

# CMIP6 Model Documentation

<b>Institute:</b>	NOAA-GFDL
<b>Model:</b>	GFDL-ESM4
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# 1 Key Properties

*Land ice key properties*

## 1.1 Key Properties

*Land ice key properties*

### 1.1.1 Overview

*Overview of land surface model.*

**Spec. ID:** cmip6.landice.key\_properties.overview

**Is Required ?** TRUE

**Enter TEXT value:**

### 1.1.2 Model Name

*Name of land surface model code*

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

**Is Required ?** TRUE

**Enter TEXT value:**

### 1.1.3 Ice Albedo

*Specify how ice albedo is modelled*

**Spec. ID:** cmip6.landice.key\_properties.ice\_albedo

**Is Required ?** TRUE

**Select value(s):**

- ☐ Prescribed
- ☐ Function of ice age
- ☐ Function of ice density
- ☐ Other - please specify:

### 1.1.4 Atmospheric Coupling Variables

*Which variables are passed between the atmosphere and ice (e.g. orography, ice mass)*

**Spec. ID:** cmip6.landice.key\_properties.atmospheric\_coupling\_variables

**Is Required ?** TRUE

**Enter TEXT value:**

### 1.1.5 Oceanic Coupling Variables

*Which variables are passed between the ocean and ice*

**Spec. ID:** cmip6.landice.key\_\_properties.oceanic\_\_coupling\_\_variables

**Is Required ?** TRUE

**Enter TEXT value:**

### 1.1.6 Prognostic Variables

*Which variables are prognostically calculated in the ice model*

**Spec. ID:** cmip6.landice.key\_\_properties.prognostic\_\_variables

**Is Required ?** TRUE

**Select value(s):**

- ☐ Ice velocity
- ☐ Ice thickness
- ☐ Ice temperature
- ☐ Other - please specify:

## 1.2 Software Properties

*Software properties of land ice code*

### 1.2.1 Repository

*Location of code for this component.*

**Spec. ID:** cmip6.landice.key\_\_properties.software\_\_properties.repository

**Is Required ?** FALSE

**Enter TEXT value:**

### 1.2.2 Code Version

*Code version identifier.*

**Spec. ID:** cmip6.landice.key\_\_properties.software\_\_properties.code\_\_version

**Is Required ?** FALSE

**Enter TEXT value:**

### 1.2.3 Code Languages

*Code language(s).*

**Spec. ID:** cmip6.landice.key\_\_properties.software\_\_properties.code\_\_languages

**Is Required ?** FALSE

**Enter TEXT value(s):**

## 2 Grid

*Land ice grid*

### 2.1 Grid

*Land ice grid*

#### 2.1.1 Overview

*Overview of the grid in the land ice scheme*

**Spec. ID:** cmip6.landice.grid.overview

**Is Required ?** TRUE

**Enter TEXT value:**

#### 2.1.2 Adaptive Grid

*Is an adaptive grid being used?*

**Spec. ID:** cmip6.landice.grid.adaptive\_grid

**Is Required ?** TRUE

**Select value:**

☐ True ☐ False

#### 2.1.3 Base Resolution

*The base resolution (in metres), before any adaption*

**Spec. ID:** cmip6.landice.grid.base\_resolution

**Is Required ?** TRUE

**Enter FLOAT value:**

#### 2.1.4 Resolution Limit

*If an adaptive grid is being used, what is the limit of the resolution (in metres)*

**Spec. ID:** cmip6.landice.grid.resolution\_limit

**Is Required ?** FALSE

**Enter FLOAT value:**

#### 2.1.5 Projection

*The projection of the land ice grid (e.g. albers\_equal\_area)*

**Spec. ID:** cmip6.landice.grid.projection

**Is Required ?** TRUE

**Enter TEXT value:**

## 3 Glaciers

*Land ice glaciers*

### 3.1 Glaciers

*Land ice glaciers*

#### 3.1.1 Overview

*Overview of glaciers in the land ice scheme*

**Spec. ID:** cmip6.landice.glaciers.overview

**Is Required ?** TRUE

**Enter TEXT value:**

#### 3.1.2 Description

*Describe the treatment of glaciers, if any*

**Spec. ID:** cmip6.landice.glaciers.description

**Is Required ?** TRUE

**Enter TEXT value:**

#### 3.1.3 Dynamic Areal Extent

*Does the model include a dynamic glacial extentxxx?*

**Spec. ID:** cmip6.landice.glaciers.dynamic\_areal\_extent

**Is Required ?** FALSE

**Select value:**

☐ True      ☐ False

## 4 Ice

*Ice sheet and ice shelf*

### 4.1 Ice

*Ice sheet and ice shelf*

#### 4.1.1 Overview

*Overview of the ice sheet and ice shelf in the land ice scheme*

**Spec. ID:** cmip6.landice.ice.overview

**Is Required ?** TRUE

**Enter TEXT value:**

#### 4.1.2 Grounding Line Method

*Specify the technique used for modelling the grounding line in the ice sheet-ice shelf coupling*

**Spec. ID:** cmip6.landice.ice.grounding\_line\_method

**Is Required ?** TRUE

**Select value:**

- ☐ Grounding line prescribed
- ☐ Flux prescribed (Schoof)
- ☐ Fixed grid size
- ☐ Moving grid
- ☐ Other - please specify:

#### 4.1.3 Ice Sheet

*Are ice sheets simulatedxxx?*

**Spec. ID:** cmip6.landice.ice.ice\_sheet

**Is Required ?** TRUE

**Select value:**

- ☐ True
- ☐ False

#### 4.1.4 Ice Shelf

*Are ice shelves simulatedxxx?*

**Spec. ID:** cmip6.landice.ice.ice\_shelf

**Is Required ?** TRUE

Select value:

☐

True

☐

False

## 4.2 Mass Balance

*Description of the surface mass balance treatment*

### 4.2.1 Surface Mass Balance

*Describe how and where the surface mass balance (SMB) is calculated. Include the temporal coupling frequency from the atmosphere, whether or not a separate SMB model is used, and if so details of this model, such as its resolution*

**Spec. ID:** cmip6.landice.ice.mass\_balance.surface\_mass\_balance

**Is Required ?** TRUE

**Enter TEXT value:**

## 4.3 Basal

*Description of basal melting*

### 4.3.1 Bedrock

*Describe the implementation of basal melting over bedrock*

**Spec. ID:** cmip6.landice.ice.mass\_balance.basal.bedrock

**Is Required ?** FALSE

**Enter TEXT value:**

### 4.3.2 Ocean

*Describe the implementation of basal melting over the ocean*

**Spec. ID:** cmip6.landice.ice.mass\_balance.basal.ocean

**Is Required ?** FALSE

**Enter TEXT value:**

## 4.4 Frontal

*Description of calving/melting from the ice shelf front*

### 4.4.1 Calving

*Describe the implementation of calving from the front of the ice shelf*

**Spec. ID:** cmip6.landice.ice.mass\_balance.frontal.calving

**Is Required ?** FALSE

**Enter TEXT value:**



#### 4.4.2 Melting

*Describe the implementation of melting from the front of the ice shelf*

**Spec. ID:** cmip6.landice.ice.mass\_balance.frontal.melting

**Is Required ?** FALSE

**Enter TEXT value:**

### 4.5 Dynamics

#### 4.5.1 Description

*General description of ice sheet and ice shelf dynamics*

**Spec. ID:** cmip6.landice.ice.dynamics.description

**Is Required ?** TRUE

**Enter TEXT value:**

#### 4.5.2 Approximation

*Approximation type used in modelling ice dynamics*

**Spec. ID:** cmip6.landice.ice.dynamics.approximation

**Is Required ?** TRUE

**Select value(s):**

- ☐ SIA
- ☐ SAA
- ☐ Full stokes
- ☐ Other - please specify:

#### 4.5.3 Adaptive Timestep

*Is there an adaptive time scheme for the ice scheme?*

**Spec. ID:** cmip6.landice.ice.dynamics.adaptive\_timestep

**Is Required ?** TRUE

**Select value:**

- ☐ True
- ☐ False

#### 4.5.4 Timestep

*Timestep (in seconds) of the ice scheme. If the timestep is adaptive, then state a representative timestep.*

**Spec. ID:** cmip6.landice.ice.dynamics.timestep

**Is Required ?** TRUE

**Enter INTEGER value:**