Feedback from CMIP6 Model Groups on Forcings

SLIDES kindly provided by the CMIP6 Model Groups – THANKS!

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1-2 November 2016

WGCM-20

University of Princeton, USA

CMIP
The World Climate Research Programme's Coupled Model Intercomparison Project

DLR

CMIP6: Participating Model Groups

Input on Forcing Questionnaire Received / Not Received

1	ACCESS-ESM	Australia	13	EC-Earth3	Europe	24	MIROC-CGCM	Japan
2	AWI-CM	Germany	14	EMAC	Germany	25	MIROC-ESM	Japan
3	BCC	China	15	FGOALS	China	26	MPI-ESM	Germany
4	BESM	Brazil	16	FIO	China	27	MRI-ESM2	Japan
5	BNU	China	17	GFDL	USA	28	MRI-AGCM3	Japan
6	CAMS-CMS	China	18	GISS	USA	29	NICAM	Japan
7	CanESM	Canada	19	IITM-ESM	India	30	NorESM	Norway
8	CasESM	China	20	HadGEM3	UK	31	NUIST	China
9	CESM2	USA	21	INM	Russia	32	TaiESM	Taiwan
10	CESS-THU	China	22	IPSL -CM6	France	33	UKESM	UK
11	CMCC	Italy	23	K-ACE	Republic of Korea	34	VRESM	South Africa / Australia
12	CNRM	France						

New in CMIP:

2 new model groups from Germany (AWI-CM, EMAC)
4 new model groups from China (CAMS-CMS, CasESM, CESS-THU, NUIST)
1 new model group from Brazil (BESM)
1 new model group from India (IITM)
1 new model group from Taiwan (TaiESM)
1 new model group from Republic of Korea (K-ACE)
1 new model group from South Africa / Australia (VRESM)
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=> 11 new model groups

CMIP
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1. Model Name: ACCESS-ESM2; Institution: CSIRO-ARCCSS-BoM; Country: Australia

Forcing Dataset	Will be used (YES/NO)	Pre-industrial	Historical
SLCF Emissions	YES	Preliminary	Preliminary
Biomass Burning	YES	Preliminary	Preliminary
GHG Emissions	YES	Preliminary	Preliminary
Land-use	YES	Preliminary	Preliminary
GHG concentrations	YES	Preliminary	Preliminary
Ozone concentrations	YES	Preliminary	Preliminary
Nitrogen deposition	YES	Preliminary	Preliminary
Simple plume aerosol	NO	Using online aerosols so	don‘t need simple plume aerosol
Solar	YES	Preliminary	Preliminary
Stratospheric aerosol	YES	Preliminary	Preliminary
AMIP SST and SIC	YES	Preliminary	Preliminary

KEY: OK | Testing | Preliminary | Unknown

See CMIP Panel website at https://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6 for details

3. Model Name: BCC-ESM1-LR, BCC-CSM2-MR, BCC-CSM2-HR; Institution: Beijing Climate Center; Country: China

Forcing Dataset	Will be used (YES/NO)	Pre-industrial	Historical
SLCF Emissions	YES	Testing	Preliminary
Biomass Burning	YES	Testing	Preliminary
GHG Emissions	YES	Testing	Preliminary
Land-use	YES	Testing	Preliminary
GHG concentrations	YES	OK	OK
Ozone concentrations	YES	OK	OK
Nitrogen deposition	NO		
Simple plume aerosol	YES	OK	OK
Solar	YES	OK	OK
Stratospheric aerosol	YES	OK	OK
AMIP SST and SIC	YES	OK	OK

KEY: OK | Testing | Preliminary | Unknown

See CMIP Panel website at https://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6 for details

9. Model Name: CESM2; Institution: NCAR; Country: USA

Forcing Dataset	Will be used (YES/NO)	Pre-industrial	Historical
SLCF Emissions	YES		
GHG Emissions	NO (except for C4MIP runs)		
Land-use	YES		
GHG concentrations	YES		
Ozone concentrations	NO		
Nitrogen deposition	NO		
Simple plume aerosol	NO		
Solar	YES		
Stratospheric aerosol	NO		
AMIP SST and SIC	YES		

KEY: OK | Testing | Preliminary | Unknown

See CMIP Panel website at https://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6 for details

Please insert any additional feedback on the forcings or other comments for WGCM here

- Ozone/nitrogen deposition/stratospheric aerosols will come from CESM2-WACCM simulations (which will also be provided to CMIP6, including DECK simulations).
- Volcanic aerosols are going to be simulated from emissions.
- We are focusing on the PI at this point and have not done any historical simulations with CMIP6 forcings.
- We are in the process of bringing the CMIP6 emissions/GHG concentrations. We have been using the solar recommendation.

11. Model Name: CMCC-CM2-HR4; Institution: CMCC; Country: Italy

Forcing Dataset	Will be used (YES/NO)	Pre-industrial	Historical
SLCF Emissions	yes	unknown	unknown
Biomass Burning	no	-	-
GHG Emissions	no	-	-
Land-use	yes	unknown	unknown
GHG concentrations	yes	ok	preliminary
Ozone concentrations	yes	ok	preliminary
Nitrogen deposition	no	-	-
Simple plume aerosol	yes	testing	testing
Solar	yes	ok	preliminary
Stratospheric aerosol	no	-	-
AMIP SST and SIC	yes	testing	testing

KEY: OK | Testing | Preliminary | Unknown

See CMIP Panel website at https://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6 for details

11. Model Name: CMCC-CM2-HR5; Institution: CMCC; Country: Italy

Forcing Dataset	Will be used (YES/NO)	Pre-industrial	Historical
SLCF Emissions	yes	unknown	unknown
Biomass Burning	no	-	-
GHG Emissions	no	-	-
Land-use	yes	unknown	unknown
GHG concentrations	yes	ok	preliminary
Ozone concentrations	yes	ok	preliminary
Nitrogen deposition	no	-	-
Simple plume aerosol	no	-	-
Solar	yes	Ok	preliminary
Stratospheric aerosol	no	-	-
AMIP SST and SIC	yes	testing	testing

KEY: OK | Testing | Preliminary | Unknown

See CMIP Panel website at https://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6 for details

11. Model Name: CMCC-CM2-SR5; Institution: CMCC; Country: Italy

Forcing Dataset	Will be used (YES/NO)	Pre-industrial	Historical
SLCF Emissions	yes	unknown	unknown
Biomass Burning	no	-	-
GHG Emissions	no	-	-
Land-use	yes	unknown	unknown
GHG concentrations	yes	ok	preliminary
Ozone concentrations	yes	ok	preliminary
Nitrogen deposition	no	-	-
Simple plume aerosol	no	-	-
Solar	yes	ok	preliminary
Stratospheric aerosol	no	-	-
AMIP SST and SIC	yes	testing	testing

KEY: OK | Testing | Preliminary | Unknown

See CMIP Panel website at https://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6 for details

11. Model Name: CMCC-ESM2; Institution: CMCC; Country: Italy

Forcing Dataset	Will be used (YES/NO)	Pre-industrial	Historical
SLCF Emissions	yes	unknown	unknown
Biomass Burning	no	-	-
GHG Emissions	yes	unknown	unknown
Land-use	yes	unknown	unknown
GHG concentrations	yes	ok	preliminary
Ozone concentrations	yes	ok	preliminary
Nitrogen deposition	yes	ok	preliminary
Simple plume aerosol	no	-	-
Solar	yes	ok	preliminary
Stratospheric aerosol	no	-	-
AMIP SST and SIC	yes	testing	testing

KEY: OK | Testing | Preliminary | Unknown

See CMIP Panel website at https://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6 for details

12. Model Name: CNRM-CM6-1; Institution: CNRM-CERFACS; Country: France

Forcing Dataset	Will be used (YES/NO)	Pre-industrial	Historical
SLCF Emissions	Yes	Yes	Yes
Biomass Burning	Yes	Yes	Yes
GHG Emissions	No	No	No
Land-use	No	No	No
GHG concentrations	Yes	Yes	Yes
Ozone concentrations	No	No	No
Nitrogen deposition	No	No	No
Simple plume aerosol	No	No	No
Solar	Yes	Yes	Yes
Stratospheric aerosol	Yes	Yes	Yes
AMIP SST and SIC	Yes	Yes	Yes

See CMIP Panel website at https://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6 for details

12. Model Name: CNRM-CM6-1-HR; Institution: CNRM-CERFACS; Country: France

Forcing Dataset	Will be used (YES/NO)	Pre-industrial	Historical
SLCF Emissions	Yes	Yes	Yes
Biomass Burning	Yes	Yes	Yes
GHG Emissions	No	No	No
Land-use	No	No	No
GHG concentrations	Yes	Yes	Yes
Ozone concentrations	No	No	No
Nitrogen deposition	No	No	No
Simple plume aerosol	No	No	No
Solar	Yes	Yes	Yes
Stratospheric aerosol	Yes	Yes	Yes
AMIP SST and SIC	Yes	Yes	Yes

See CMIP Panel website at https://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6 for details

12. Model Name: CNRM-ESM2-1; Institution: CNRM-CERFACS; Country: France

Forcing Dataset	Will be used (YES/NO)	Pre-industrial	Historical
SLCF Emissions	Yes	Yes	Yes
Biomass Burning	Yes	Yes	Yes
GHG Emissions	Yes	Yes	Yes
Land-use	Yes	Yes	Yes
GHG concentrations	Yes	Yes	Yes
Ozone concentrations	No	No	No
Nitrogen deposition	No	No	No
Simple plume aerosol	No	No	No
Solar	Yes	Yes	Yes
Stratospheric aerosol	Yes	Yes	Yes
AMIP SST and SIC	Yes	Yes	Yes

See CMIP Panel website at https://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6 for details

12. Model Name: CNRM-ESM2-1-HR; Institution: CNRM-CERFACS; Country: France

Forcing Dataset	Will be used (YES/NO)	Pre-industrial	Historical
SLCF Emissions	Yes	Yes	Yes
Biomass Burning	Yes	Yes	Yes
GHG Emissions	Yes	Yes	Yes
Land-use	Yes	Yes	Yes
GHG concentrations	Yes	Yes	Yes
Ozone concentrations	No	No	No
Nitrogen deposition	No	No	No
Simple plume aerosol	No	No	No
Solar	Yes	Yes	Yes
Stratospheric aerosol	Yes	Yes	Yes
AMIP SST and SIC	Yes	Yes	Yes

See CMIP Panel website at https://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6 for details

Please insert any additional feedback on the forcings / input4MIPs or other CMIP6 related topics for WGCM here

•**CNRM-CERFACS plan to begin their CMIP6 simulations by late november 2016** due to strong constraints on supercomputing. CNRM-CERFACS have decided that no post-processing will be applied to their model output (in other words, all the configurations used directly produce data which can be directly published on CNRM's ESGF datanode). To this end, CNRM-CERFACS **urgently** need to know when stabilized reference versions of the following will we available :

- the Data Request. By default, CNRM-CERFACS will only publish data on their native grid. If requested by CMIP6, some output may also be interpolated to regular grids. Again, we would like to stress that this interpolation step will be applied « on line » (once a simulation is finished, nothing else than available model output will be produced). **Therefore, we need a definition of the aimed regular grids and which variables need to be interpolated to these grids before late November 2016. We also need a stabilized variable request for every MIP by then.**
- a technical specification of the needed output (DRS, CMIP6 CV). CNRM-CERFACS also wonder if the CMIP6 panel would allow changes of the DRS and CMIP6 CV during the exercise.

13. Model Name: EC-Earth3 and the EC-Earth3 family; Institution: EC-Earth-consortium; Country: European countries

Forcing Dataset	Will be used (YES/NO)	Pre-industrial	Historical
SLCF Emissions	Yes	Testing	Testing
GHG Emissions	Yes	Not available yet	Not available yet
Land-use	Yes*	Testing	Testing
GHG concentrations	Yes	OK	OK
Ozone concentrations	Yes	Testing	Testing
Nitrogen deposition	No	Testing	Testing
Simple plume aerosol	Yes	OK	OK
Solar	Yes	OK	OK
Stratospheric aerosol	Yes	Preliminary	Preliminary
AMIP SST and SIC	Yes	OK	OK

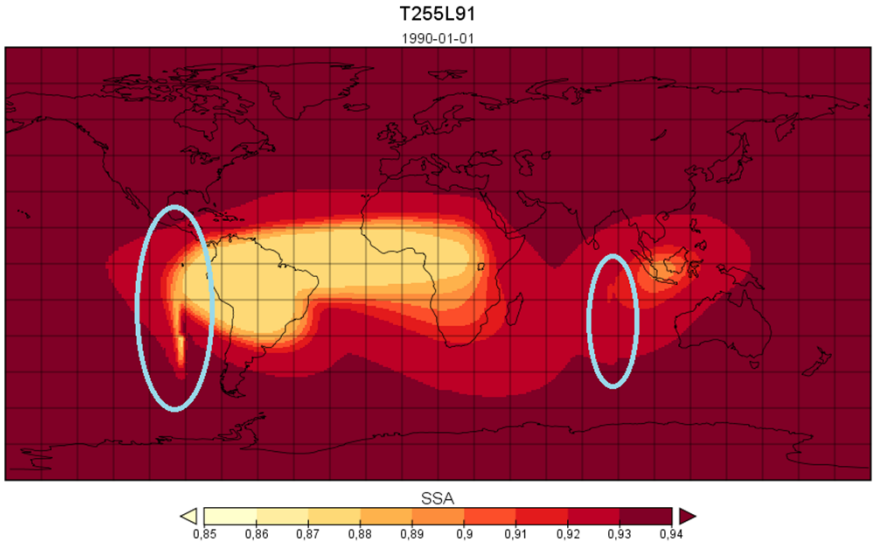
* Technically no. We will use prescribed land cover which has been derived from the LUH2 forcing.

KEY: OK | Testing | Preliminary | Unknown

See CMIP Panel website at https://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6 for details

Please insert any additional feedback on the forcings or other comments for WGCM here

- In the MACv2-SP code, there is an error in the calculation of the background optical depth, which subsequently is used in the calculation of the CDNC scale factor (dNoverN). This factor effectively sets the aerosol indirect effect. The error persists in the latest release (MACv2-SP_v1). The error has been reported to MPI-M.
- The distribution of the single-scattering albedo (SSA) from MACv2-SP_v1 shows some unrealistic small-scale features (see figure below). The impact is expected to be small.
- Anthropogenic (CEDS) emissions and biomass burning emissions are provided as separate data sets, resulting in different file conventions and NMVOC splits.



- It is not nice that the format of the forcing files of the **final** releases does change again when they are put to input4mips, this has happened to SST/SIC and to GHG forcing.

17. Model Name: GFDL; Institution: GFDL; Country: USA

Forcing	Pre-industrial	Historical	Future
WMGG conc	OK	OK	not yet available
SLCF emissions	testing	testing	not yet available
CO2 emissions	?	?	?
Strat aerosols	OK	OK	OK
Ozone conc	downloaded	downloaded	not yet available
Nitrogen deposition	?	?	?
Solar	OK	OK	OK
AMIPBC SST/SIC	N/A	OK	N/A
Land use	beta available	beta available	not yet available

KEY: OK | Testing@GFDL | Preliminary | Unknown

17. Model Name: GFDL; Institution: GFDL; Country: USA

Forcing	Availability
Aerosol optical properties/CDNC	downloaded (not tested)
CFMIP (pattern SST)	?
FAFMIP (surface flux perturbations)	?
OMIP (CORE-2, JRA-55)	?
RFMIP (atm. conditions)	downloaded (not tested)

KEY:

OK	Testing@GFDL	Preliminary	Unknown

19. Model Name: IITM-ESM; Institution: IITM; Country: India

Forcing Dataset	Will be used (YES/NO)	Pre-industrial	Historical
SLCF Emissions	No		
Biomass Burning	No		
GHG Emissions	No		
Land-use	yes	testing	testing
GHG concentrations	**Yes**	OK	testing
Ozone concentrations	yes	OK	testing
Nitrogen deposition	No		
Simple plume aerosol	yes	testing	Testing
Solar	yes	OK	testing
Stratospheric aerosol	yes	Testing	testing
AMIP SST and SIC	yes	OK	testing

KEY: **OK** | **Testing** | **Preliminary** | **Unknown**

See CMIP Panel website at https://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6 for details

22. Model Name: IPSL-CM6; Institution: IPSL; Country: France

Forcing Dataset	Will be used (YES/NO)	Pre-industrial	Historical
SLCF Emissions	YES	Testing	Preliminary
BB emissions	YES	Testing	Preliminary
GHG Emissions	YES	Not available yet	Not available yet
Land-use	YES	Testing	Testing
GHG concentrations	YES	Looks OK but still testing	Looks OK but still testing
Ozone concentrations	YES	Testing	Testing
Nitrogen deposition	YES	Preliminary	Preliminary
Simple plume aerosol	YES	Unknown	Unknown
Solar	YES	Looks OK but still testing	Looks OK but still testing
Stratospheric aerosol	YES	Looks OK but still testing	Looks OK but still testing
AMIP SST and SIC	YES	Testing	Testing

KEY: **OK** | **Testing** | **Preliminary** | **Unknown**

See CMIP Panel website at https://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6 for details

Please insert any additional feedback on the forcings or other comments for WGCM here

- Model-tailored stratospheric aerosol datasets do not include information on the 550 nm extinction coefficient, yet stratospheric aerosol optical depth at 550 nm is a variable requested by several MIPs. It cannot be delivered with precision in the current state of play.
- The stratospheric aerosol dataset include some upper tropospheric aerosols in a way that is not consistent over time, yet it does not include information on the tropopause height so we have no other solution at the moment than using the model tropopause height (either interactive or climatological) to mask tropospheric aerosols. This issue has been flagged to ETZH, but has received no answer (even a “not possible” one).
- The daily solar forcing could be useful to study high-frequency variations in the stratosphere but requires adopting a Gregorian calendar for historical and future simulations (and hence on piControl?), a CMIP6 panel recommendation on this would be welcomed.
- The biomass burning emission dataset has a monthly resolution and relies on observations, hence includes real-world interannual variability that would not necessarily be in phase in *historical* simulations. It makes sense to smooth the BB emission data and a CMIP6 panel recommendation on this would be welcomed.
- Most forcing datasets are not documented and have not undergone any sort of review process. What if reviews on the forthcoming GMD forcing papers request corrections to the datasets.
- Emissions for future scenarios are not yet available. There is of course a requirement of continuity in the emissions in 2014, but it would be nice if there is also a requirement of continuity in the first derivative (to avoid unrealistic scenarios that have a change of slope in 2014).

23. Model Name: K-ACE; Institution: NIMS-KMA; Country: Republic of Korea

Forcing Dataset	Will be used (YES/NO)	Pre-industrial	Historical
SLCF Emissions	YES	Preliminary	Unknown
Biomass Burning	YES	Preliminary	Unknown
GHG Emissions	NO		
Land-use	YES	Preliminary	Unknown
GHG concentrations	YES	Preliminary	Unknown
Ozone concentrations	YES	Preliminary	Unknown
Nitrogen deposition	NO		
Simple plume aerosol	YES	Preliminary	Unknown
Solar	YES	Preliminary	Unknown
Stratospheric aerosol	NO		
AMIP SST and SIC	YES	Preliminary	Unknown

KEY: OK | Testing | Preliminary | Unknown

See CMIP Panel website at https://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6 for details

26. Model Name: MPI-ESM-HR; Institution: Max Planck Institute for Meteorology; Country: Germany

Forcing Dataset	Will be used (YES/NO)	Pre-industrial	Historical
SLCF Emissions	NO		
Biomass Burning	NO		
GHG Emissions	NO		
Land-use	YES	Testing	Testing
GHG concentrations	YES	Testing	Testing
Ozone concentrations	YES	OK	OK
Nitrogen deposition	NO		
Simple plume aerosol	YES	N/A	OK
Solar	YES	OK	OK
Stratospheric aerosol	YES	Will not be used	OK
AMIP SST and SIC	YES	N/A	OK

KEY: | OK | Testing | Preliminary | Unknown |

See CMIP Panel website at https://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6 for details

26. Model Name: MPI-ESM-LR; Institution: Max Planck Institute for Meteorology; Country: Germany

Forcing Dataset	Will be used (YES/NO)	Pre-industrial	Historical
SLCF Emissions	NO		
Biomass Burning	NO		
GHG Emissions	YES	Unknown	Unknown
Land-use	YES	Testing	Testing
GHG concentrations	YES	Testing	Testing
Ozone concentrations	YES	OK	OK
Nitrogen deposition	YES	Unknown	Unknown
Simple plume aerosol	YES	N/A	OK
Solar	YES	OK	OK
Stratospheric aerosol	YES	Will not be used	OK
AMIP SST and SIC	YES	N/A	OK

KEY: OK | Testing | Preliminary | Unknown

See CMIP Panel website at https://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6 for details

26. Model Name: MPI-ESM-XR; Institution: Max Planck Institute for Meteorology; Country: Germany

Forcing Dataset	Will be used (YES/NO)	Pre-industrial	Historical
SLCF Emissions	NO		
Biomass Burning	NO		
GHG Emissions	NO		
Land-use	YES	Testing	Testing
GHG concentrations	YES	Testing	Testing
Ozone concentrations	YES	Testing	Testing
Nitrogen deposition	NO		
Simple plume aerosol	YES	Testing	Testing
Solar	YES	Testing	Testing
Stratospheric aerosol	YES	Testing	Testing
AMIP SST and SIC	YES	Testing	Testing

KEY: OK | Testing | Preliminary | Unknown

See CMIP Panel website at https://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6 for details

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- How to handle (i.e. to cut off) tropospheric values in the stratospheric aerosol dataset was not agreed upon. We chose to use a climatological tropopause (as defined by the WMO) of our model. We acknowledge that the difference may be small, but different models may have different tropopause heights which could potentially lead to different forcing fields.

27. Model Name: MRI-ESM2; Institution: MRI; Country: Japan

Forcing Dataset	Will be used (YES/NO)	Pre-industrial	Historical
SLCF Emissions	YES	Preliminary	Preliminary
Biomass Burning	YES	Preliminary	Preliminary
GHG Emissions	YES	Preliminary	Preliminary
Land-use	YES	Preliminary	Preliminary
GHG concentrations	YES	Testing	Testing
Ozone concentrations	NO		
Nitrogen deposition	NO		
Simple plume aerosol	NO		
Solar	YES	Testing	Testing
Stratospheric aerosol	YES	Testing	Testing
AMIP SST and SIC	YES	Testing	Testing

KEY: OK | Testing | Preliminary | Unknown

See CMIP Panel website at https://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6 for details

34. Model Name: VRESM; Institution: CSIR-CSIRO; Country: South Africa - Australia

Forcing Dataset	Will be used (YES/NO)	Pre-industrial	Historical
SLCF Emissions	YES		
Biomass Burning	YES		
GHG Emissions	NO		
Land-use	YES		
GHG concentrations	YES		
Ozone concentrations	YES		
Nitrogen deposition	YES		
Simple plume aerosol	NO		
Solar	YES		
Stratospheric aerosol	YES		
AMIP SST and SIC	YES		

KEY: OK | Testing | Preliminary | Unknown

See CMIP Panel website at https://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6 for details