CMIP6 Model Documentation

Institute:	UA
Model:	MCM-UA-1-0
Topic:	Top Level
Doc. Generated:	2020-04-08
Doc. Seeded From:	Spreadsheet
Specialization Version:	1.1.1
Further Info:	https://es-doc.org/cmip6
Note:	* indicates a required property

Documentation Contents

1 Key Properties

Key properties of the model

1.1.1 Top level properties

Key properties of the model

1.1.1.1 Name *

Name of coupled model

MCM_UA

1.1.1.2 Keywords *

Keywords associated with coupled model

AOGCM

1.1.1.3 Overview *

Top level overview of coupled model

R30 spectral atmosphere coupled to MOM1 ocean using simple Manabe land model and simple Bryan sea ice model.

1.2.1 Flux Correction

Flux correction properties of the model

1.2.1.1 Details *

Describe if/how flux corrections are applied in the model

Flux adjustments are used. The fluxes are not corrected in any way. The flux adjustments are intended to keep SST and SSS realistic. The flux adjustments are computed in 2 steps. First and atmosphere-only model is run to equilibrium (about 20 years). The surface fluxes are archived (monthly averages). Step 2 the fluxes from step 1 are input to an ocean only model which is also run to equilibrium (about 4000 model years). The SST and SSS in the ocean model are restored towards observations using a Haney type restoring. The time averages of the restoring terms at equilibrium are the flux adjustments used in the AOGCM.

1.3.1 Genealogy

Genealogy and history of the model

1.3.1.1 Year Released *

Year the model was released

1995

1.3.1.2 CMIP3 Parent

CMIP3 parent if any

None

1.3.1.3 CMIP5 Parent

CMIP5 parent if any

None

1.3.1.4 CMIP5 Differences

Briefly summarize the differences between this model and its CMIP5 parent, if applicable

Not applicable

1.3.1.5 Previous Name

Previously known as

GFDL climate model

1.4.1 Software Properties

Software properties of model

1.4.1.1 Repository

Location of code for this component.

Github

1.4.1.2 Code Version

Code version identifier.

1

1.4.1.3 Code Languages

Code language(s).

FORTRAN 77

1.4.1.4 Components Structure

Describe how model realms are structured into independent software components (coupled via a coupler) and internal software components.

Atmosphere-land coupled to ocean-sea ice model. The coupler conserves heat and water written by Stouffer in 1985.

1.4.1.5 Coupler

Overarching coupling framework for model.

- ☐ OASIS - The OASIS coupler - prior to OASIS-MCT
- ☐ OASIS3-MCT - The MCT variant of the OASIS coupler
- ☐ ESMF - Vanilla Earth System Modelling Framework
- ☐ NUOPC - National Unified Operational Prediction Capability variant of ESMF
- ☐ Bespoke - Customised coupler developed for this model

☐ Unknown - It is not known what/if-a coupler is used

☐ None - No coupler is used

☐ Other - please specify:

1.5.1 Coupling

1.5.1.1 Atmosphere Double Flux *

Is the atmosphere passing a double flux to the ocean and sea ice (as opposed to a single one)?

☐ True ☒ False

1.5.1.2 Atmosphere Fluxes Calculation Grid

Where are the air-sea fluxes calculated

☒ Atmosphere grid

☐ Ocean grid

☐ Specific coupler grid

☐ Other - please specify:

1.5.1.3 Atmosphere Relative Winds *

Are relative or absolute winds used to compute the flux? I.e. do ocean surface currents enter the wind stress calculation?

☐ True ☒ False

1.6.1 Tuning Applied

Tuning methodology for model

1.6.1.1 Description *

General overview description of tuning: explain and motivate the main targets and metrics/diagnostics retained. Document the relative weight given to climate performance metrics/diagnostics versus process oriented metrics/diagnostics, 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.

None. Flux adjustments used.

1.6.1.2 Global Mean Metrics Used

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

None

1.6.1.3 Regional Metrics Used

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

None

1.6.1.4 Trend Metrics Used

List observed trend metrics/diagnostics used in tuning model/component (such as 20th century)

Enter COMMA SEPARATED list:

1.6.1.5 Energy Balance *

Describe how energy balance was obtained in the full system: in the various components independently or at the components coupling stage?

Flux adjustments

1.6.1.6 Fresh Water Balance *

Describe how fresh_water balance was obtained in the full system: in the various components independently or at the components coupling stage?

Atmosphere - ocean components conserve as does the coupler.

1.6.2 Heat

Global heat convervation properties of the model

1.6.2.1 Global *

Describe if/how heat is conserved globally

Atmosphere - ocean components conserve as does the coupler. The coupler does no interpolations. Two ocean-sea ice grid boxes (east-west) lie underneath 1 atmosphere-land grid box - exactly. Fluxes into ocean-sea ice are split into two and passed to each ocean box. SST is averaged and passed up to atmosphere box.

1.6.2.2 Atmos Ocean Interface

Describe if/how heat is conserved at the atmosphere/ocean coupling interface

Two ocean grid boxes underly each atmosphere grid box. Land-sea boundary set by atmosphere grid. Atmosphere flux from each grid atm grid box is passed to both ocean-sea ice boxes underlying it.

1.6.2.3 Atmos Land Interface *

Describe if/how heat is conserved at the atmosphere/land coupling interface

Land has no heat capacity.

1.6.2.4 Atmos Sea-ice Interface

Describe if/how heat is conserved at the atmosphere/sea-ice coupling interface

Two ocean grid boxes underly each atmosphere grid box. Land-sea boundary set by atmosphere grid. Atmosphere flux from each grid atm grid box is passed to both ocean-sea ice boxes underlying it. Sea ice thickness is averaged and passed up to atmosphere box.

1.6.2.5 Ocean Seaice Interface

Describe if/how heat is conserved at the ocean/sea-ice coupling interface

Freezing is set to -2C. If ocean temperature drops below -2C, sea ice is formed. No sensible heat storage in sea ice. They are on same grid exactly. No conservation issue.

1.6.2.6 Land Ocean Interface

Describe if/how heat is conserved at the land/ocean coupling interface

No heat is exchanged between the land and ocean. Just water which has no temperature.

1.6.3 Fresh Water

Global fresh water convervation properties of the model

1.6.3.1 Global *

Describe if/how fresh_water is conserved globally

Two ocean grid boxes underly each atmosphere grid box. Land-sea boundary set by atmosphere grid. Atmosphere flux from each atmosphere grid box is passed to both ocean-sea ice boxes underlying it.

1.6.3.2 Atmos Ocean Interface

Describe if/how fresh_water is conserved at the atmosphere/ocean coupling interface

Two ocean grid boxes underly each atmosphere grid box. Land-sea boundary set by atmosphere grid. Atmosphere flux from each grid atm grid box is passed to both ocean-sea ice boxes underlying it.

1.6.3.3 Atmos Land Interface *

Describe if/how fresh water is conserved at the atmosphere/land coupling interface

Manabe bucket model is used (Manabe 1969). Runoff is routed to ocean via a realistic river network. Land and atmosphere use same grid exactly.

1.6.3.4 Atmos Sea-ice Interface

Describe if/how fresh water is conserved at the atmosphere/sea-ice coupling interface

All frozen water is added to sea ice thickness. See above.

1.6.3.5 Ocean Seaice Interface

Describe if/how fresh water is conserved at the ocean/sea-ice coupling interface

Freezing/melt is taken from/added to SSS. See above.

1.6.3.6 Runoff

Describe how runoff is distributed and conserved

Manabe bucket model.

1.6.3.7 Iceberg Calving

Describe if/how iceberg calving is modeled and conserved

Snow depth is not allowed to exceed 20 cm water equivalent. Any snow depth greater than 20 cm is sent to ocean as a frozen water flux using the river network.

1.6.3.8 Endoreic Basins

Describe if/how endoreic basins (no ocean access) are treated

None

1.6.3.9 Snow Accumulation

Describe how snow accumulation over land and over sea-ice is treated

Snowfall is added to snow depth. If surface temperature exceeds 0C, snow melts. No snow on sea ice.

1.6.4 Salt

Global salt convervation properties of the model

1.6.4.1 Ocean Seaice Interface

Describe if/how salt is conserved at the ocean/sea-ice coupling interface

Two ocean grid boxes underly each atmosphere grid box. Land-sea boundary set by atmosphere grid. Atmosphere flux from each grid atm grid box is passed to both ocean-sea ice boxes underlying it. Virtual salt flux formulation.

1.6.5 Momentum

Global momentum convervation properties of the model

1.6.5.1 Details

Describe if/how momentum is conserved in the model

Enter TEXT:

2 Radiative Forcings

Radiative forcings of the model for historical and scenario (aka Table 12.1 IPCC AR5)

2.1.1 Top level properties

Radiative forcings of the model for historical and scenario (aka Table 12.1 IPCC AR5)

2.1.1.1 Name

Commonly used name for the radiative forcings in toplevel model.

CMIP6

2.1.1.2 Overview

Overview of radiative forcings of the model for historical and scenario (aka table 12.1 ipcc ar5) in toplevel model.

Equivalent CO2 used to represent radiative forcing of GHG except water vapor. Two time period aerosol concentration distributions specified (1985 and 2050). Also given is the total globally averaged aerosol optical depth. To find any given year, the ratio of the global averages and weighting in time fo the map time periods was performed. To convert the interpolated aerosol value into a forcing, the surface albedos were modified using the Haywood et al. method. Volcanoes were represented as a change in the solar constant. Solar changes also changed the solar constant.

2.1.2 CO2

Carbon dioxide forcing

2.1.2.1 Provision *

How this forcing agent is provided (e.g. via concentrations, emission precursors, prognostically derived, etc.)

☐ N/A - Not applicable - forcing agent is not included

☐ M - Emissions and concentrations determined by the model state rather than externally prescribed

☐ Y - Prescribed concentrations, distributions or time series data

☐ E - Concentrations calculated interactively driven by prescribed emissions or precursor emissions

☐ ES - Surface emissions (and 3-D concentrations away from the surface) derived via the model from the prescribed surface concentration

☐ C - Fixed prescribed climatology of concentrations with no year-to-year variability

☐ Other - please specify:

2.1.2.2 Additional Information

Additional information relating to the provision and implementation of this forcing agent (e.g. citations, use of non-standard datasets, explaining how multiple provisions are used, etc.).

Equivalent CO2 used.

2.1.3 CH4

Methane forcing

2.1.3.1 Provision *

How this forcing agent is provided (e.g. via concentrations, emission precursors, prognostically derived, etc.)

- ☐ N/A - Not applicable - forcing agent is not included
- ☐ M - Emissions and concentrations determined by the model state rather than externally prescribed
- ☐ Y - Prescribed concentrations, distributions or time series data
- ☐ E - Concentrations calculated interactively driven by prescribed emissions or precursor emissions
- ☐ ES - Surface emissions (and 3-D concentrations away from the surface) derived via the model from the prescribed surface concentration
- ☐ C - Fixed prescribed climatology of concentrations with no year-to-year variability
- ☐ Other - please specify:

2.1.3.2 Additional Information

Additional information relating to the provision and implementation of this forcing agent (e.g. citations, use of non-standard datasets, explaining how multiple provisions are used, etc.).

Equivalent CO2 used.

2.1.4 N2O

Nitrous oxide forcing

2.1.4.1 Provision *

How this forcing agent is provided (e.g. via concentrations, emission precursors, prognostically derived, etc.)

- ☐ N/A - Not applicable - forcing agent is not included
- ☐ M - Emissions and concentrations determined by the model state rather than externally prescribed
- ☐ Y - Prescribed concentrations, distributions or time series data
- ☐ E - Concentrations calculated interactively driven by prescribed emissions or precursor emissions
- ☐ ES - Surface emissions (and 3-D concentrations away from the surface) derived via the model from the prescribed surface concentration
- ☐ C - Fixed prescribed climatology of concentrations with no year-to-year variability
- ☐ Other - please specify:

2.1.4.2 Additional Information

Additional information relating to the provision and implementation of this forcing agent (e.g. citations, use of non-standard datasets, explaining how multiple provisions are used, etc.).

Equivalent CO2 used.

2.1.5 Tropospheric O3

Troposheric ozone forcing

2.1.5.1 Provision *

How this forcing agent is provided (e.g. via concentrations, emission precursors, prognostically derived, etc.)

- ☐ N/A - Not applicable - forcing agent is not included
- ☐ M - Emissions and concentrations determined by the model state rather than externally prescribed
- ☐ Y - Prescribed concentrations, distributions or time series data
- ☐ E - Concentrations calculated interactively driven by prescribed emissions or precursor emissions
- ☐ ES - Surface emissions (and 3-D concentrations away from the surface) derived via the model from the prescribed surface concentration
- ☐ C - Fixed prescribed climatology of concentrations with no year-to-year variability
- ☐ Other - please specify:

2.1.5.2 Additional Information

Additional information relating to the provision and implementation of this forcing agent (e.g. citations, use of non-standard datasets, explaining how multiple provisions are used, etc.).

Equivalent CO2 used.

2.1.6 Stratospheric O3

Stratospheric ozone forcing

2.1.6.1 Provision *

How this forcing agent is provided (e.g. via concentrations, emission precursors, prognostically derived, etc.)

- ☐ N/A - Not applicable - forcing agent is not included
- ☐ M - Emissions and concentrations determined by the model state rather than externally prescribed
- ☐ Y - Prescribed concentrations, distributions or time series data
- ☐ E - Concentrations calculated interactively driven by prescribed emissions or precursor emissions
- ☐ ES - Surface emissions (and 3-D concentrations away from the surface) derived via the model from the prescribed surface concentration
- ☐ C - Fixed prescribed climatology of concentrations with no year-to-year variability
- ☐ Other - please specify:

2.1.6.2 Additional Information

Additional information relating to the provision and implementation of this forcing agent (e.g. citations, use of non-standard datasets, explaining how multiple provisions are used, etc.).

Equivalent CO2 used.

2.1.7 CFC

Ozone-depleting and non-ozone-depleting fluorinated gases forcing

2.1.7.1 Provision *

How this forcing agent is provided (e.g. via concentrations, emission precursors, prognostically derived, etc.)

☐ N/A - Not applicable - forcing agent is not included

☐ M - Emissions and concentrations determined by the model state rather than externally prescribed

☐ Y - Prescribed concentrations, distributions or time series data

☐ E - Concentrations calculated interactively driven by prescribed emissions or precursor emissions

☐ ES - Surface emissions (and 3-D concentrations away from the surface) derived via the model from the prescribed surface concentration

☐ C - Fixed prescribed climatology of concentrations with no year-to-year variability

☐ Other - please specify:

2.1.7.2 Equivalence Concentration *

Details of any equivalence concentrations used

Select SINGLE option:

☐ N/A - Not applicabale (CFCs not included or emissions and concentrations determined by the model state)

☐ Option 1 - CFCs, including CFC-12, are provided as actual concentrations

☐ Option 2 - CFC-12 is provided as actual concentrations and any other gases are provided as an equivalence concentration of CFC-11

☐ Option 3 - Ozone depleting gases, including CFC-12, are provided as an equivalence concentration of CFC-12 and all other fluorinated gases are provided as an equivalence concentration of HFC-134a

☐ Other - please specify:

2.1.7.3 Additional Information

Additional information relating to the provision and implementation of this forcing agent (e.g. citations, use of non-standard datasets, explaining how multiple provisions are used, etc.).

Enter TEXT:

2.1.8 SO4

SO4 aerosol forcing

2.1.8.1 Provision *

How this forcing agent is provided (e.g. via concentrations, emission precursors, prognostically derived, etc.)

☐ N/A - Not applicable - forcing agent is not included

☐ M - Emissions and concentrations determined by the model state rather than externally prescribed

☐ Y - Prescribed concentrations, distributions or time series data

☐ E - Concentrations calculated interactively driven by prescribed emissions or precursor emissions

☐ ES - Surface emissions (and 3-D concentrations away from the surface) derived via the model from the prescribed surface concentration

☐ C - Fixed prescribed climatology of concentrations with no year-to-year variability

☐ Other - please specify:

2.1.8.2 Additional Information

Additional information relating to the provision and implementation of this forcing agent (e.g. citations, use of non-standard datasets, explaining how multiple provisions are used, etc.).

Haywood et al. 1997

2.1.9 Black Carbon

Black carbon aerosol forcing

2.1.9.1 Provision *

How this forcing agent is provided (e.g. via concentrations, emission precursors, prognostically derived, etc.)

☐ N/A - Not applicable - forcing agent is not included

☐ M - Emissions and concentrations determined by the model state rather than externally prescribed

☐ Y - Prescribed concentrations, distributions or time series data

☐ E - Concentrations calculated interactively driven by prescribed emissions or precursor emissions

☐ ES - Surface emissions (and 3-D concentrations away from the surface) derived via the model from the prescribed surface concentration

☐ C - Fixed prescribed climatology of concentrations with no year-to-year variability

☐ Other - please specify:

2.1.9.2 Additional Information

Additional information relating to the provision and implementation of this forcing agent (e.g. citations, use of non-standard datasets, explaining how multiple provisions are used, etc.).

Enter TEXT:

2.1.10 Organic Carbon

Organic carbon aerosol forcing

2.1.10.1 Provision *

How this forcing agent is provided (e.g. via concentrations, emission precursors, prognostically derived, etc.)

☐ N/A - Not applicable - forcing agent is not included

☐ M - Emissions and concentrations determined by the model state rather than externally prescribed

☐ Y - Prescribed concentrations, distributions or time series data

☐ E - Concentrations calculated interactively driven by prescribed emissions or precursor emissions

☐ ES - Surface emissions (and 3-D concentrations away from the surface) derived via the model from the prescribed surface concentration

☐ C - Fixed prescribed climatology of concentrations with no year-to-year variability

☐ Other - please specify:

2.1.10.2 Additional Information

Additional information relating to the provision and implementation of this forcing agent (e.g. citations, use of non-standard datasets, explaining how multiple provisions are used, etc.).

Enter TEXT:

2.1.11 Nitrate

Nitrate forcing

2.1.11.1 Provision *

How this forcing agent is provided (e.g. via concentrations, emission precursors, prognostically derived, etc.)

☐ N/A - Not applicable - forcing agent is not included

☐ M - Emissions and concentrations determined by the model state rather than externally prescribed

☐ Y - Prescribed concentrations, distributions or time series data

☐ E - Concentrations calculated interactively driven by prescribed emissions or precursor emissions

☐ ES - Surface emissions (and 3-D concentrations away from the surface) derived via the model from the prescribed surface concentration

☐ C - Fixed prescribed climatology of concentrations with no year-to-year variability

☐ Other - please specify:

2.1.11.2 Additional Information

Additional information relating to the provision and implementation of this forcing agent (e.g. citations, use of non-standard datasets, explaining how multiple provisions are used, etc.).

Enter TEXT:

2.1.12 Cloud Albedo Effect

Cloud albedo effect forcing (RFaci)

2.1.12.1 Provision *

How this forcing agent is provided (e.g. via concentrations, emission precursors, prognostically derived, etc.)

☐ N/A - Not applicable - forcing agent is not included

☐ M - Emissions and concentrations determined by the model state rather than externally prescribed

☐ Y - Prescribed concentrations, distributions or time series data

☐ E - Concentrations calculated interactively driven by prescribed emissions or precursor emissions

☐ ES - Surface emissions (and 3-D concentrations away from the surface) derived via the model from the prescribed surface concentration

☐ C - Fixed prescribed climatology of concentrations with no year-to-year variability

☐ Other - please specify:

2.1.12.2 Aerosol Effect On Ice Clouds *

Radiative effects of aerosols on ice clouds are represented?

☐ True ☒ False

2.1.12.3 Additional Information

Additional information relating to the provision and implementation of this forcing agent (e.g. citations, use of non-standard datasets, explaining how multiple provisions are used, etc.).

Enter TEXT:

2.1.13 Cloud Lifetime Effect

Cloud lifetime effect forcing (ERFaci)

2.1.13.1 Provision *

How this forcing agent is provided (e.g. via concentrations, emission precursors, prognostically derived, etc.)

☐ N/A - Not applicable - forcing agent is not included

☐ M - Emissions and concentrations determined by the model state rather than externally prescribed

☐ Y - Prescribed concentrations, distributions or time series data

☐ E - Concentrations calculated interactively driven by prescribed emissions or precursor emissions

☐ ES - Surface emissions (and 3-D concentrations away from the surface) derived via the model from the prescribed surface concentration

☐ C - Fixed prescribed climatology of concentrations with no year-to-year variability

☐ Other - please specify:

2.1.13.2 Aerosol Effect On Ice Clouds *

Radiative effects of aerosols on ice clouds are represented?

☐ True ☒ False

2.1.13.3 RFaci From Sulfate Only *

Radiative forcing from aerosol cloud interactions from sulfate aerosol only?

☐ True ☒ False

2.1.13.4 Additional Information

Additional information relating to the provision and implementation of this forcing agent (e.g. citations, use of non-standard datasets, explaining how multiple provisions are used, etc.).

Enter TEXT:

2.1.14 Dust

Dust forcing

2.1.14.1 Provision *

How this forcing agent is provided (e.g. via concentrations, emission precursors, prognostically derived, etc.)

☐ N/A - Not applicable - forcing agent is not included

☐ M - Emissions and concentrations determined by the model state rather than externally prescribed

☐ Y - Prescribed concentrations, distributions or time series data

☐ E - Concentrations calculated interactively driven by prescribed emissions or precursor emissions

☐ ES - Surface emissions (and 3-D concentrations away from the surface) derived via the model from the prescribed surface concentration

☐ C - Fixed prescribed climatology of concentrations with no year-to-year variability

☐ Other - please specify:

2.1.14.2 Additional Information

Additional information relating to the provision and implementation of this forcing agent (e.g. citations, use of non-standard datasets, explaining how multiple provisions are used, etc.).

Enter TEXT:

2.1.15 Tropospheric Volcanic

Tropospheric volcanic forcing

2.1.15.1 Provision *

How this forcing agent is provided (e.g. via concentrations, emission precursors, prognostically derived, etc.)

☐ N/A - Not applicable - forcing agent is not included

☐ M - Emissions and concentrations determined by the model state rather than externally prescribed

☐ Y - Prescribed concentrations, distributions or time series data

☐ E - Concentrations calculated interactively driven by prescribed emissions or precursor emissions

☐ ES - Surface emissions (and 3-D concentrations away from the surface) derived via the model from the prescribed surface concentration

☐ C - Fixed prescribed climatology of concentrations with no year-to-year variability

☐ Other - please specify:

2.1.15.2 Historical Explosive Volcanic Aerosol Implementation *

How explosive volcanic aerosol is implemented in historical simulations

Select SINGLE option:

☐ Type A - Explosive volcanic aerosol returns rapidly to zero (or near-zero) background.

☐ Type B - Explosive volcanic aerosol returns rapidly to constant (average volcano)

☐ Type C - Explosive volcanic aerosol returns slowly (over several decades) to constant (average volcano) background.

☐ Type D - Explosive volcanic aerosol set to zero

☐ Type E - Explosive volcanic aerosol set to constant (average volcano) background

☐ Other - please specify:

2.1.15.3 Future Explosive Volcanic Aerosol Implementation *

How explosive volcanic aerosol is implemented in future simulations

☐ Type A - Explosive volcanic aerosol returns rapidly to zero (or near-zero) background.

☐ Type B - Explosive volcanic aerosol returns rapidly to constant (average volcano)

☐ Type C - Explosive volcanic aerosol returns slowly (over several decades) to constant (average volcano) background.

☐ Type D - Explosive volcanic aerosol set to zero

☐ Type E - Explosive volcanic aerosol set to constant (average volcano) background

☐ Other - please specify:

2.1.15.4 Additional Information

Additional information relating to the provision and implementation of this forcing agent (e.g. citations, use of non-standard datasets, explaining how multiple provisions are used, etc.).

Enter TEXT:

2.1.16 Stratospheric Volcanic

Stratospheric volcanic forcing

2.1.16.1 Provision *

How this forcing agent is provided (e.g. via concentrations, emission precursors, prognostically derived, etc.)

☐ N/A - Not applicable - forcing agent is not included

☐ M - Emissions and concentrations determined by the model state rather than externally prescribed

☐ Y - Prescribed concentrations, distributions or time series data

☐ E - Concentrations calculated interactively driven by prescribed emissions or precursor emissions

☐ ES - Surface emissions (and 3-D concentrations away from the surface) derived via the model from the prescribed surface concentration

☐ C - Fixed prescribed climatology of concentrations with no year-to-year variability

☐ Other - please specify:

2.1.16.2 Historical Explosive Volcanic Aerosol Implementation *

How explosive volcanic aerosol is implemented in historical simulations

Select SINGLE option:

☐ Type A - Explosive volcanic aerosol returns rapidly to zero (or near-zero) background.

☐ Type B - Explosive volcanic aerosol returns rapidly to constant (average volcano)

☐ Type C - Explosive volcanic aerosol returns slowly (over several decades) to constant (average volcano) background.

☐ Type D - Explosive volcanic aerosol set to zero

☐ Type E - Explosive volcanic aerosol set to constant (average volcano) background

☐ Other - please specify:

2.1.16.3 Future Explosive Volcanic Aerosol Implementation *

How explosive volcanic aerosol is implemented in future simulations

☐ Type A - Explosive volcanic aerosol returns rapidly to zero (or near-zero) background.

☐ Type B - Explosive volcanic aerosol returns rapidly to constant (average volcano)

☐ Type C - Explosive volcanic aerosol returns slowly (over several decades) to constant (average volcano) background.

☐ Type D - Explosive volcanic aerosol set to zero

☐ Type E - Explosive volcanic aerosol set to constant (average volcano) background

☐ Other - please specify:

2.1.16.4 Additional Information

Additional information relating to the provision and implementation of this forcing agent (e.g. citations, use of non-standard datasets, explaining how multiple provisions are used, etc.).

Enter TEXT:

2.1.17 Sea Salt

Sea salt forcing

2.1.17.1 Provision *

How this forcing agent is provided (e.g. via concentrations, emission precursors, prognostically derived, etc.)

☐ N/A - Not applicable - forcing agent is not included

☐ M - Emissions and concentrations determined by the model state rather than externally prescribed

☐ Y - Prescribed concentrations, distributions or time series data

☐ E - Concentrations calculated interactively driven by prescribed emissions or precursor emissions

☐ ES - Surface emissions (and 3-D concentrations away from the surface) derived via the model from the prescribed surface concentration

☐ C - Fixed prescribed climatology of concentrations with no year-to-year variability

☐ Other - please specify:

2.1.17.2 Additional Information

Additional information relating to the provision and implementation of this forcing agent (e.g. citations, use of non-standard datasets, explaining how multiple provisions are used, etc.).

Enter TEXT:

2.1.18 Land Use

Land use forcing

2.1.18.1 Provision *

How this forcing agent is provided (e.g. via concentrations, emission precursors, prognostically derived, etc.)

☐ N/A - Not applicable - forcing agent is not included

☐ M - Emissions and concentrations determined by the model state rather than externally prescribed

☐ Y - Prescribed concentrations, distributions or time series data

☐ E - Concentrations calculated interactively driven by prescribed emissions or precursor emissions

☐ ES - Surface emissions (and 3-D concentrations away from the surface) derived via the model from the prescribed surface concentration

☐ C - Fixed prescribed climatology of concentrations with no year-to-year variability

☐ Other - please specify:

2.1.18.2 Crop Change Only *

Land use change represented via crop change only?

☐ True ☒ False

2.1.18.3 Additional Information

Additional information relating to the provision and implementation of this forcing agent (e.g. citations, use of non-standard datasets, explaining how multiple provisions are used, etc.).

Enter TEXT:

2.1.19 Solar

Solar forcing

2.1.19.1 Provision *

How solar forcing is provided

☐ N/A - Not applicable - solar forcing is not included

☐ Irradiance - Solar irradiance forcing

☐ Proton - Proton pathway to solar forcing

☐ Electron - Electron pathway to solar forcing

☐ Cosmic ray - Cosmic ray pathway to solar forcing

☐ Other - please specify:

2.1.19.2 Additional Information

Additional information relating to the provision and implementation of this forcing agent (e.g. citations, use of non-standard datasets, explaining how multiple provisions are used, etc.).

Enter TEXT: