

CMIP6 Model Documentation

Institute:	NOAA-GFDL
Model:	GFDL-ESM4
Topic:	Land Surface
Doc. Generated:	2018-02-12
Doc. Seeded From:	N/A
Specialization Version:	0.2.0
Further Info:	https://es-doc.org/cmip6 https://specializations.es-doc.org/cmip6

Documentation Contents

1	Key Properties	1
1.1	Key Properties	1
1.2	Conservation Properties	2
1.3	Timestepping Framework	3
1.4	Software Properties	4
2	Grid	5
2.1	Grid	5
2.2	Horizontal	5
2.3	Vertical	5
3	Soil	7
3.1	Soil	7
3.2	Soil Map	7
3.3	Snow Free Albedo	9
3.4	Hydrology	10
3.5	Freezing	11
3.6	Drainage	12
3.7	Heat Treatment	13
4	Snow	15
4.1	Snow	15
4.2	Snow Albedo	17
5	Vegetation	19
5.1	Vegetation	19
6	Energy Balance	25
6.1	Energy Balance	25
7	Carbon Cycle	27
7.1	Carbon Cycle	27
7.2	Vegetation	28
7.3	Photosynthesis	28
7.4	Autotrophic Respiration	29
7.5	Allocation	29
7.6	Phenology	30
7.7	Mortality	30
7.8	Litter	30
7.9	Soil	31
7.10	Permafrost Carbon	32
8	Nitrogen Cycle	34
8.1	Nitrogen Cycle	34
9	River Routing	35
9.1	River Routing	35
9.2	Oceanic Discharge	37

10 Lakes	39
10.1 Lakes	39
10.2 Method	40
10.3 Wetlands	41

1 Key Properties

Land surface key properties

1.1 Key Properties

Land surface key properties

1.1.1 Model Overview

Overview of land surface model.

Spec. ID: cmip6.land.key_properties.model_overview

Is Required ? TRUE

Enter TEXT value:

1.1.2 Model Name

Name of land surface model code (e.g. MOSES2.2)

Spec. ID: cmip6.land.key_properties.model_name

Is Required ? TRUE

Enter TEXT value:

1.1.3 Description

General description of the processes modelled (e.g. dynamic vegetation, prognostic albedo, etc.)

Spec. ID: cmip6.land.key_properties.description

Is Required ? TRUE

Enter TEXT value:

1.1.4 Land Atmosphere Flux Exchanges

Fluxes exchanged with the atmosphere.

Spec. ID: cmip6.land.key_properties.land_atmosphere_flux_exchanges

Is Required ? FALSE

Select value(s):

- ☐ Water
- ☐ Energy
- ☐ Carbon
- ☐ Nitrogen
- ☐ Phosphorous
- ☐ Other - please specify:

1.1.5 Atmospheric Coupling Treatment

Describe the treatment of land surface coupling with the Atmosphere model component, which may be different for different quantities (e.g. dust: semi-implicit, water vapour: explicit)

Spec. ID: cmip6.land.key_properties.atmospheric_coupling_treatment

Is Required ? TRUE

Enter TEXT value:

1.1.6 Land Cover

Types of land cover defined in the land surface model

Spec. ID: cmip6.land.key_properties.land_cover

Is Required ? TRUE

Select value(s):

- ☐ Bare soil
- ☐ Urban
- ☐ Lake
- ☐ Land ice
- ☐ Lake ice
- ☐ Vegetated
- ☐ Other - please specify:

1.1.7 Land Cover Change

Describe how land cover change is managed (e.g. the use of net or gross transitions)

Spec. ID: cmip6.land.key_properties.land_cover_change

Is Required ? FALSE

Enter TEXT value:

1.1.8 Tiling

Describe the general tiling procedure used in the land surface (if any). Include treatment of physiography, land/sea, (dynamic) vegetation coverage and orography/roughness

Spec. ID: cmip6.land.key_properties.tiling

Is Required ? TRUE

Enter TEXT value:

1.2 Conservation Properties

TODO

1.2.1 Energy

Describe if/how energy is conserved globally and to what level (e.g. within X [units]/year)

Spec. ID: cmip6.land.key_properties.conservations_properties.energy

Is Required ? FALSE

Enter TEXT value:

1.2.2 Water

Describe if/how water is conserved globally and to what level (e.g. within X [units]/year)

Spec. ID: cmip6.land.key_properties.conservations_properties.water

Is Required ? FALSE

Enter TEXT value:

1.2.3 Carbon

Describe if/how carbon is conserved globally and to what level (e.g. within X [units]/year)

Spec. ID: cmip6.land.key_properties.conservations_properties.carbon

Is Required ? FALSE

Enter TEXT value:

1.3 Timestepping Framework

TODO

1.3.1 Timestep Dependent On Atmosphere

Is a time step dependent on the frequency of atmosphere couplingxxx?

Spec. ID: cmip6.land.key_properties.timestepping_framework.timestep_dependent_on_atmosphere

Is Required ? TRUE

Select value:

☐ True ☐ False

1.3.2 Time Step

Overall timestep of land surface model (i.e. time between calls)

Spec. ID: cmip6.land.key_properties.timestepping_framework.time_step

Is Required ? TRUE

Enter INTEGER value:

1.3.3 Timestepping Method

General description of time stepping method and associated time step(s)

Spec. ID: cmip6.land.key_properties.timestepping_framework.timestepping_method

Is Required ? TRUE

Enter TEXT value:

1.4 Software Properties

Software properties of land surface code

1.4.1 Repository

Location of code for this component.

Spec. ID: cmip6.land.key_properties.software_properties.repository

Is Required ? FALSE

Enter TEXT value:

1.4.2 Code Version

Code version identifier.

Spec. ID: cmip6.land.key_properties.software_properties.code_version

Is Required ? FALSE

Enter TEXT value:

1.4.3 Code Languages

Code language(s).

Spec. ID: cmip6.land.key_properties.software_properties.code_languages

Is Required ? FALSE

Enter TEXT value(s):

2 Grid

Land surface grid

2.1 Grid

Land surface grid

2.1.1 Overview

Overview of the grid in the land surface

Spec. ID: cmip6.land.grid.overview

Is Required ? TRUE

Enter TEXT value:

2.2 Horizontal

The horizontal grid in the land surface

2.2.1 Description

Describe the general structure of the horizontal grid (not including any tiling)

Spec. ID: cmip6.land.grid.horizontal.description

Is Required ? TRUE

Enter TEXT value:

2.2.2 Matches Atmosphere Grid

Does the horizontal grid match the atmospherexxx?

Spec. ID: cmip6.land.grid.horizontal.matches_atmosphere_grid

Is Required ? TRUE

Select value:

☐ True ☐ False

2.3 Vertical

The vertical grid in the soil

2.3.1 Description

Describe the general structure of the vertical grid in the soil (not including any tiling)

Spec. ID: cmip6.land.grid.vertical.description

Is Required ? TRUE

Enter TEXT value:

2.3.2 Total Depth

The total depth of the soil (in metres)

Spec. ID: cmip6.land.grid.vertical.total_depth

Is Required ? TRUE

Enter INTEGER value:

3 Soil

Land surface soil

3.1 Soil

Land surface soil

3.1.1 Overview

Overview of soil in the land surface

Spec. ID: cmip6.land.soil.overview

Is Required ? TRUE

Enter TEXT value:

3.1.2 Heat Water Coupling

Describe the coupling between heat and water in the soil

Spec. ID: cmip6.land.soil.heat_water_coupling

Is Required ? TRUE

Enter TEXT value:

3.1.3 Number Of Soil layers

The number of soil layers

Spec. ID: cmip6.land.soil.number_of_soil layers

Is Required ? TRUE

Enter INTEGER value:

3.1.4 Prognostic Variables

List the prognostic variables of the soil scheme

Spec. ID: cmip6.land.soil.prognostic_variables

Is Required ? TRUE

Enter TEXT value:

3.2 Soil Map

Key properties of the land surface soil map

3.2.1 Description

General description of soil map

Spec. ID: cmip6.land.soil.soil_map.description

Is Required ? TRUE

Enter TEXT value:

3.2.2 Structure

Describe the soil structure map

Spec. ID: cmip6.land.soil.soil_map.structure

Is Required ? FALSE

Enter TEXT value:

3.2.3 Texture

Describe the soil texture map

Spec. ID: cmip6.land.soil.soil_map.texture

Is Required ? FALSE

Enter TEXT value:

3.2.4 Organic Matter

Describe the soil organic matter map

Spec. ID: cmip6.land.soil.soil_map.organic_matter

Is Required ? FALSE

Enter TEXT value:

3.2.5 Albedo

Describe the soil albedo map

Spec. ID: cmip6.land.soil.soil_map.albedo

Is Required ? FALSE

Enter TEXT value:

3.2.6 Water Table

Describe the soil water table map, if any

Spec. ID: cmip6.land.soil.soil_map.water_table

Is Required ? FALSE

Enter TEXT value:

3.2.7 Continuously Varying Soil Depth

Does the soil properties vary continuously with depthxxx?

Spec. ID: cmip6.land.soil.soil_map.continuously_varying_soil_depth

Is Required ? TRUE

Select value:

☐ True ☐ False

3.2.8 Soil Depth

Describe the soil depth map

Spec. ID: cmip6.land.soil.soil_map.soil_depth

Is Required ? FALSE

Enter TEXT value:

3.3 Snow Free Albedo

TODO

3.3.1 Prognostic

Is snow free albedo prognostic:xxx?

Spec. ID: cmip6.land.soil.snow_free_albedo.prognostic

Is Required ? TRUE

Select value:

☐ True ☐ False

3.3.2 Functions

If prognostic, describe the dependancies on snow free albedo calculations

Spec. ID: cmip6.land.soil.snow_free_albedo.functions

Is Required ? FALSE

Select value(s):

- ☐ Vegetation type
- ☐ Soil humidity
- ☐ Vegetation state
- ☐ Other - please specify:

3.3.3 Direct Diffuse

If prognostic, describe the distinction between direct and diffuse albedo

Spec. ID: cmip6.land.soil.snow_free_albedo.direct_diffuse

Is Required ? FALSE

Select value:

- ☐ Distinction between direct and diffuse albedo
- ☐ No distinction between direct and diffuse albedo
- ☐ Other - please specify:

3.3.4 Number Of Wavelength Bands

If prognostic, enter the number of wavelength bands used

Spec. ID: cmip6.land.soil.snow_free_albedo.number_of_wavelength_bands

Is Required ? FALSE

Enter INTEGER value:

3.4 Hydrology

Key properties of the land surface soil hydrology

3.4.1 Description

General description of the soil hydrological model

Spec. ID: cmip6.land.soil.hydrology.description

Is Required ? TRUE

Enter TEXT value:

3.4.2 Time Step

Time step of river soil hydrology in seconds

Spec. ID: cmip6.land.soil.hydrology.time_step

Is Required ? TRUE

Enter INTEGER value:

3.4.3 Tiling

Describe the soil hydrology tiling, if any.

Spec. ID: cmip6.land.soil.hydrology.tiling

Is Required ? FALSE

Enter TEXT value:

3.4.4 Vertical Discretisation

Describe the typical vertical discretisation

Spec. ID: cmip6.land.soil.hydrology.vertical_discretisation

Is Required ? TRUE

Enter TEXT value:

3.4.5 Number Of Ground Water Layers

The number of soil layers that may contain water

Spec. ID: cmip6.land.soil.hydrology.number_of_ground_water_layers

Is Required ? TRUE

Enter INTEGER value:

3.4.6 Lateral Connectivity

Describe the lateral connectivity between tiles

Spec. ID: cmip6.land.soil.hydrology.lateral_connectivity

Is Required ? TRUE

Select value(s):

- ☐ Perfect connectivity - Common soil for multiple tiles
- ☐ Darcian flow - Darcian flow among hillslope tiles
- ☐ Other - please specify:

3.4.7 Method

The hydrological dynamics scheme in the land surface model

Spec. ID: cmip6.land.soil.hydrology.method

Is Required ? TRUE

Select value:

- ☐ Bucket
- ☐ Force-restore
- ☐ Choisnel
- ☐ Explicit diffusion
- ☐ Other - please specify:

3.5 Freezing

TODO

3.5.1 Number Of Ground Ice Layers

How many soil layers may contain ground ice

Spec. ID: cmip6.land.soil.hydrology.freezing.number_of_ground_ice_layers

Is Required ? TRUE

Enter INTEGER value:

3.5.2 Ice Storage Method

Describe the method of ice storage

Spec. ID: cmip6.land.soil.hydrology.freezing.ice_storage_method

Is Required ? TRUE

Enter TEXT value:

3.5.3 Permafrost

Describe the treatment of permafrost, if any, within the land surface scheme

Spec. ID: cmip6.land.soil.hydrology.freezing.permafrost

Is Required ? TRUE

Enter TEXT value:

3.6 Drainage

TODO

3.6.1 Description

General describe how drainage is included in the land surface scheme

Spec. ID: cmip6.land.soil.hydrology.drainage.description

Is Required ? TRUE

Enter TEXT value:

3.6.2 Types

Different types of runoff represented by the land surface model

Spec. ID: cmip6.land.soil.hydrology.drainage.types

Is Required ? FALSE

Select value(s):

- ☐ Gravity drainage
- ☐ Horton mechanism
- ☐ Topmodel-based
- ☐ Dunne mechanism
- ☐ Lateral subsurface flow
- ☐ Baseflow from groundwater
- ☐ Other - please specify:

3.7 Heat Treatment

TODO

3.7.1 Description

General description of how heat treatment properties are defined

Spec. ID: cmip6.land.soil.heat_treatment.description

Is Required ? TRUE

Enter TEXT value:

3.7.2 Time Step

Time step of soil heat scheme in seconds

Spec. ID: cmip6.land.soil.heat_treatment.time_step

Is Required ? TRUE

Enter INTEGER value:

3.7.3 Tiling

Describe the soil heat treatment tiling, if any.

Spec. ID: cmip6.land.soil.heat_treatment.tiling

Is Required ? FALSE

Enter TEXT value:

3.7.4 Vertical Discretisation

Describe the typical vertical discretisation

Spec. ID: cmip6.land.soil.heat_treatment.vertical_discretisation

Is Required ? TRUE

Enter TEXT value:

3.7.5 Heat Storage

Specify the method of heat storage

Spec. ID: cmip6.land.soil.heat_treatment.heat_storage

Is Required ? TRUE

Select value:

- ☐ Force-restore
- ☐ Explicit diffusion
- ☐ Other - please specify:

3.7.6 Processes

Describe processes included in the treatment of soil heat

Spec. ID: cmip6.land.soil.heat__treatment.processes

Is Required ? TRUE

Select value(s):

- ☐ Soil moisture freeze-thaw
- ☐ Coupling with snow temperature
- ☐ Other - please specify:

4 Snow

Land surface snow

4.1 Snow

Land surface snow

4.1.1 Overview

Overview of snow in the land surface

Spec. ID: cmip6.land.snow.overview

Is Required ? TRUE

Enter TEXT value:

4.1.2 Tiling

Describe the snow tiling, if any.

Spec. ID: cmip6.land.snow.tiling

Is Required ? FALSE

Enter TEXT value:

4.1.3 Number Of Snow Layers

The number of snow levels used in the land surface scheme/model

Spec. ID: cmip6.land.snow.number_of_snow_layers

Is Required ? TRUE

Enter INTEGER value:

4.1.4 Density

Description of the treatment of snow density

Spec. ID: cmip6.land.snow.density

Is Required ? TRUE

Select value:

- ☐ Prognostic
- ☐ Constant
- ☐ Other - please specify:

4.1.5 Water Equivalent

Description of the treatment of the snow water equivalent

Spec. ID: cmip6.land.snow.water__equivalent

Is Required ? TRUE

Select value:

- ☐ Prognostic
- ☐ Diagnostic
- ☐ Other - please specify:

4.1.6 Heat Content

Description of the treatment of the heat content of snow

Spec. ID: cmip6.land.snow.heat__content

Is Required ? TRUE

Select value:

- ☐ Prognostic
- ☐ Diagnostic
- ☐ Other - please specify:

4.1.7 Temperature

Description of the treatment of snow temperature

Spec. ID: cmip6.land.snow.temperature

Is Required ? TRUE

Select value:

- ☐ Prognostic
- ☐ Diagnostic
- ☐ Other - please specify:

4.1.8 Liquid Water Content

Description of the treatment of snow liquid water

Spec. ID: cmip6.land.snow.liquid__water__content

Is Required ? TRUE

Select value:

- ☐ Prognostic
- ☐ Diagnostic
- ☐ Other - please specify:

4.1.9 Snow Cover Fractions

Specify cover fractions used in the surface snow scheme

Spec. ID: cmip6.land.snow.snow_cover_fractions

Is Required ? TRUE

Select value(s):

- ☐ Ground snow fraction
- ☐ Vegetation snow fraction
- ☐ Other - please specify:

4.1.10 Processes

Snow related processes in the land surface scheme

Spec. ID: cmip6.land.snow.processes

Is Required ? TRUE

Select value(s):

- ☐ Snow interception
- ☐ Snow melting
- ☐ Snow freezing
- ☐ Blowing snow
- ☐ Other - please specify:

4.1.11 Prognostic Variables

List the prognostic variables of the snow scheme

Spec. ID: cmip6.land.snow.prognostic_variables

Is Required ? TRUE

Enter TEXT value:

4.2 Snow Albedo

TODO

4.2.1 Type

Describe the treatment of snow-covered land albedo

Spec. ID: cmip6.land.snow.snow_albedo.type

Is Required ? TRUE

Select value:

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

4.2.2 Functions

If prognostic,

Spec. ID: cmip6.land.snow.snow_albedo.functions

Is Required ? FALSE

Select value(s):

- ☐ Vegetation type
- ☐ Snow age
- ☐ Snow density
- ☐ Snow grain type
- ☐ Aerosol deposition
- ☐ Other - please specify:

5 Vegetation

Land surface vegetation

5.1 Vegetation

Land surface vegetation

5.1.1 Overview

Overview of vegetation in the land surface

Spec. ID: cmip6.land.vegetation.overview

Is Required ? TRUE

Enter TEXT value:

5.1.2 Time Step

Time step of vegetation scheme in seconds

Spec. ID: cmip6.land.vegetation.time_step

Is Required ? TRUE

Enter INTEGER value:

5.1.3 Dynamic Vegetation

Is there dynamic evolution of vegetationxxx?

Spec. ID: cmip6.land.vegetation.dynamic_vegetation

Is Required ? TRUE

Select value:

☐ True ☐ False

5.1.4 Tiling

Describe the vegetation tiling, if any.

Spec. ID: cmip6.land.vegetation.tiling

Is Required ? FALSE

Enter TEXT value:

5.1.5 Vegetation Representation

Vegetation classification used

Spec. ID: cmip6.land.vegetation.vegetation_representation

Is Required ? TRUE

Select value:

- ☐ Vegetation types
- ☐ Biome types
- ☐ Other - please specify:

5.1.6 Vegetation Types

List of vegetation types in the classification, if any

Spec. ID: cmip6.land.vegetation.vegetation_types

Is Required ? FALSE

Select value(s):

- ☐ Broadleaf tree
- ☐ Needleleaf tree
- ☐ C3 grass
- ☐ C4 grass
- ☐ Vegetated
- ☐ Other - please specify:

5.1.7 Biome Types

List of biome types in the classification, if any

Spec. ID: cmip6.land.vegetation.biome_types

Is Required ? FALSE

Select value(s):

- ☐ Evergreen needleleaf forest
- ☐ Evergreen broadleaf forest
- ☐ Deciduous needleleaf forest
- ☐ Deciduous broadleaf forest
- ☐ Mixed forest
- ☐ Woodland
- ☐ Wooded grassland
- ☐ Closed shrubland
- ☐ Opne shrubland
- ☐ Grassland

- ☐ Cropland
- ☐ Wetlands
- ☐ Other - please specify:

5.1.8 Vegetation Time Variation

How the vegetation fractions in each tile are varying with time

Spec. ID: cmip6.land.vegetation.vegetation_time_variation

Is Required ? TRUE

Select value:

- ☐ Fixed (not varying)
- ☐ Prescribed (varying from files)
- ☐ Dynamical (varying from simulation)
- ☐ Other - please specify:

5.1.9 Vegetation Map

If vegetation fractions are not dynamically updated , describe the vegetation map used (common name and reference, if possible)

Spec. ID: cmip6.land.vegetation.vegetation_map

Is Required ? FALSE

Enter TEXT value:

5.1.10 Interception

Is vegetation interception of rainwater representedxxx?

Spec. ID: cmip6.land.vegetation.interception

Is Required ? TRUE

Select value:

- ☐ True
- ☐ False

5.1.11 Phenology

Treatment of vegetation phenology

Spec. ID: cmip6.land.vegetation.phenology

Is Required ? TRUE

Select value:

- ☐ Prognostic

- ☐ Diagnostic (vegetation map)
- ☐ Other - please specify:

5.1.12 Phenology Description

General description of the treatment of vegetation phenology

Spec. ID: cmip6.land.vegetation.phenology_description

Is Required ? FALSE

Enter TEXT value:

5.1.13 Leaf Area Index

Treatment of vegetation leaf area index

Spec. ID: cmip6.land.vegetation.leaf_area_index

Is Required ? TRUE

Select value:

- ☐ Prescribed
- ☐ Prognostic
- ☐ Diagnostic
- ☐ Other - please specify:

5.1.14 Leaf Area Index Description

General description of the treatment of leaf area index

Spec. ID: cmip6.land.vegetation.leaf_area_index_description

Is Required ? FALSE

Enter TEXT value:

5.1.15 Biomass

Treatment of vegetation biomass

Spec. ID: cmip6.land.vegetation.biomass

Is Required ? TRUE

Select value:

- ☐ Prognostic
- ☐ Diagnostic
- ☐ Other - please specify:

5.1.16 Biomass Description

General description of the treatment of vegetation biomass

Spec. ID: cmip6.land.vegetation.biomass_description

Is Required ? FALSE

Enter TEXT value:

5.1.17 Biogeography

Treatment of vegetation biogeography

Spec. ID: cmip6.land.vegetation.biogeography

Is Required ? TRUE

Select value:

- ☐ Prognostic
- ☐ Diagnostic
- ☐ Other - please specify:

5.1.18 Biogeography Description

General description of the treatment of vegetation biogeography

Spec. ID: cmip6.land.vegetation.biogeography_description

Is Required ? FALSE

Enter TEXT value:

5.1.19 Stomatal Resistance

Specify what the vegetation stomatal resistance depends on

Spec. ID: cmip6.land.vegetation.stomatal_resistance

Is Required ? TRUE

Select value(s):

- ☐ Light
- ☐ Temperature
- ☐ Water availability
- ☐ CO2
- ☐ O3
- ☐ Other - please specify:

5.1.20 Stomatal Resistance Description

General description of the treatment of vegetation stomatal resistance

Spec. ID: cmip6.land.vegetation.stomatal_resistance_description

Is Required ? FALSE

Enter TEXT value:

5.1.21 Prognostic Variables

List the prognostic variables of the vegetation scheme

Spec. ID: cmip6.land.vegetation.prognostic_variables

Is Required ? TRUE

Enter TEXT value:

6 Energy Balance

Land surface energy balance

6.1 Energy Balance

Land surface energy balance

6.1.1 Overview

Overview of energy balance in land surface

Spec. ID: cmip6.land.energy_balance.overview

Is Required ? TRUE

Enter TEXT value:

6.1.2 Tiling

Describe the energy balance tiling, if any.

Spec. ID: cmip6.land.energy_balance.tiling

Is Required ? FALSE

Enter TEXT value:

6.1.3 Number Of Surface Temperatures

The maximum number of distinct surface temperatures in a grid cell (for example, each subgrid tile may have its own temperature)

Spec. ID: cmip6.land.energy_balance.number_of_surface_temperatures

Is Required ? TRUE

Enter INTEGER value:

6.1.4 Evaporation

Specify the formulation method for land surface evaporation, from soil and vegetation

Spec. ID: cmip6.land.energy_balance.evaporation

Is Required ? TRUE

Select value(s):

- ☐ Alpha
- ☐ Beta
- ☐ Combined
- ☐ Monteith potential evaporation
- ☐ Other - please specify:

6.1.5 Processes

Describe which processes are included in the energy balance scheme

Spec. ID: cmip6.land.energy_balance.processes

Is Required ? TRUE

Select value(s):

- ☐ Transpiration
- ☐ Other - please specify:

7 Carbon Cycle

Land surface carbon cycle

7.1 Carbon Cycle

Land surface carbon cycle

7.1.1 Overview

Overview of carbon cycle in land surface

Spec. ID: cmip6.land.carbon_cycle.overview

Is Required ? TRUE

Enter TEXT value:

7.1.2 Tiling

Describe the carbon cycle tiling, if any.

Spec. ID: cmip6.land.carbon_cycle.tiling

Is Required ? FALSE

Enter TEXT value:

7.1.3 Time Step

Time step of carbon cycle in seconds

Spec. ID: cmip6.land.carbon_cycle.time_step

Is Required ? TRUE

Enter INTEGER value:

7.1.4 Anthropogenic Carbon

Describe the treatment of the anthropogenic carbon pool

Spec. ID: cmip6.land.carbon_cycle.anthropogenic_carbon

Is Required ? FALSE

Select value(s):

- ☐ Grand slam protocol
- ☐ Residence time
- ☐ Decay time
- ☐ Other - please specify:

7.1.5 Prognostic Variables

List the prognostic variables of the carbon scheme

Spec. ID: cmip6.land.carbon_cycle.prognostic_variables

Is Required ? TRUE

Enter TEXT value:

7.2 Vegetation

TODO

7.2.1 Number Of Carbon Pools

Enter the number of carbon pools used

Spec. ID: cmip6.land.carbon_cycle.vegetation.number_of_carbon_pools

Is Required ? TRUE

Enter INTEGER value:

7.2.2 Carbon Pools

List the carbon pools used

Spec. ID: cmip6.land.carbon_cycle.vegetation.carbon_pools

Is Required ? FALSE

Enter TEXT value:

7.2.3 Forest Stand Dynamics

Describe the treatment of forest stand dynamics

Spec. ID: cmip6.land.carbon_cycle.vegetation.forest_stand_dynamics

Is Required ? FALSE

Enter TEXT value:

7.3 Photosynthesis

TODO

7.3.1 Method

Describe the general method used for photosynthesis (e.g. type of photosynthesis, distinction between C3 and C4 grasses, Nitrogen dependence, etc.)

Spec. ID: cmip6.land.carbon_cycle.vegetation.photosynthesis.method

Is Required ? FALSE

Enter TEXT value:

7.4 Autotrophic Respiration

TODO

7.4.1 Maintenance Respiration

Describe the general method used for maintenance respiration

Spec. ID: cmip6.land.carbon_cycle.vegetation.autotrophic_respiration.maintenance_respiration

Is Required ? FALSE

Enter TEXT value:

7.4.2 Growth Respiration

Describe the general method used for growth respiration

Spec. ID: cmip6.land.carbon_cycle.vegetation.autotrophic_respiration.growth_respiration

Is Required ? FALSE

Enter TEXT value:

7.5 Allocation

TODO

7.5.1 Method

Describe the general principle behind the allocation scheme

Spec. ID: cmip6.land.carbon_cycle.vegetation.allocation.method

Is Required ? TRUE

Enter TEXT value:

7.5.2 Allocation Bins

Specify distinct carbon bins used in allocation

Spec. ID: cmip6.land.carbon_cycle.vegetation.allocation.allocation_bins

Is Required ? TRUE

Select value:

- ☐ Leaves + stems + roots
- ☐ Leaves + stems + roots (leafy + woody)
- ☐ Leaves + fine roots + coarse roots + stems
- ☐ Whole plant (no distinction)
- ☐ Other - please specify:

7.5.3 Allocation Fractions

Describe how the fractions of allocation are calculated

Spec. ID: cmip6.land.carbon_cycle.vegetation.allocation.allocation_fractions

Is Required ? TRUE

Select value:

- ☐ Fixed
- ☐ Function of vegetation type
- ☐ Function of plant allometry
- ☐ Explicitly calculated
- ☐ Other - please specify:

7.6 Phenology

TODO

7.6.1 Method

Describe the general principle behind the phenology scheme

Spec. ID: cmip6.land.carbon_cycle.vegetation.phenology.method

Is Required ? TRUE

Enter TEXT value:

7.7 Mortality

TODO

7.7.1 Method

Describe the general principle behind the mortality scheme

Spec. ID: cmip6.land.carbon_cycle.vegetation.mortality.method

Is Required ? TRUE

Enter TEXT value:

7.8 Litter

TODO

7.8.1 Number Of Carbon Pools

Enter the number of carbon pools used

Spec. ID: cmip6.land.carbon_cycle.litter.number_of_carbon_pools

Is Required ? TRUE

Enter INTEGER value:

7.8.2 Carbon Pools

List the carbon pools used

Spec. ID: cmip6.land.carbon_cycle.litter.carbon_pools

Is Required ? FALSE

Enter TEXT value:

7.8.3 Decomposition

List the decomposition methods used

Spec. ID: cmip6.land.carbon_cycle.litter.decomposition

Is Required ? FALSE

Enter TEXT value:

7.8.4 Method

List the general method used

Spec. ID: cmip6.land.carbon_cycle.litter.method

Is Required ? FALSE

Enter TEXT value:

7.9 Soil

TODO

7.9.1 Number Of Carbon Pools

Enter the number of carbon pools used

Spec. ID: cmip6.land.carbon_cycle.soil.number_of_carbon_pools

Is Required ? TRUE

Enter INTEGER value:

7.9.2 Carbon Pools

List the carbon pools used

Spec. ID: cmip6.land.carbon_cycle.soil.carbon_pools

Is Required ? FALSE

Enter TEXT value:

7.9.3 Decomposition

List the decomposition methods used

Spec. ID: cmip6.land.carbon_cycle.soil.decomposition

Is Required ? FALSE

Enter TEXT value:

7.9.4 Method

List the general method used

Spec. ID: cmip6.land.carbon_cycle.soil.method

Is Required ? FALSE

Enter TEXT value:

7.10 Permafrost Carbon

TODO

7.10.1 Is Permafrost Included

Is permafrost includedxxx?

Spec. ID: cmip6.land.carbon_cycle.permafrost_carbon.is_permafrost_included

Is Required ? TRUE

Select value:

☐ True ☐ False

7.10.2 Emitted Greenhouse Gases

List the GHGs emitted

Spec. ID: cmip6.land.carbon_cycle.permafrost_carbon.emitted_greenhouse_gases

Is Required ? FALSE

Enter TEXT value:

7.10.3 Decomposition

List the decomposition methods used

Spec. ID: cmip6.land.carbon_cycle.permafrost_carbon.decomposition

Is Required ? FALSE

Enter TEXT value:

7.10.4 Impact On Soil Properties

Describe the impact of permafrost on soil properties

Spec. ID: cmip6.land.carbon_cycle.permafrost_carbon.impact_on_soil_properties

Is Required ? FALSE

Enter TEXT value:

8 Nitrogen Cycle

Land surface nitrogen cycle

8.1 Nitrogen Cycle

Land surface nitrogen cycle

8.1.1 Overview

Overview of the nitrogen cycle in the land surface

Spec. ID: cmip6.land.nitrogen_cycle.overview

Is Required ? TRUE

Enter TEXT value:

8.1.2 Tiling

Describe the nitrogen cycle tiling, if any.

Spec. ID: cmip6.land.nitrogen_cycle.tiling

Is Required ? FALSE

Enter TEXT value:

8.1.3 Time Step

Time step of nitrogen cycle in seconds

Spec. ID: cmip6.land.nitrogen_cycle.time_step

Is Required ? TRUE

Enter INTEGER value:

8.1.4 Prognostic Variables

List the prognostic variables of the nitrogen scheme

Spec. ID: cmip6.land.nitrogen_cycle.prognostic_variables

Is Required ? TRUE

Enter TEXT value:

9 River Routing

Land surface river routing

9.1 River Routing

Land surface river routing

9.1.1 Overview

Overview of river routing in the land surface

Spec. ID: cmip6.land.river_routing.overview

Is Required ? TRUE

Enter TEXT value:

9.1.2 Tiling

Describe the river routing, if any.

Spec. ID: cmip6.land.river_routing.tiling

Is Required ? FALSE

Enter TEXT value:

9.1.3 Time Step

Time step of river routing scheme in seconds

Spec. ID: cmip6.land.river_routing.time_step

Is Required ? TRUE

Enter INTEGER value:

9.1.4 Grid Inherited From Land Surface

Is the grid inherited from land surfacexxx?

Spec. ID: cmip6.land.river_routing.grid_inherited_from_land_surface

Is Required ? TRUE

Select value:

☐ True ☐ False

9.1.5 Grid Description

General description of grid, if not inherited from land surface

Spec. ID: cmip6.land.river_routing.grid_description

Is Required ? FALSE

Enter TEXT value:

9.1.6 Number Of Reservoirs

Enter the number of reservoirs

Spec. ID: cmip6.land.river_routing.number_of_reservoirs

Is Required ? TRUE

Enter INTEGER value:

9.1.7 Water Re Evaporation

TODO

Spec. ID: cmip6.land.river_routing.water_re_evaporation

Is Required ? TRUE

Select value(s):

- ☐ Flood plains
- ☐ Irrigation
- ☐ Other - please specify:

9.1.8 Coupled To Atmosphere

Is river routing coupled to the atmosphere model componentxxx?

Spec. ID: cmip6.land.river_routing.coupled_to_atmosphere

Is Required ? FALSE

Select value:

- ☐ True
- ☐ False

9.1.9 Coupled To Land

Describe the coupling between land and rivers

Spec. ID: cmip6.land.river_routing.coupled_to_land

Is Required ? FALSE

Enter TEXT value:

9.1.10 Quantities Exchanged With Atmosphere

If couple to atmosphere, which quantities are exchanged between river routing and the atmosphere model componentsxxx?

Spec. ID: cmip6.land.river_routing.quantities_exchanged_with_atmosphere

Is Required ? FALSE

Select value(s):

- ☐ Heat
- ☐ Water
- ☐ Tracers
- ☐ Other - please specify:

9.1.11 Basin Flow Direction Map

What type of basin flow direction map is being usedxxx?

Spec. ID: cmip6.land.river_routing.basin_flow_direction_map

Is Required ? TRUE

Select value:

- ☐ Present day
- ☐ Adapted for other periods
- ☐ Other - please specify:

9.1.12 Flooding

Describe the representation of flooding, if any

Spec. ID: cmip6.land.river_routing.flooding

Is Required ? FALSE

Enter TEXT value:

9.1.13 Prognostic Variables

List the prognostic variables of the river routing

Spec. ID: cmip6.land.river_routing.prognostic_variables

Is Required ? TRUE

Enter TEXT value:

9.2 Oceanic Discharge

TODO

9.2.1 Discharge Type

Specify how rivers are discharged to the ocean

Spec. ID: cmip6.land.river_routing.oceanic_discharge.discharge_type

Is Required ? TRUE

Select value:

- ☐ Direct (large rivers)
- ☐ Diffuse
- ☐ Other - please specify:

9.2.2 Quantities Transported

Quantities that are exchanged from river-routing to the ocean model component

Spec. ID: cmip6.land.river_routing.oceanic_discharge.quantities_transported

Is Required ? TRUE

Select value(s):

- ☐ Heat
- ☐ Water
- ☐ Tracers
- ☐ Other - please specify:

10 Lakes

Land surface lakes

10.1 Lakes

Land surface lakes

10.1.1 Overview

Overview of lakes in the land surface

Spec. ID: cmip6.land.lakes.overview

Is Required ? TRUE

Enter TEXT value:

10.1.2 Coupling With Rivers

Are lakes coupled to the river routing model componentxxx?

Spec. ID: cmip6.land.lakes.coupling__with_rivers

Is Required ? TRUE

Select value:

☐ True ☐ False

10.1.3 Time Step

Time step of lake scheme in seconds

Spec. ID: cmip6.land.lakes.time_step

Is Required ? TRUE

Enter INTEGER value:

10.1.4 Quantities Exchanged With Rivers

If coupling with rivers, which quantities are exchanged between the lakes and rivers

Spec. ID: cmip6.land.lakes.quantities__exchanged__with_rivers

Is Required ? FALSE

Select value(s):

- ☐ Heat
- ☐ Water
- ☐ Tracers
- ☐ Other - please specify:

10.1.5 Vertical Grid

Describe the vertical grid of lakes

Spec. ID: cmip6.land.lakes.vertical_grid

Is Required ? FALSE

Enter TEXT value:

10.1.6 Prognostic Variables

List the prognostic variables of the lake scheme

Spec. ID: cmip6.land.lakes.prognostic_variables

Is Required ? TRUE

Enter TEXT value:

10.2 Method

TODO

10.2.1 Ice Treatment

Is lake ice includedxxx?

Spec. ID: cmip6.land.lakes.method.ice_treatment

Is Required ? TRUE

Select value:

☐ True ☐ False

10.2.2 Albedo

Describe the treatment of lake albedo

Spec. ID: cmip6.land.lakes.method.albedo

Is Required ? TRUE

Select value:

☐ Prognostic
☐ Diagnostic
☐ Other - please specify:

10.2.3 Dynamics

Which dynamics of lakes are treatedxxx? horizontal, vertical, etc.

Spec. ID: cmip6.land.lakes.method.dynamics

Is Required ? TRUE

Select value(s):

- ☐ No lake dynamics
- ☐ Vertical
- ☐ Horizontal
- ☐ Other - please specify:

10.2.4 Dynamic Lake Extent

Is a dynamic lake extent scheme includedxxx?

Spec. ID: cmip6.land.lakes.method.dynamic_lake_extent

Is Required ? TRUE

Select value:

- ☐ True
- ☐ False

10.2.5 Endorheic Basins

Basins not flowing to ocean includedxxx?

Spec. ID: cmip6.land.lakes.method.endorheic_basins

Is Required ? TRUE

Select value:

- ☐ True
- ☐ False

10.3 Wetlands

TODO

10.3.1 Description

Describe the treatment of wetlands, if any

Spec. ID: cmip6.land.lakes.wetlands.description

Is Required ? FALSE

Enter TEXT value: