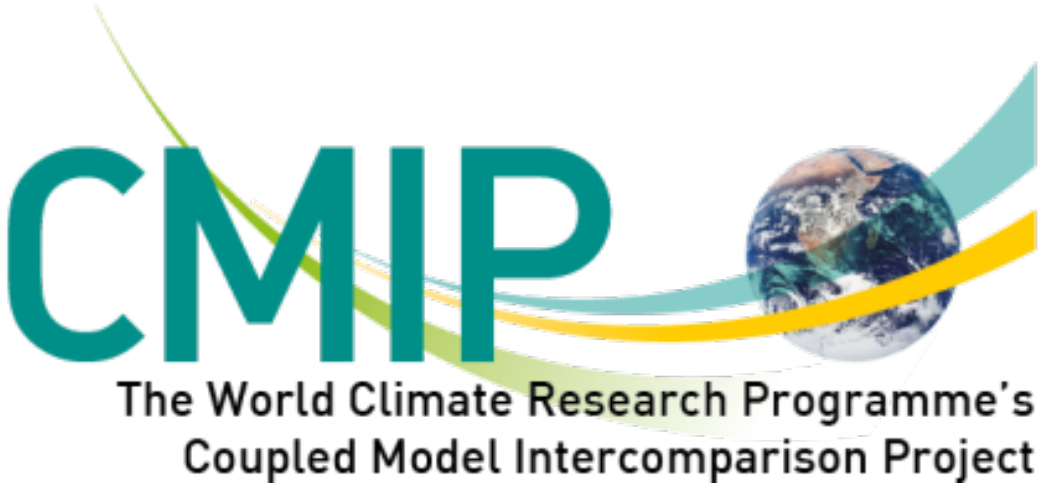
Status of the Coupled Model Intercomparison Project Phase 6 (CMIP6)

Veronika Eyring, Greg Flato, Jean-Francois Lamarque, Jerry Meehl, Cath Senior, Ron Stouffer, Karl Taylor (CMIP Panel)

25 March 2019

WGCM Meeting

Barcelona, Spain



CMIP5/6 evolution: More institutions, more models, more experiments, more data

	Institute	Country		Institute	Country		Institute	Country		Institute	Country
1	AS-RCEC	Taiwan	**11**	CSIR-CSIRO	South Africa	**21**	IPSL	France	**31**	NERC	UK
2	AWI	Germany	**12**	CSIRO	Australia	**22**	KIOST	Korea	**32**	NIMS-KMA	Korea
3	BCC	China	**13**	CSIRO-ARCCSS-BoM	Australia	**23**	MESSy-Consortium	Germany	**33**	NIWA	New Zealand
4	BNU	China	**14**	E3SM-Project	USA	**24**	MIROC	Japan	**34**	NOAA-GFDL	USA
5	CAMS	China	**15**	EC-Earth-Consortium	Sweden	**25**	MOHC	UK	**35**	NUIST	China
6	CAS	China	**16**	ECMWF	UK	**26**	MPI-M	Germany	**36**	SNU	Korea
7	CCCma	Canada	**17**	FIO-QLNM	China	**27**	MRI	Japan	**37**	THU	China
8	CCCR-IITM	India	**18**	HAMMOZ-Consortium	Switzerland	**28**	NASA-GISS	USA	**38**	UA	USA
9	CMCC	Italy	**19**	INM	Russia	**29**	NCAR	USA	**39**	UofT	Canada
10	CNRM-CERFACS	France	**20**	INPE	Brazil	**30**	NCC	Norway	**40**	UTAS	Australia

Thanks from CMIP Panel and WGCM to all model groups!

CMIP6 status: data availability

- Model output now being served by ESGF from 12 institutions (19 models)
- Much output to be made available over the coming months

source_id	# of activities	AerChemMIP	C4MIP	CFMIP	CMIP	DAMIP	DCPP	FAFMIP	GeoMIP	HighResMIP	LUMIP	OMIP	PMIP	RFMIP	ScenarioMIP
# of models	45	4	1	3	15	4	1	1	1	6	1	1	1	3	3
BCC-CSM2-MR	1				1731										
BCC-ESM1	1				671										
CESM2	2			363	11216										
CESM2-WACCM	1				4856										
CNRM-CM6-1	4	435			7086	2179									1328
CNRM-ESM2-1	4	3375	724		8633									597	
CanESM5	1				515										
E3SM-1-0	1				17										
FGOALS-f3-L	1				1										
GFDL-AM4	1				69										
GFDL-CM4	1				336										
GISS-E2-1-G	4			166	2884	4150					830				
HadGEM3-GC31-HM	1									2					
HadGEM3-GC31-LM	1									2					
HadGEM3-GC31-MM	1									2					
IPSL-CM6A-ATM-HR	1									250					
IPSL-CM6A-LR	11	9494		3397	35696	19586	116015		1156	271		642	1628	4256	12935
MIROC6	2				2347			545							
MRI-ESM2-0	5	162			1242	486								324	648
NICAM16-7S	1									6					

More than 28 days | More than 7 days | Less than 7 days

https://pcmdi.llnl.gov/CMIP6/ArchiveStatistics/esgf_data_holdings/

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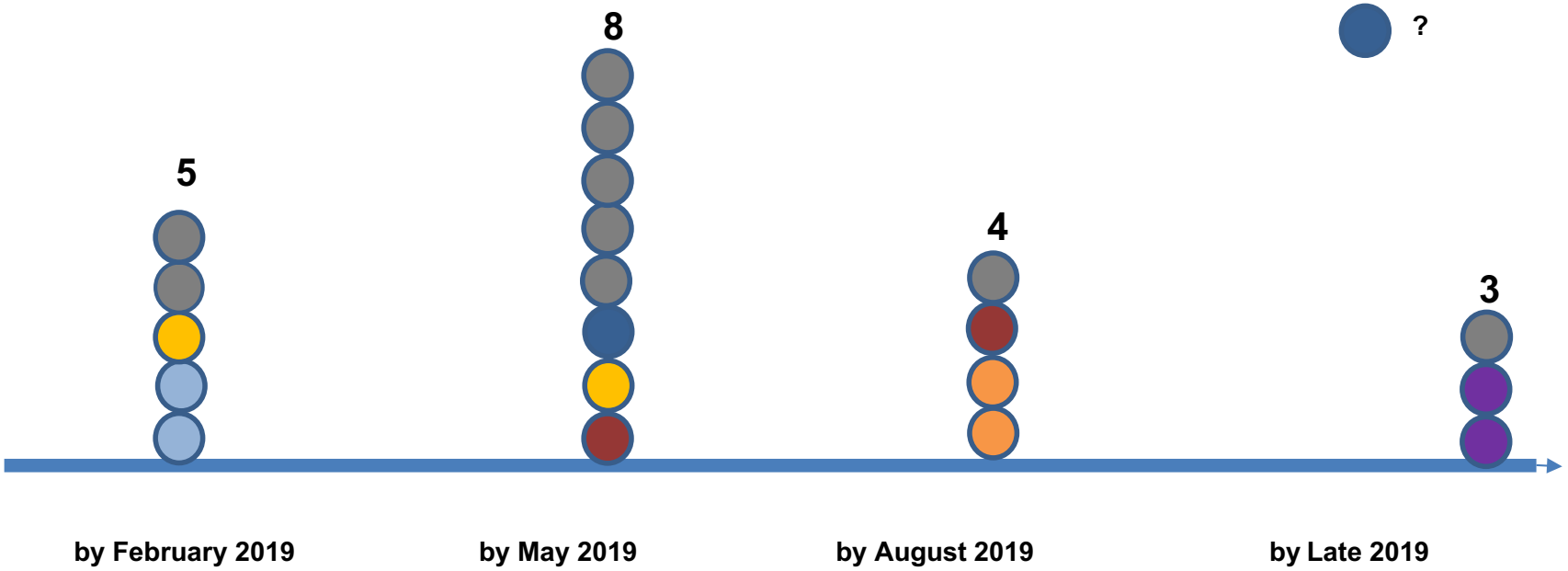
source_id	# of expts	historical	piControl	1pctCO2	amip	abrupt-4xCO2
# of models	47	11	12	7	10	7
BCC-CSM2-MR	4	574	144	146		146
BCC-ESM1	2	534	137			
CESM2	3	9736	930		550	
CESM2-WACCM	3	2487	962		1407	
CNRM-CM6-1	5	4079	302	387	500	1818
CNRM-ESM2-1	5	2951	440	1506	564	1456
CanESM5	1	515				
E3SM-1-0	1		17			
FGOALS-f3-L	1				1	
GFDL-AM4	1				69	
GFDL-CM4	1		336			
GISS-E2-1-G	5	1711	176	166	665	166
HadGEM3-GC31-HM	0					
HadGEM3-GC31-LM	0					
HadGEM3-GC31-MM	0					
IPSL-CM6A-ATM-HR	0					
IPSL-CM6A-LR	5	22368	885	704	3330	8020
MIROC6	5	1090	109	109	930	109
MRI-ESM2-0	5	270	54	54	162	702

More than 28 days | More than 7 days | Less than 7 days

https://pcmdi.llnl.gov/CMIP6/ArchiveStatistics/esgf_data_holdings/

Current timeline for ScenarioMIP Experiment completion

Tier 1 (**SSP1-2.6; SSP2-4.5; SSP3-7.0;SSP5-8.5; *SSP1-1.9***)
21 Models from 15 Modelling Centres



Same color (other than grey) = same modeling center/different model version

Courtesy of Claudia Tebaldi and Erich Fisher (January 2019)

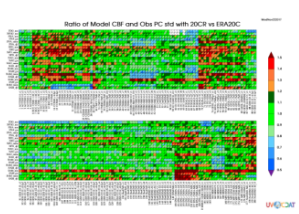
WGI Timeline

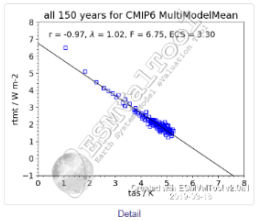
2019	
6-12 January	Second Lead Author Meeting, Vancouver, Canada
7 April	**Submission of First Order Draft to TSU**
29 April – 23 June	Expert Review of First Order Draft
26 Aug – 1 Sep	Third Lead Author Meeting, Toulouse, France
31 Dec	Literature submission cut off
2020	
12 January	**Submission of Second Order Draft to TSU**
2 March – 26 April	Expert and Government Review of Second Order Draft
1– 7 June	Fourth Lead Author Meeting (location tbd)
15 October	**Cut-off date for accepted literature for inclusion in the Final Draft**
7 Dec – 31 Jan	Final Government Distribution of Final Draft and Government Review of the Summary for Policymakers
2021	
12 – 18 April	Submission to the WGI Session for approval of the Summary for Policymakers and acceptance of the underlying Report (location tbc)

Workflow for Routine Evaluation in CMIP

- Ensuring traceability and provenance of the results –

Results at the moment password restricted and watermarked: should we keep this and how long?





Well-Established Analysis
Sharing of Diagnostic Code
Guidance and support from CMIP Panel,
WGNE/WGCM Climate Model Metrics
Panel and , CMIP6-Endorsed MIPs

Model Output

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

Processing Capability

ESGF
Earth System Grid Federation

Data Archive

Standardised Interfaces

Community-tools for Routine ESM Evaluation

Visualization & documentation
of evaluation results
Record of provenance
Scientific interpretation
Additional in-depth analysis

Observations and Reanalyses

obs4MIPs
ana4MIPs

Analysis computing environment integrated with the ESGF

State evaluation of ECVs
(climatology, trends, ...)
Process and phenomena evaluation
Link to projections
(MMM analysis and emergent constraints)
Performance metrics

ESMValTool
Earth System Model eValuation Tool

CMEC

Eyring et al., ESD (2016)

DLR

NCAR UCAR | CGD's Climate Analysis Section
Climate Variability Diagnostics Package

Dissemination of CMIP6 (selection)

- CMIP6 Special Issue in GMD at https://www.geosci-model-dev.net/special_issue590.html
- A Short Introduction to Climate Models - CMIP & CMIP6 Video produced by WCRP
  - Short version on Youtube at https://www.youtube.com/watch?v=wTBkq9nWNEE
  - Long version on Youtube at https://www.youtube.com/watch?v=WdRiYPJLt4o
- GMD Highlight Article by David Carlson, Veronika Eyring, Narelle van der Wel, and Gaby Langendijk
- Nature Climate Change Interview on CMIP6 at http://www.nature.com/nclimate/journal/v7/n10/full/nclimate3398.html
- Model output will be published at the Earth System Grid Federation (ESGF)
- Monitor results of CMIP5/CMIP6 model evaluation with the ESMValTool at http://cmip-esmvaltool.dkrz.de/
- Coordinated press release in preparation

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

What is the delta from CMIP5 to CMIP6?

- The value of CMIP is that it *enables* fundamental research
  - There is now easy access to multi-model simulation output
  - 100's of research papers based on CMIP3 output
  - 1000's of CMIP5-based research papers
- CMIP also provides a multi-model perspective that can be relied on to help set priorities in model development
  - Can be helpful in gauging progress in model improvement
- Close the loop
  - Why this huge effort? What is the added value? => peer-reviewed publication on the benefits of CMIP6 led by CMIP Panel