# CMIP6 Model Documentation

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|---|---|
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| **Model**: | NICAM16-9D-L78 |
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| **Note**: | * indicates a required property |

# Documentation Contents

# 1 Key Properties

*Atmosphere key properties*

## 1.1 Key Properties

*Atmosphere key properties*

### 1.1.1 Name *

*Name of atmos model code*

**Enter TEXT:**

### 1.1.2 Keywords *

*Keywords associated with atmos model code*

**Enter COMMA SEPERATED list:**

### 1.1.3 Overview *

*Overview of atmos model.*

**Enter TEXT:**

### 1.1.4 Model Family *

*Type of atmospheric model.*

**Select SINGLE option:**

- ☐ AGCM - Atmospheric General Circulation Model
- ☐ ARCM - Atmospheric Regional Climate Model
- ☐ Other - please specify:

### 1.1.5 Basic Approximations *

*Basic approximations made in the atmosphere.*

**Select MULTIPLE options:**

- ☐ Primitive equations
- ☐ Non-hydrostatic
- ☐ Anelastic
- ☐ Boussinesq
- ☐ Hydrostatic
- ☐ Quasi-hydrostatic
- ☐ Other - please specify:

## 1.2 Resolution

*Characteristics of the model resolution*

### 1.2.1 Overview

*Overview of characteristics of the model resolution in atmos model.*

**Enter TEXT:**

### 1.2.2 Horizontal Resolution Name *

*This is a string usually used by the modelling group to describe the resolution of the model grid, e.g. T42, N48.*

**Enter TEXT:**

### 1.2.3 Canonical Horizontal Resolution *

*Expression quoted for gross comparisons of resolution, e.g. 2.5 x 3.75 degrees lat-lon.*

**Enter TEXT:**

### 1.2.4 Range Horizontal Resolution *

*Range of horizontal resolution with spatial details, eg. 1 deg (Equator) - 0.5 deg*

**Enter TEXT:**

### 1.2.5 Number Of Vertical Levels *

*Number of vertical levels resolved on the computational grid.*

**Enter INTEGER value:**

### 1.2.6 High Top *

*Does the atmosphere have a high-top? High-Top atmospheres have a fully resolved stratosphere with a model top above the stratopause.*

**Select either TRUE or FALSE:**

☐ True ☐ False

## 1.3 Timestepping

*Characteristics of the atmosphere model time stepping*

### 1.3.1 Overview

*Overview of characteristics of the atmosphere model time stepping in atmos model.*

**Enter TEXT:**

### 1.3.2 Timestep Dynamics *

*Timestep for the dynamics in seconds*

**Enter INTEGER value:**

### 1.3.3 Timestep Shortwave Radiative Transfer

*Timestep for the shortwave radiative transfer in seconds.*

**Enter INTEGER value:**

### 1.3.4 Timestep Longwave Radiative Transfer

*Timestep for the longwave radiative transfer in seconds.*

**Enter INTEGER value:**

## 1.4 Orography

*Characteristics of the model orography*

### 1.4.1 Overview

*Overview of characteristics of the model orography in atmos model.*

**Enter TEXT:**

### 1.4.2 Type *

*Type of orographic representation.*

**Select SINGLE option:**

- ☐ Fixed: present day
- ☐ Fixed: modified - Provide details of modification below
- ☐ Other - please specify:

### 1.4.3 Modified

*If the orography type is modified describe the adaptation.*

**Select MULTIPLE options:**

- ☐ Related to ice sheets
- ☐ Related to tectonics
- ☐ Modified mean
- ☐ Modified variance if taken into account in model (cf gravity waves)

☐ Other - please specify:

### 1.4.4 Time-varying

*Describe any time varying orographic change*

**Enter TEXT:**

## 1.5 Tuning Applied

*Tuning methodology for atmospheric component*

### 1.5.1 Overview

*Overview of tuning methodology for atmospheric component in atmos model.*

**Enter TEXT:**

### 1.5.2 Description *

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

**Enter TEXT:**

### 1.5.3 Global Mean Metrics Used

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

**Enter COMMA SEPERATED list:**

### 1.5.4 Regional Metrics Used

*List of regional metrics of mean state used in tuning model/component*

**Enter COMMA SEPERATED list:**

### 1.5.5 Trend Metrics Used

*List observed trend metrics used in tuning model/component*

**Enter COMMA SEPERATED list:**

# 2 Grid

*Atmosphere grid*

## 2.1 Grid

*Atmosphere grid*

### 2.1.1 Name

*Name of grid in atmos model.*

**Enter TEXT:**

### 2.1.2 Overview

*Overview of grid in atmos model.*

**Enter TEXT:**

## 2.2 Discretisation

*Atmosphere grid discretisation*

### 2.2.1 Overview

*Overview of atmosphere grid discretisation in atmos model.*

**Enter TEXT:**

### 2.2.2 Overview *

*Overview description of grid discretisation in the atmosphere*

**Enter TEXT:**

## 2.3 Horizontal

*Atmosphere discretisation in the horizontal*

### 2.3.1 Scheme Type *

*Horizontal discretisation type*

**Select SINGLE option:**

- ☐ Spectral
- ☐ Fixed grid
- ☐ Other - please specify:

### 2.3.2 Scheme Method *

*Horizontal discretisation method*

**Select SINGLE option:**

- ☐ Finite elements
- ☐ Finite volumes
- ☐ Finite difference
- ☐ Centered finite difference

### 2.3.3 Scheme Order *

*Horizontal discretisation function order*

**Select SINGLE option:**

- ☐ Second
- ☐ Third
- ☐ Fourth
- ☐ Other - please specify:

### 2.3.4 Horizontal Pole

*Horizontal discretisation pole singularity treatment*

**Select SINGLE option:**

- ☐ Filter
- ☐ Pole rotation
- ☐ Artificial island
- ☐ Other - please specify:

### 2.3.5 Grid Type *

*Horizontal grid type*

**Select SINGLE option:**

- ☐ Gaussian
- ☐ Latitude-Longitude
- ☐ Cubed-Sphere
- ☐ Icosahedral
- ☐ Other - please specify:

## 2.4 Vertical

*Atmosphere discretisation in the vertical*

### 2.4.1 Coordinate Type *

*Type of vertical coordinate system*

**Select MULTIPLE options:**

- ☐ Isobaric - Vertical coordinate on pressure levels
- ☐ Sigma - Allows vertical coordinate to follow model terrain
- ☐ Hybrid sigma-pressure - Sigma system near terrain and isobaric above
- ☐ Hybrid pressure
- ☐ Vertically lagrangian
- ☐ Other - please specify:

# 3 Dynamical Core

*Characteristics of the dynamical core*

## 3.1 Dynamical Core

*Characteristics of the dynamical core*

### 3.1.1 Name

*Commonly used name for the dynamical core in atmos model.*

**Enter TEXT:**

### 3.1.2 Overview

*Overview of characteristics of the dynamical core in atmos model.*

**Enter TEXT:**

### 3.1.3 Timestepping Type *

*Timestepping framework type*

**Select SINGLE option:**

- ☐ Adams-Bashforth
- ☐ Explicit
- ☐ Implicit
- ☐ Semi-implicit
- ☐ Leap frog
- ☐ Multi-step
- ☐ Runge Kutta fifth order
- ☐ Runge Kutta second order
- ☐ Runge Kutta third order
- ☐ Other - please specify:

### 3.1.4 Prognostic Variables *

*List of the model prognostic variables*

**Select MULTIPLE options:**

- ☐ Surface pressure
- ☐ Wind components
- ☐ Divergence/curl

- ☐ Temperature
- ☐ Potential temperature
- ☐ Total water
- ☐ Water vapour
- ☐ Water liquid
- ☐ Water ice
- ☐ Total water moments
- ☐ Clouds
- ☐ Radiation
- ☐ Other - please specify:

## 3.2 Top Boundary

*Type of boundary layer at the top of the model*

### 3.2.1 Overview

*Overview of type of boundary layer at the top of the model in atmos model.*

**Enter TEXT:**

### 3.2.2 Top Boundary Condition *

*Top boundary condition*

**Select SINGLE option:**

- ☐ Sponge layer
- ☐ Radiation boundary condition
- ☐ Other - please specify:

### 3.2.3 Top Heat *

*Top boundary heat treatment*

**Enter TEXT:**

### 3.2.4 Top Wind *

*Top boundary wind treatment*

**Enter TEXT:**

## 3.3 Lateral Boundary

*Type of lateral boundary condition (if the model is a regional model)*

### 3.3.1 Overview

*Overview of type of lateral boundary condition (if the model is a regional model) in atmos model.*

**Enter TEXT:**

### 3.3.2 Condition

*Type of lateral boundary condition*

**Select SINGLE option:**

- ☐ Sponge layer
- ☐ Radiation boundary condition
- ☐ Other - please specify:

## 3.4 Diffusion Horizontal

*Horizontal diffusion scheme*

### 3.4.1 Overview

*Overview of horizontal diffusion scheme in atmos model.*

**Enter TEXT:**

### 3.4.2 Scheme Name

*Horizontal diffusion scheme name*

**Enter TEXT:**

### 3.4.3 Scheme Method *

*Horizontal diffusion scheme method*

**Select SINGLE option:**

- ☐ Iterated Laplacian
- ☐ Bi-harmonic
- ☐ Other - please specify:

## 3.5 Advection

*Dynamical core advection*

### 3.5.1 Overview

*Overview of dynamical core advection in atmos model.*

**Enter TEXT:**

## 3.6 Tracers

*Tracer advection scheme*

### 3.6.1 Scheme Name

*Tracer advection scheme name*

**Select SINGLE option:**

- ☐ Heun
- ☐ Roe and VanLeer
- ☐ Roe and Superbee
- ☐ Prather
- ☐ UTOPIA
- ☐ Other - please specify:

### 3.6.2 Scheme Characteristics *

*Tracer advection scheme characteristics*

**Select MULTIPLE options:**

- ☐ Eulerian
- ☐ Modified Euler
- ☐ Lagrangian
- ☐ Semi-Lagrangian
- ☐ Cubic semi-Lagrangian
- ☐ Quintic semi-Lagrangian
- ☐ Mass-conserving
- ☐ Finite volume
- ☐ Flux-corrected
- ☐ Linear
- ☐ Quadratic
- ☐ Quartic
- ☐ Other - please specify:

### 3.6.3 Conserved Quantities *

*Tracer advection scheme conserved quantities*

**Select MULTIPLE options:**

- ☐ Dry mass
- ☐ Tracer mass
- ☐ Other - please specify:

#### 3.6.4 Conservation Method *

*Tracer advection scheme conservation method*

**Select SINGLE option:**

- ☐ Conservation fixer
- ☐ Priestley algorithm
- ☐ Other - please specify:

### 3.7 Momentum

*Momentum advection scheme*

#### 3.7.1 Scheme Name

*Momentum advection schemes name*

**Select SINGLE option:**

- ☐ VanLeer
- ☐ Janjic
- ☐ SUPG (Streamline Upwind Petrov-Galerkin)
- ☐ Other - please specify:

#### 3.7.2 Scheme Characteristics *

*Momentum advection scheme characteristics*

**Select MULTIPLE options:**

- ☐ 2nd order
- ☐ 4th order
- ☐ Cell-centred
- ☐ Staggered grid
- ☐ Semi-staggered grid
- ☐ Other - please specify:

### 3.7.3 Scheme Staggering Type *

*Momentum advection scheme staggering type*

**Select SINGLE option:**

- ☐ Arakawa B-grid
- ☐ Arakawa C-grid
- ☐ Arakawa D-grid
- ☐ Arakawa E-grid
- ☐ Other - please specify:

### 3.7.4 Conserved Quantities *

*Momentum advection scheme conserved quantities*

**Select MULTIPLE options:**

- ☐ Angular momentum
- ☐ Horizontal momentum
- ☐ Enstrophy
- ☐ Mass
- ☐ Total energy
- ☐ Vorticity
- ☐ Other - please specify:

### 3.7.5 Conservation Method *

*Momentum advection scheme conservation method*

**Select SINGLE option:**

- ☐ Conservation fixer
- ☐ Other - please specify:

# 4 Radiation

*Characteristics of the atmosphere radiation process*

## 4.1 Radiation

*Characteristics of the atmosphere radiation process*

### 4.1.1 Name

*Commonly used name for the radiation in atmos model.*

**Enter TEXT:**

### 4.1.2 Overview

*Overview of characteristics of the atmosphere radiation process in atmos model.*

**Enter TEXT:**

### 4.1.3 Aerosols *

*Aerosols whose radiative effect is taken into account in the atmosphere model*

**Select MULTIPLE options:**

- ☐ Sulphate
- ☐ Nitrate
- ☐ Sea salt
- ☐ Dust
- ☐ Ice
- ☐ Organic
- ☐ BC - Black carbon / soot
- ☐ SOA - Secondary organic aerosols
- ☐ POM - Particulate organic matter
- ☐ Polar stratospheric ice
- ☐ NAT - Nitric acid trihydrate
- ☐ NAD - Nitric acid dihydrate
- ☐ STS - Supercooled ternary solution aerosol particle
- ☐ Other - please specify:

## 4.2 Shortwave Radiation

*Properties of the shortwave radiation scheme*

### 4.2.1 Overview

*Overview of properties of the shortwave radiation scheme in atmos model.*

**Enter TEXT:**

### 4.2.2 Overview *

*Overview description of shortwave radiation in the atmosphere*

**Enter TEXT:**

### 4.2.3 Name

*Commonly used name for the shortwave radiation scheme*

**Enter TEXT:**

### 4.2.4 Spectral Integration *

*Shortwave radiation scheme spectral integration*

**Select SINGLE option:**

- ☐ Wide-band model
- ☐ Correlated-k
- ☐ Exponential sum fitting
- ☐ Other - please specify:

### 4.2.5 Transport Calculation *

*Shortwave radiation transport calculation methods*

**Select MULTIPLE options:**

- ☐ Two-stream
- ☐ Layer interaction
- ☐ Bulk - Highly parameterised methods that use bulk expressions
- ☐ Adaptive - Exploits spatial and temporal correlations in optical characteristics
- ☐ Multi-stream
- ☐ Other - please specify:

### 4.2.6 Spectral Intervals *

*Shortwave radiation scheme number of spectral intervals*

**Enter INTEGER value:**

## 4.3 Shortwave GHG

*Representation of greenhouse gases in the shortwave radiation scheme*

### 4.3.1 Overview

*Overview of representation of greenhouse gases in the shortwave radiation scheme in atmos model.*

**Enter TEXT:**

### 4.3.2 Greenhouse Gas Complexity *

*Complexity of greenhouse gases whose shortwave radiative effects are taken into account in the atmosphere model*

**Select MULTIPLE options:**

☐ CO2 - Carbon Dioxide

☐ CH4 - Methane

☐ N2O - Nitrous Oxide

☐ CFC-11 eq - Summarize the effect of non CO2, CH4, N2O and CFC-12 gases with an equivalence concentration of CFC-11

☐ CFC-12 eq - Summarize the radiative effect of the Ozone Depleating Substances, ODSs, with a CFC-12 equivalence concentration

☐ HFC-134a eq - Summarize the radiative effect of other fluorinated gases with a HFC-134a equivalence concentration

☐ Explicit ODSs - Explicit representation of Ozone Depleting Substances e.g. CFCs, HCFCs and Halons

☐ Explicit other fluorinated gases - Explicit representation of other fluorinated gases e.g. HFCs and PFCs

☐ O3

☐ H2O

☐ Other - please specify:

### 4.3.3 ODS

*Ozone depleting substances whose shortwave radiative effects are explicitly taken into account in the atmosphere model*

**Select MULTIPLE options:**

☐ CFC-12 - CFC

☐ CFC-11 - CFC

☐ CFC-113 - CFC

☐ CFC-114 - CFC

☐ CFC-115 - CFC

☐ HCFC-22 - HCFC

- ☐ HCFC-141b - HCFC
- ☐ HCFC-142b - HCFC
- ☐ Halon-1211 - Halon
- ☐ Halon-1301 - Halon
- ☐ Halon-2402 - Halon
- ☐ Methyl chloroform - CH3CCl3
- ☐ Carbon tetrachloride - CCl4
- ☐ Methyl chloride - CH3Cl
- ☐ Methylene chloride - CH2Cl2
- ☐ Chloroform - CHCl3
- ☐ Methyl bromide - Ch3Br
- ☐ Other - please specify:

### 4.3.4 Other Flourinated Gases

*Other flourinated gases whose shortwave radiative effects are explicitly taken into account in the atmosphere model*

**Select MULTIPLE options:**

- ☐ HFC-134a - HFC
- ☐ HFC-23 - HFC
- ☐ HFC-32 - HFC
- ☐ HFC-125 - HFC
- ☐ HFC-143a - HFC
- ☐ HFC-152a - HFC
- ☐ HFC-227ea - HFC
- ☐ HFC-236fa - HFC
- ☐ HFC-245fa - HFC
- ☐ HFC-365mfc - HFC
- ☐ HFC-43-10mee - HFC
- ☐ CF4 - PFC
- ☐ C2F6 - PFC
- ☐ C3F8 - PFC
- ☐ C4F10 - PFC

☐ C5F12 - PFC

☐ C6F14 - PFC

☐ C7F16 - PFC

☐ C8F18 - PFC

☐ C-C4F8 - PFC

☐ NF3

☐ SF6

☐ SO2F2

☐ Other - please specify:

## 4.4 Shortwave Cloud Ice

*Shortwave radiative properties of ice crystals in clouds*

### 4.4.1 Overview

*Overview of shortwave radiative properties of ice crystals in clouds in atmos model.*

**Enter TEXT:**

### 4.4.2 General Interactions *

*General shortwave radiative interactions with cloud ice crystals*

**Select MULTIPLE options:**

☐ Scattering

☐ Emission/absorption

☐ Other - please specify:

### 4.4.3 Physical Representation *

*Physical representation of cloud ice crystals in the shortwave radiation scheme*

**Select MULTIPLE options:**

☐ Bi-modal size distribution - Small mode diameters: a few tens of microns, large mode diameters: typically hundreds of microns

☐ Ensemble of ice crystals - Complex shapes represented with an ensemble of symmetric shapes

☐ Mean projected area - Randomly oriented irregular ice crystals present a greater mean projected area than spheres

☐ Ice water path - Integrated ice water path through the cloud kg m-2

☐ Crystal asymmetry

- ☐ Crystal aspect ratio
- ☐ Effective crystal radius
- ☐ Other - please specify:

### 4.4.4 Optical Methods *

*Optical methods applicable to cloud ice crystals in the shortwave radiation scheme*

**Select MULTIPLE options:**

- ☐ T-matrix - For non-spherical particles
- ☐ Geometric optics - For non-spherical particles
- ☐ Finite difference time domain (FDTD) - For non-spherical particles
- ☐ Mie theory - For spherical particles
- ☐ Anomalous diffraction approximation
- ☐ Other - please specify:

## 4.5 Shortwave Cloud Liquid

*Shortwave radiative properties of liquid droplets in clouds*

### 4.5.1 Overview

*Overview of shortwave radiative properties of liquid droplets in clouds in atmos model.*

**Enter TEXT:**

### 4.5.2 General Interactions *

*General shortwave radiative interactions with cloud liquid droplets*

**Select MULTIPLE options:**

- ☐ Scattering
- ☐ Emission/absorption
- ☐ Other - please specify:

### 4.5.3 Physical Representation *

*Physical representation of cloud liquid droplets in the shortwave radiation scheme*

**Select MULTIPLE options:**

- ☐ Cloud droplet number concentration - CDNC
- ☐ Effective cloud droplet radii
- ☐ Droplet size distribution

☐ Liquid water path - Integrated liquid water path through the cloud kg m-2

☐ Other - please specify:

#### 4.5.4 Optical Methods *

*Optical methods applicable to cloud liquid droplets in the shortwave radiation scheme*

**Select MULTIPLE options:**

☐ Geometric optics - For non-spherical particles

☐ Mie theory - For spherical particles

☐ Other - please specify:

### 4.6 Shortwave Cloud Inhomogeneity

*Cloud inhomogeneity in the shortwave radiation scheme*

#### 4.6.1 Overview

*Overview of cloud inhomogeneity in the shortwave radiation scheme in atmos model.*

**Enter TEXT:**

#### 4.6.2 Cloud Inhomogeneity *

*Method for taking into account horizontal cloud inhomogeneity*

**Select SINGLE option:**

☐ Monte Carlo Independent Column Approximation - McICA

☐ Triplecloud - Regions of clear sky, optically thin cloud and optically thick cloud, Shonk et al 2010

☐ Analytic

☐ Other - please specify:

### 4.7 Shortwave Aerosols

*Shortwave radiative properties of aerosols*

#### 4.7.1 Overview

*Overview of shortwave radiative properties of aerosols in atmos model.*

**Enter TEXT:**

#### 4.7.2 General Interactions *

*General shortwave radiative interactions with aerosols*

**Select MULTIPLE options:**

- ☐ Scattering
- ☐ Emission/absorption
- ☐ Other - please specify:

### 4.7.3 Physical Representation *

*Physical representation of aerosols in the shortwave radiation scheme*

**Select MULTIPLE options:**

- ☐ Number concentration
- ☐ Effective radii
- ☐ Size distribution
- ☐ Asymmetry
- ☐ Aspect ratio
- ☐ Mixing state - For shortwave radiative interaction
- ☐ Other - please specify:

### 4.7.4 Optical Methods *

*Optical methods applicable to aerosols in the shortwave radiation scheme*

**Select MULTIPLE options:**

- ☐ T-matrix - For non-spherical particles
- ☐ Geometric optics - For non-spherical particles
- ☐ Finite difference time domain (FDTD) - For non-spherical particles
- ☐ Mie theory - For spherical particles
- ☐ Anomalous diffraction approximation
- ☐ Other - please specify:

## 4.8 Shortwave Gases

*Shortwave radiative properties of gases*

### 4.8.1 Overview

*Overview of shortwave radiative properties of gases in atmos model.*

**Enter TEXT:**

### 4.8.2 General Interactions *

*General shortwave radiative interactions with gases*

**Select MULTIPLE options:**

- ☐ Scattering
- ☐ Emission/absorption
- ☐ Other - please specify:

## 4.9 Longwave Radiation

*Properties of the longwave radiation scheme*

### 4.9.1 Overview

*Overview of properties of the longwave radiation scheme in atmos model.*

**Enter TEXT:**

### 4.9.2 Overview *

*Overview description of longwave radiation in the atmosphere*

**Enter TEXT:**

### 4.9.3 Name

*Commonly used name for the longwave radiation scheme.*

**Enter TEXT:**

### 4.9.4 Spectral Integration *

*Longwave radiation scheme spectral integration*

**Select SINGLE option:**

- ☐ Wide-band model
- ☐ Correlated-k
- ☐ Exponential sum fitting
- ☐ Other - please specify:

### 4.9.5 Transport Calculation *

*Longwave radiation transport calculation methods*

**Select MULTIPLE options:**

- ☐ Two-stream
- ☐ Layer interaction
- ☐ Bulk - Highly parameterised methods that use bulk expressions

☐ Adaptive - Exploits spatial and temporal correlations in optical characteristics

☐ Multi-stream

☐ Other - please specify:

### 4.9.6 Spectral Intervals *

*Longwave radiation scheme number of spectral intervals*

**Enter INTEGER value:**

## 4.10 Longwave GHG

*Representation of greenhouse gases in the longwave radiation scheme*

### 4.10.1 Overview

*Overview of representation of greenhouse gases in the longwave radiation scheme in atmos model.*

**Enter TEXT:**

### 4.10.2 Greenhouse Gas Complexity *

*Complexity of greenhouse gases whose longwave radiative effects are taken into account in the atmosphere model*

**Select MULTIPLE options:**

☐ CO2 - Carbon Dioxide

☐ CH4 - Methane

☐ N2O - Nitrous Oxide

☐ CFC-11 eq - Summarize the effect of non CO2, CH4, N2O and CFC-12 gases with an equivalence concentration of CFC-11

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☐ Explicit other fluorinated gases - Explicit representation of other fluorinated gases e.g. HFCs and PFCs

☐ O3

☐ H2O

☐ Other - please specify:

### 4.10.3 ODS

*Ozone depleting substances whose longwave radiative effects are explicitly taken into account in the atmosphere model*

**Select MULTIPLE options:**

- ☐ CFC-12 - CFC
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- ☐ CFC-113 - CFC
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- ☐ Halon-1301 - Halon
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- ☐ Carbon tetrachloride - CCl4
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- ☐ Methylene chloride - CH2Cl2
- ☐ Chloroform - CHCl3
- ☐ Methyl bromide - Ch3Br
- ☐ Other - please specify:

### 4.10.4 Other Flourinated Gases

*Other flourinated gases whose longwave radiative effects are explicitly taken into account in the atmosphere model*

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- ☐ HFC-32 - HFC
- ☐ HFC-125 - HFC
- ☐ HFC-143a - HFC
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- ☐ HFC-227ea - HFC
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- ☐ HFC-245fa - HFC
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- ☐ C4F10 - PFC
- ☐ C5F12 - PFC
- ☐ C6F14 - PFC
- ☐ C7F16 - PFC
- ☐ C8F18 - PFC
- ☐ C-C4F8 - PFC
- ☐ NF3
- ☐ SF6
- ☐ SO2F2
- ☐ Other - please specify:

## 4.11 Longwave Cloud Ice

*Longwave radiative properties of ice crystals in clouds*

### 4.11.1 Overview

*Overview of longwave radiative properties of ice crystals in clouds in atmos model.*

**Enter TEXT:**

### 4.11.2 General Interactions *

*General longwave radiative interactions with cloud ice crystals*

**Select MULTIPLE options:**

- ☐ Scattering
- ☐ Emission/absorption
- ☐ Other - please specify:

### 4.11.3 Physical Reprenstation *

*Physical representation of cloud ice crystals in the longwave radiation scheme*

**Select MULTIPLE options:**

☐ Bi-modal size distribution - Small mode diameters: a few tens of microns, large mode diameters: typically hundreds of microns

☐ Ensemble of ice crystals - Complex shapes represented with an ensemble of symmetric shapes

☐ Mean projected area - Randomly oriented irregular ice crystals present a greater mean projected area than spheres

☐ Ice water path - Integrated ice water path through the cloud kg m-2

☐ Crystal asymmetry

☐ Crystal aspect ratio

☐ Effective crystal radius

☐ Other - please specify:

### 4.11.4 Optical Methods *

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☐ Finite difference time domain (FDTD) - For non-spherical particles

☐ Mie theory - For spherical particles

☐ Anomalous diffraction approximation

☐ Other - please specify:

## 4.12 Longwave Cloud Liquid

*Longwave radiative properties of liquid droplets in clouds*

### 4.12.1 Overview

*Overview of longwave radiative properties of liquid droplets in clouds in atmos model.*

**Enter TEXT:**

### 4.12.2 General Interactions *

*General longwave radiative interactions with cloud liquid droplets*

**Select MULTIPLE options:**

- ☐ Scattering
- ☐ Emission/absorption
- ☐ Other - please specify:

### 4.12.3 Physical Representation *

*Physical representation of cloud liquid droplets in the longwave radiation scheme*

**Select MULTIPLE options:**

- ☐ Cloud droplet number concentration - CDNC
- ☐ Effective cloud droplet radii
- ☐ Droplet size distribution
- ☐ Liquid water path - Integrated liquid water path through the cloud kg m-2
- ☐ Other - please specify:

### 4.12.4 Optical Methods *

*Optical methods applicable to cloud liquid droplets in the longwave radiation scheme*

**Select MULTIPLE options:**

- ☐ Geometric optics - For non-spherical particles
- ☐ Mie theory - For spherical particles
- ☐ Other - please specify:

## 4.13 Longwave Cloud Inhomogeneity

*Cloud inhomogeneity in the longwave radiation scheme*

### 4.13.1 Overview

*Overview of cloud inhomogeneity in the longwave radiation scheme in atmos model.*

**Enter TEXT:**

### 4.13.2 Cloud Inhomogeneity *

*Method for taking into account horizontal cloud inhomogeneity*

**Select SINGLE option:**

- ☐ Monte Carlo Independent Column Approximation - McICA
- ☐ Triplecloud - Regions of clear sky, optically thin cloud and optically thick cloud, Shonk et al 2010
- ☐ Analytic
- ☐ Other - please specify:

## 4.14 Longwave Aerosols

*Longwave radiative properties of aerosols*

### 4.14.1 Overview

*Overview of longwave radiative properties of aerosols in atmos model.*

**Enter TEXT:**

### 4.14.2 General Interactions *

*General longwave radiative interactions with aerosols*

**Select MULTIPLE options:**

- ☐ Scattering
- ☐ Emission/absorption
- ☐ Other - please specify:

### 4.14.3 Physical Representation *

*Physical representation of aerosols in the longwave radiation scheme*

**Select MULTIPLE options:**

- ☐ Number concentration
- ☐ Effective radii
- ☐ Size distribution
- ☐ Asymmetry
- ☐ Aspect ratio
- ☐ Mixing state - For shortwave radiative interaction
- ☐ Other - please specify:

### 4.14.4 Optical Methods *

*Optical methods applicable to aerosols in the longwave radiation scheme*

**Select MULTIPLE options:**

- ☐ T-matrix - For non-spherical particles
- ☐ Geometric optics - For non-spherical particles
- ☐ Finite difference time domain (FDTD) - For non-spherical particles
- ☐ Mie theory - For spherical particles
- ☐ Anomalous diffraction approximation
- ☐ Other - please specify:

## 4.15 Longwave Gases

*Longwave radiative properties of gases*

### 4.15.1 Overview

*Overview of longwave radiative properties of gases in atmos model.*

**Enter TEXT:**

### 4.15.2 General Interactions *

*General longwave radiative interactions with gases*

**Select MULTIPLE options:**

- ☐ Scattering
- ☐ Emission/absorption
- ☐ Other - please specify:

# 5 Turbulence Convection

*Atmosphere Convective Turbulence and Clouds*

## 5.1 Turbulence Convection

*Atmosphere Convective Turbulence and Clouds*

### 5.1.1 Name

*Commonly used name for the turbulence convection in atmos model.*

**Enter TEXT:**

### 5.1.2 Overview

*Overview of atmosphere convective turbulence and clouds in atmos model.*

**Enter TEXT:**

## 5.2 Boundary Layer Turbulence

*Properties of the boundary layer turbulence scheme*

### 5.2.1 Overview

*Overview of properties of the boundary layer turbulence scheme in atmos model.*

**Enter TEXT:**

### 5.2.2 Scheme Name

*Boundary layer turbulence scheme name*

**Select SINGLE option:**

- ☐ Mellor-Yamada
- ☐ Holtslag-Boville
- ☐ EDMF - Combined Eddy Diffusivity Mass-Flux
- ☐ Other - please specify:

### 5.2.3 Scheme Type *

*Boundary layer turbulence scheme type*

**Select MULTIPLE options:**

- ☐ TKE prognostic
- ☐ TKE diagnostic
- ☐ TKE coupled with water
- ☐ Vertical profile of Kz

- ☐ Non-local diffusion
- ☐ Monin-Obukhov similarity
- ☐ Coastal Buddy Scheme - Separate components for coastal near surface winds over ocean and land
- ☐ Coupled with convection
- ☐ Coupled with gravity waves
- ☐ Depth capped at cloud base - Boundary layer capped at cloud base when convection is diagnosed
- ☐ Other - please specify:

#### 5.2.4 Closure Order *

*Boundary layer turbulence scheme closure order*

**Enter INTEGER value:**

#### 5.2.5 Counter Gradient *

*Uses boundary layer turbulence scheme counter gradient*

**Select either TRUE or FALSE:**

☐ True ☐ False

### 5.3 Deep Convection

*Properties of the deep convection scheme*

#### 5.3.1 Overview

*Overview of properties of the deep convection scheme in atmos model.*

**Enter TEXT:**

#### 5.3.2 Scheme Name

*Deep convection scheme name*

**Enter TEXT:**

#### 5.3.3 Scheme Type *

*Deep convection scheme type*

**Select MULTIPLE options:**

- ☐ Mass-flux
- ☐ Adjustment
- ☐ Plume ensemble - Zhang-McFarlane

☐ Other - please specify:

### 5.3.4 Scheme Method *

*Deep convection scheme method*

**Select MULTIPLE options:**

☐ CAPE - Mass flux determined by CAPE, convectively available potential energy.

☐ Bulk - A bulk mass flux scheme is used

☐ Ensemble - Summation over an ensemble of convective clouds with differing characteristics

☐ CAPE/WFN based - CAPE-Cloud Work Function: Based on the quasi-equilibrium of the free troposphere

☐ TKE/CIN based - TKE-Convective Inhibition: Based on the quasi-equilibrium of the boundary layer

☐ Other - please specify:

### 5.3.5 Processes *

*Physical processes taken into account in the parameterisation of deep convection*

**Select MULTIPLE options:**

☐ Vertical momentum transport

☐ Convective momentum transport

☐ Entrainment

☐ Detrainment

☐ Penetrative convection

☐ Updrafts

☐ Downdrafts

☐ Radiative effect of anvils

☐ Re-evaporation of convective precipitation

☐ Other - please specify:

### 5.3.6 Microphysics

*Microphysics scheme for deep convection. Microphysical processes directly control the amount of detrainment of cloud hydrometeor and water vapor from updrafts*

**Select MULTIPLE options:**

☐ Tuning parameter based

☐ Single moment

☐ Two moment

☐ Other - please specify:

## 5.4 Shallow Convection

*Properties of the shallow convection scheme*

### 5.4.1 Overview

*Overview of properties of the shallow convection scheme in atmos model.*

**Enter TEXT:**

### 5.4.2 Scheme Name

*Shallow convection scheme name*

**Enter TEXT:**

### 5.4.3 Scheme Type *

*Shallow convection scheme type*

**Select MULTIPLE options:**

☐ Mass-flux

☐ Cumulus-capped boundary layer

☐ Other - please specify:

### 5.4.4 Scheme Method *

*Shallow convection scheme method*

**Select SINGLE option:**

☐ Same as deep (unified)

☐ Included in boundary layer turbulence

☐ Separate diagnosis - Deep and Shallow convection schemes use different thermodynamic closure criteria

☐ Other - please specify:

### 5.4.5 Processes *

*Physical processes taken into account in the parameterisation of shallow convection*

**Select MULTIPLE options:**

☐ Convective momentum transport

☐ Entrainment

☐ Detrainment

- ☐ Penetrative convection
- ☐ Re-evaporation of convective precipitation
- ☐ Other - please specify:

### 5.4.6 Microphysics

*Microphysics scheme for shallow convection*

**Select MULTIPLE options:**

- ☐ Tuning parameter based
- ☐ Single moment
- ☐ Two moment
- ☐ Other - please specify:

# 6 Microphysics Precipitation

*Large Scale Cloud Microphysics and Precipitation*

## 6.1 Microphysics Precipitation

*Large Scale Cloud Microphysics and Precipitation*

### 6.1.1 Name

*Commonly used name for the microphysics precipitation in atmos model.*

**Enter TEXT:**

### 6.1.2 Overview

*Overview of large scale cloud microphysics and precipitation in atmos model.*

**Enter TEXT:**

## 6.2 Large Scale Precipitation

*Properties of the large scale precipitation scheme*

### 6.2.1 Overview

*Overview of properties of the large scale precipitation scheme in atmos model.*

**Enter TEXT:**

### 6.2.2 Scheme Name

*Commonly used name of the large scale precipitation parameterisation scheme*

**Enter TEXT:**

### 6.2.3 Hydrometeors *

*Precipitating hydrometeors taken into account in the large scale precipitation scheme*

**Select MULTIPLE options:**

- ☐ Liquid rain
- ☐ Snow
- ☐ Hail
- ☐ Graupel
- ☐ Other - please specify:

## 6.3 Large Scale Cloud Microphysics

*Properties of the large scale cloud microphysics scheme*

### 6.3.1 Overview

*Overview of properties of the large scale cloud microphysics scheme in atmos model.*

**Enter TEXT:**

### 6.3.2 Scheme Name

*Commonly used name of the microphysics parameterisation scheme used for large scale clouds.*

**Enter TEXT:**

### 6.3.3 Processes *

*Large scale cloud microphysics processes*

**Select MULTIPLE options:**

- ☐ Mixed phase
- ☐ Cloud droplets
- ☐ Cloud ice
- ☐ Ice nucleation
- ☐ Water vapour deposition
- ☐ Effect of raindrops
- ☐ Effect of snow
- ☐ Effect of graupel
- ☐ Other - please specify:

# 7 Cloud Scheme

*Characteristics of the cloud scheme*

## 7.1 Cloud Scheme

*Characteristics of the cloud scheme*

### 7.1.1 Name

*Commonly used name for the cloud scheme in atmos model.*

**Enter TEXT:**

### 7.1.2 Overview

*Overview of characteristics of the cloud scheme in atmos model.*

**Enter TEXT:**

### 7.1.3 Scheme Type *

*Describes the type(s) of cloud scheme: prognostic, diagnostic, other.*

**Select MULTIPLE options:**

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

### 7.1.4 Uses Separate Treatment *

*Description for when different cloud schemes are used for different types of clouds e.g. convective, stratiform and boundary layer)*

**Enter TEXT:**

### 7.1.5 Processes *

*Processes included in the cloud scheme*

**Select MULTIPLE options:**

- ☐ Entrainment
- ☐ Detrainment
- ☐ Bulk cloud
- ☐ Other - please specify:

### 7.1.6 Prognostic Variables

*List the prognostic variables used by the cloud scheme, if applicable.*

**Select MULTIPLE options:**

- ☐ Cloud amount
- ☐ Liquid
- ☐ Ice
- ☐ Rain
- ☐ Snow
- ☐ Cloud droplet number concentration - To document the use of two-moment cloud microphysics schemes
- ☐ Ice crystal number concentration - To document the use of two-moment cloud microphysics schemes
- ☐ Other - please specify:

### 7.1.7 Atmos Coupling

*Atmosphere components that are linked to the cloud scheme*

**Select MULTIPLE options:**

- ☐ Atmosphere_radiation
- ☐ Atmosphere_microphysics_precipitation
- ☐ Atmosphere_turbulence_convection
- ☐ Atmosphere_gravity_waves
- ☐ Atmosphere_natural_forcing
- ☐ Atmosphere_observation_simulation

## 7.2 Optical Cloud Properties

*Optical cloud properties*

### 7.2.1 Overview

*Overview of optical cloud properties in atmos model.*

**Enter TEXT:**

### 7.2.2 Cloud Overlap Method

*Method for taking into account overlapping of cloud layers*

**Select SINGLE option:**

- ☐ Random

- ☐ Maximum
- ☐ Maximum-random - Combination of maximum and random overlap between clouds
- ☐ Exponential
- ☐ Other - please specify:

### 7.2.3 Cloud Inhomogeneity

*Method for taking into account cloud inhomogeneity*

**Enter TEXT:**

## 7.3 Sub Grid Scale Water Distribution

*Sub-grid scale water distribution*

### 7.3.1 Overview

*Overview of sub-grid scale water distribution in atmos model.*

**Enter TEXT:**

### 7.3.2 Type *

*Sub-grid scale water distribution type*

**Select SINGLE option:**

- ☐ Prognostic
- ☐ Diagnostic

### 7.3.3 Function Name *

*Sub-grid scale water distribution function name*

**Enter TEXT:**

### 7.3.4 Function Order *

*Sub-grid scale water distribution function type*

**Enter INTEGER value:**

### 7.3.5 Convection Coupling *

*Sub-grid scale water distribution coupling with convection*

**Select MULTIPLE options:**

- ☐ Coupled with deep
- ☐ Coupled with shallow

☐ Not coupled with convection

## 7.4 Sub Grid Scale Ice Distribution

*Sub-grid scale ice distribution*

### 7.4.1 Overview

*Overview of sub-grid scale ice distribution in atmos model.*

**Enter TEXT:**

### 7.4.2 Type *

*Sub-grid scale ice distribution type*

**Select SINGLE option:**

☐ Prognostic

☐ Diagnostic

### 7.4.3 Function Name *

*Sub-grid scale ice distribution function name*

**Enter TEXT:**

### 7.4.4 Function Order *

*Sub-grid scale ice distribution function type*

**Enter INTEGER value:**

### 7.4.5 Convection Coupling *

*Sub-grid scale ice distribution coupling with convection*

**Select MULTIPLE options:**

☐ Coupled with deep

☐ Coupled with shallow

☐ Not coupled with convection

# 8 Observation Simulation

*Characteristics of observation simulation*

## 8.1 Observation Simulation

*Characteristics of observation simulation*

### 8.1.1 Name

*Commonly used name for the observation simulation in atmos model.*

**Enter TEXT:**

### 8.1.2 Overview

*Overview of characteristics of observation simulation in atmos model.*

**Enter TEXT:**

## 8.2 Isscp Attributes

*ISSCP Characteristics*

### 8.2.1 Overview

*Overview of isscp characteristics in atmos model.*

**Enter TEXT:**

### 8.2.2 Top Height Estimation Method

*Cloud simulator ISSCP top height estimation methodUo*

**Select MULTIPLE options:**

- ☐ No adjustment
- ☐ IR brightness
- ☐ Visible optical depth
- ☐ Other - please specify:

### 8.2.3 Top Height Direction

*Cloud simulator ISSCP top height direction*

**Select SINGLE option:**

- ☐ Lowest altitude level
- ☐ Highest altitude level
- ☐ Other - please specify:

## 8.3 Cosp Attributes

*CFMIP Observational Simulator Package attributes*

### 8.3.1 Overview

*Overview of cfmip observational simulator package attributes in atmos model.*

**Enter TEXT:**

### 8.3.2 Run Configuration

*Cloud simulator COSP run configuration*

**Select SINGLE option:**

☐ Inline

☐ Offline

☐ Other - please specify:

### 8.3.3 Number Of Grid Points

*Cloud simulator COSP number of grid points*

**Enter INTEGER value:**

### 8.3.4 Number Of Sub Columns

*Cloud simulator COSP number of sub-cloumns used to simulate sub-grid variability*

**Enter INTEGER value:**

### 8.3.5 Number Of Levels

*Cloud simulator COSP number of levels*

**Enter INTEGER value:**

## 8.4 Radar Inputs

*Characteristics of the cloud radar simulator*

### 8.4.1 Overview

*Overview of characteristics of the cloud radar simulator in atmos model.*

**Enter TEXT:**

### 8.4.2 Frequency

*Cloud simulator radar frequency (Hz)*

**Enter FLOAT value:**

### 8.4.3 Type

*Cloud simulator radar type*

**Select SINGLE option:**

- ☐ Surface
- ☐ Space borne
- ☐ Other - please specify:

### 8.4.4 Gas Absorption

*Cloud simulator radar uses gas absorption*

**Select either TRUE or FALSE:**

☐ True ☐ False

### 8.4.5 Effective Radius

*Cloud simulator radar uses effective radius*

**Select either TRUE or FALSE:**

☐ True ☐ False

## 8.5 Lidar Inputs

*Characteristics of the cloud lidar simulator*

### 8.5.1 Overview

*Overview of characteristics of the cloud lidar simulator in atmos model.*

**Enter TEXT:**

### 8.5.2 Ice Types

*Cloud simulator lidar ice type*

**Select SINGLE option:**

- ☐ Ice spheres
- ☐ Ice non-spherical
- ☐ Other - please specify:

### 8.5.3 Overlap

*Cloud simulator lidar overlap*

**Select MULTIPLE options:**

- ☐ Max
- ☐ Random
- ☐ Other - please specify:

# 9 Gravity Waves

*Characteristics of the parameterised gravity waves in the atmosphere, whether from orography or other sources*

## 9.1 Gravity Waves

*Characteristics of the parameterised gravity waves in the atmosphere, whether from orography or other sources*

### 9.1.1 Name

*Commonly used name for the gravity waves in atmos model.*

**Enter TEXT:**

### 9.1.2 Overview

*Overview of characteristics of the parameterised gravity waves in the atmosphere, whether from orography or other sources in atmos model.*

**Enter TEXT:**

### 9.1.3 Sponge Layer *

*Sponge layer in the upper levels in order to avoid gravity wave reflection at the top.*

**Select SINGLE option:**

- ☐ Rayleigh friction
- ☐ Diffusive sponge layer
- ☐ Other - please specify:

### 9.1.4 Background *

*Background wave distribution*

**Select SINGLE option:**

- ☐ Continuous spectrum
- ☐ Discrete spectrum
- ☐ Other - please specify:

### 9.1.5 Subgrid Scale Orography *

*Subgrid scale orography effects taken into account.*

**Select MULTIPLE options:**

- ☐ Effect on drag
- ☐ Effect on lifting

- ☐ Enhanced topography - To enhance the generation of long waves in the atmosphere
- ☐ Other - please specify:

## 9.2 Orographic Gravity Waves

*Gravity waves generated due to the presence of orography*

### 9.2.1 Overview

*Overview of gravity waves generated due to the presence of orography in atmos model.*

**Enter TEXT:**

### 9.2.2 Name

*Commonly used name for the orographic gravity wave scheme*

**Enter TEXT:**

### 9.2.3 Source Mechanisms *

*Orographic gravity wave source mechanisms*

**Select MULTIPLE options:**

- ☐ Linear mountain waves
- ☐ Hydraulic jump
- ☐ Envelope orography
- ☐ Low level flow blocking
- ☐ Statistical sub-grid scale variance
- ☐ Other - please specify:

### 9.2.4 Calculation Method *

*Orographic gravity wave calculation method*

**Select MULTIPLE options:**

- ☐ Non-linear calculation
- ☐ More than two cardinal directions
- ☐ Other - please specify:

### 9.2.5 Propagation Scheme *

*Orographic gravity wave propogation scheme*

**Select SINGLE option:**

- ☐ Linear theory

- ☐ Non-linear theory
- ☐ Includes boundary layer ducting
- ☐ Other - please specify:

### 9.2.6 Dissipation Scheme *

*Orographic gravity wave dissipation scheme*

**Select SINGLE option:**

- ☐ Total wave
- ☐ Single wave
- ☐ Spectral
- ☐ Linear
- ☐ Wave saturation vs Richardson number
- ☐ Other - please specify:

## 9.3 Non Orographic Gravity Waves

*Gravity waves generated by non-orographic processes.*

### 9.3.1 Overview

*Overview of gravity waves generated by non-orographic processes. in atmos model.*

**Enter TEXT:**

### 9.3.2 Name

*Commonly used name for the non-orographic gravity wave scheme*

**Enter TEXT:**

### 9.3.3 Source Mechanisms *

*Non-orographic gravity wave source mechanisms*

**Select MULTIPLE options:**

- ☐ Convection
- ☐ Precipitation
- ☐ Background spectrum
- ☐ Other - please specify:

### 9.3.4 Calculation Method *

*Non-orographic gravity wave calculation method*

**Select MULTIPLE options:**

- ☐ Spatially dependent
- ☐ Temporally dependent

### 9.3.5 Propagation Scheme *

*Non-orographic gravity wave propogation scheme*

**Select SINGLE option:**

- ☐ Linear theory
- ☐ Non-linear theory
- ☐ Other - please specify:

### 9.3.6 Dissipation Scheme *

*Non-orographic gravity wave dissipation scheme*

**Select SINGLE option:**

- ☐ Total wave
- ☐ Single wave
- ☐ Spectral
- ☐ Linear
- ☐ Wave saturation vs Richardson number
- ☐ Other - please specify:

# 10 Natural Forcing

*Natural forcing: solar and volcanic.*

## 10.1 Natural Forcing

*Natural forcing: solar and volcanic.*

### 10.1.1 Name

*Commonly used name for the natural forcing in atmos model.*

**Enter TEXT:**

### 10.1.2 Overview

*Overview of natural forcing: solar and volcanic. in atmos model.*

**Enter TEXT:**

## 10.2 Solar Pathways

*Pathways for solar forcing of the atmosphere*

### 10.2.1 Overview

*Overview of pathways for solar forcing of the atmosphere in atmos model.*

**Enter TEXT:**

### 10.2.2 Pathways *

*Pathways for the solar forcing of the atmosphere model domain*

**Select MULTIPLE options:**

☐ SW radiation - Shortwave solar spectral irradiance.

☐ Precipitating energetic particles - Precipitating energetic particles from the sun (predominantly protons) and the magnetosphere (predominantly electrons) affect the ionization levels in the polar middle and upper atmosphere, leading to significant changes of the chemical composition

☐ Cosmic rays - Cosmic rays are the main source of ionization in the troposphere and lower stratosphere.

☐ Other - please specify:

## 10.3 Solar Constant

*Solar constant and top of atmosphere insolation characteristics*

### 10.3.1 Overview

*Overview of solar constant and top of atmosphere insolation characteristics in atmos model.*

**Enter TEXT:**

### 10.3.2 Type *

*Time adaptation of the solar constant.*

**Select SINGLE option:**

☐ Fixed

☐ Transient

### 10.3.3 Fixed Value

*If the solar constant is fixed, enter the value of the solar constant (W m-2).*

**Enter FLOAT value:**

### 10.3.4 Transient Characteristics

*Solar constant transient characteristics (W m-2)*

**Enter TEXT:**

## 10.4 Orbital Parameters

*Orbital parameters and top of atmosphere insolation characteristics*

### 10.4.1 Overview

*Overview of orbital parameters and top of atmosphere insolation characteristics in atmos model.*

**Enter TEXT:**

### 10.4.2 Type *

*Type of orbital parameter*

**Select SINGLE option:**

☐ Fixed

☐ Transient

### 10.4.3 Fixed Reference Date

*Reference date for fixed orbital parameters (yyyy)*

**Enter INTEGER value:**

### 10.4.4 Transient Method

*Description of transient orbital parameters*

**Enter TEXT:**

### 10.4.5 Computation Method

*Method used for computing orbital parameters.*

**Select SINGLE option:**

☐ Berger 1978

☐ Laskar 2004

☐ Other - please specify:

## 10.5 Insolation Ozone

*Impact of solar insolation on stratospheric ozone*

### 10.5.1 Overview

*Overview of impact of solar insolation on stratospheric ozone in atmos model.*

**Enter TEXT:**

### 10.5.2 Solar Ozone Impact *

*Does top of atmosphere insolation impact on stratospheric ozone?*

**Select either TRUE or FALSE:**

☐ True ☐ False

## 10.6 Volcanoes Treatment

*Characteristics and treatment of volcanic forcing in the atmosphere*

### 10.6.1 Overview

*Overview of characteristics and treatment of volcanic forcing in the atmosphere in atmos model.*

**Enter TEXT:**

### 10.6.2 Volcanoes Characteristics *

*Description of how the volcanic forcing is taken into account in the atmosphere.*

**Enter TEXT:**

### 10.6.3 Volcanoes Implementation *

*How volcanic effects are modeled in the atmosphere.*

**Select SINGLE option:**

☐ High frequency solar constant anomaly

☐ Stratospheric aerosols optical thickness

☐ Other - please specify: