distribution represented?*

**Spec. ID:** cmip6.seaice.thermodynamics.ice\_thickness\_distribution.representation

**Is Required ?** TRUE

**Select value:**

- ☐ Explicit
- ☐ Virtual (enhancement of thermal conductivity, thin ice melting)
- ☐ Other - please specify:

### 4.7 Ice Floe Size Distribution

*Ice floe-size distribution details.*

#### 4.7.1 Representation

*How is the sea ice floe-size represented?*

**Spec. ID:** cmip6.seaice.thermodynamics.ice\_floe\_size\_distribution.representation

**Is Required ?** TRUE

**Select value:**

- ☐ Explicit
- ☐ Parameterised
- ☐ Other - please specify:

#### 4.7.2 Additional Details

*Please provide further details on any parameterisation of floe-size.*

**Spec. ID:** cmip6.seaice.thermodynamics.ice\_floe\_size\_distribution.additional\_details

**Is Required ?** FALSE

**Enter TEXT value:**

### 4.8 Melt Ponds

*Characteristics of melt ponds.*

#### 4.8.1 Are Included

*Are melt ponds included in the sea ice model?*

**Spec. ID:** cmip6.seaice.thermodynamics.melt\_ponds.are\_included

**Is Required ?** TRUE

Select value:

☐ True ☐ False

#### 4.8.2 Formulation

*What method of melt pond formulation is usedxxx?*

**Spec. ID:** cmip6.seaice.thermodynamics.melt\_ponds.formulation

**Is Required ?** TRUE

Select value:

- ☐ Flocco and Feltham (2010)
- ☐ Level-ice melt ponds
- ☐ Other - please specify:

#### 4.8.3 Impacts

*What do melt ponds have an impact onxxx?*

**Spec. ID:** cmip6.seaice.thermodynamics.melt\_ponds.impacts

**Is Required ?** TRUE

Select value(s):

- ☐ Albedo
- ☐ Freshwater
- ☐ Heat
- ☐ Other - please specify:

### 4.9 Snow Processes

*Thermodynamic processes in snow on sea ice*

#### 4.9.1 Has Snow Aging

*Set to True if the sea ice model has a snow aging scheme.*

**Spec. ID:** cmip6.seaice.thermodynamics.snow\_processes.has\_snow\_aging

**Is Required ?** TRUE

Select value:

☐ True ☐ False

#### 4.9.2 Snow Aging Scheme

*Describe the snow aging scheme.*

**Spec. ID:** cmip6.seaice.thermodynamics.snow\_processes.snow\_aging\_scheme

**Is Required ?** FALSE

**Enter TEXT value:**

#### 4.9.3 Has Snow Ice Formation

*Set to True if the sea ice model has snow ice formation.*

**Spec. ID:** cmip6.seaice.thermodynamics.snow\_processes.has\_snow\_ice\_formation

**Is Required ?** TRUE

**Select value:**

☐ True ☐ False

#### 4.9.4 Snow Ice Formation Scheme

*Describe the snow ice formation scheme.*

**Spec. ID:** cmip6.seaice.thermodynamics.snow\_processes.snow\_ice\_formation\_scheme

**Is Required ?** FALSE

**Enter TEXT value:**

#### 4.9.5 Redistribution

*What is the impact of ridging on snow coverxxx?*

**Spec. ID:** cmip6.seaice.thermodynamics.snow\_processes.redistribution

**Is Required ?** TRUE

**Enter TEXT value:**

#### 4.9.6 Heat Diffusion

*What is the heat diffusion through snow methodology in sea ice thermodynamicsxxx?*

**Spec. ID:** cmip6.seaice.thermodynamics.snow\_processes.heat\_diffusion

**Is Required ?** TRUE

**Select value:**

- ☐ Single-layered heat diffusion
- ☐ Multi-layered heat diffusion
- ☐ Other - please specify:

## 5 Radiative Processes

### *Sea Ice Radiative Processes*

#### 5.1 Radiative Processes

##### *Sea Ice Radiative Processes*

##### 5.1.1 Surface Albedo

*Method used to handle surface albedo.*

**Spec. ID:** cmip6.seaice.radiative\_processes.surface\_albedo

**Is Required ?** TRUE

**Select value:**

- ☐ Delta-Eddington
- ☐ Parameterized - Sea ice albedo is parameterized
- ☐ Multi-band albedo - Albedo value has a spectral dependence
- ☐ Other - please specify:

##### 5.1.2 Ice Radiation Transmission

*Method by which solar radiation through sea ice is handled.*

**Spec. ID:** cmip6.seaice.radiative\_processes.ice\_radiation\_transmission

**Is Required ?** TRUE

**Select value(s):**

- ☐ Delta-Eddington
- ☐ Exponential attenuation
- ☐ Ice radiation transmission per category - Radiation transmission through ice is different for each sea ice category
- ☐ Other - please specify: