Planning for the Coupled Model Intercomparison Project phase 6 (CMIP6)

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CMIP is organized by the World Climate Research Programme (WCRP) Working Group on Coupled Models (WGCM) co-chairs Gerald Meehl and Sandrine Bony

Within WGCM there is a CMIP Panel that directly oversees CMIP activities (chair Ron Stouffer, and in 2013 new chair Veronika Eyring; members: N. Mahowald, G. Meehl, B. Stevens, R. Stouffer, K. Taylor)

CMIP is formulated to provide a coordinated multi-model experiment framework to address compelling science questions and new scenarios

CMIP is not dictated by the IPCC

WGCM and CMIP

- **CMIP involves running and analyzing coupled climate models (AOGCMs) and Earth System Models (ESMs, usually defined as an AOGCM with at least a coupled carbon cycle, can also have dynamic vegetation, chemistry, aerosols, etc.)**

CMIP is coordinated across a number of climate science communities

IAMC (Integrated Assessment Modeling Consortium)
IGBP AIMES (Analysis, Integration and Modeling of the Earth System, carbon cycle, ESMs),
WGNE (processes and atmospheric model improvement), WGSIP (decadal climate prediction)
PMIP (paleo)
CFMIP (cloud feedbacks)
Decadal Climate Prediction Panel (WGSIP/WGCM)
CORDEX (regional climate modeling)
connect to IAV (impacts, adaptation and vulnerability) community

- **CMIP outcomes:**

- better understand natural climate variability and change
- predict the climate response to natural & anthropogenic perturbations
- assess climate predictability at the decadal timescale
- Provide a large multi-model dataset as a resource to the climate science community

Promote and facilitate model validation and diagnosis of shortcomings, and understanding processes and feedbacks in the climate system

→ Metrics panel (WGNE/WGCM)
→ Obs4MIPs, CFMIP/GCSS station outputs, CFMIP observations simulator (COSP)

Planning for CMIP6:

Assume CMIP6 would be comparable to CMIP5--involving several communities, with a core set of scenario experiments with calibration idealized experiments (e.g. 1% runs, 4XCO2, etc.), historical and future prediction/projection runs, and several layers of other experiments (but other coordination schemes may be incorporated)

rely on ESGF for data archival/access

(comments made related to de-coupling CMIP from the IPCC assessment cycle, but recognizing the reality of having models that would be state-of-the-art for IPCC assessment, not ruling out other MIPs that would occur out of cycle due to facilitation of ESGF)

Experiment specification, requires sufficient detail far enough in advance for effective configuration, and finalize prioritized fields early

CMIP6 should have continuity with CMIP5

Try to retain continuity with scenarios, though IAM community and our community may need to adjust or add sensitivity experiments (e.g. aerosols, short-lived species, land use change, 2C warming bigger peak and decline in RCP2.6)

Details of land-use change that are adapted by each group need to be addressed

Modeling groups would like CMIP6 to be smaller than CMIP5; But there are more research communities that want their experiments to be part of CMIP6 which would make it bigger…

More CMIP6 issues:

Science questions involving land use change –aerosols—short-lived species--ESM applications

reversibility or geo-engineering

More idealized experiments, e.g. 1% runs but for other forcings, idealized aerosol, ozone, land use, like the 1% runs

Decadal prediction and extremes

systematic biases

Very high resolution time slice experiments for tropical cyclones and other aspects of storms and circulation changes

Higher resolution coupled simulations for tropical cyclones, extremes, and circulation changes

Coupled land ice for global and regional sea level rise

Scenario process leading to CMIP6:

Source: Moss et al. 2010

WGCM-related planning: 2013

International Workshop on Seasonal to Decadal Prediction (May 13-16, 2013, Toulouse, France)

Sustainable Global Climate Mitigation Scenarios Workshop (May 29-31, National Center for Socio-Environmental Synthesis (SESYNC, Annapolis, MD)

Societal Dimensions Working Group Meeting, CESM Workshop (June 20, 8:30-12 noon, Breckenridge, CO)

Energy Modeling Forum, Climate Change Impacts and Integrated Assessment, (August 1-2, Snowmass CO) Organized jointly by the Integrated Assessment Modeling Consortium (IAMC) and WGCM

Next generation climate change experiments needed to advance knowledge and for assessment of CMIP6 (August 4-9, Aspen Global Change Institute, Aspen, CO) Organized jointly by WGCM, AIMES, IAMC, and other partners (WCRP and IGBP co-sponsors)

US National Academy of Sciences Board on Atmospheric Sciences and Climate (BASC)/Board on Environmental Change and Society (BECS) session on scenarios and CMIP6, fall 2013

WGCM meeting, Oct. 2013, Victoria, Canada, joint with AIMES

TIMING

CMIP5:

exploratory Aspen Global Change Institute workshop: August 2006
Iterations on experimental design in research community: 2006-2008
WGCM approved experimental design: 2008 (duration of CMIP5 2008-2013)
Modeling groups receive scenario info from IAM groups: 2010 and start runs
CMIP5 model analysis workshop: March 2012
deadline for papers assessed in IPCC AR5: July 2012
WGI AR5 report published: late 2013
Ongoing analysis of CMIP5 data: 2013 until CMIP6 data available ~2017

CMIP6:

exploratory Aspen Global Change Institute workshop: August 2013
Iterations on experimental design in research community: 2013-2015
WGCM approve experimental design: 2015 (duration of CMIP6 2015-2020)
Modeling groups receive scenario info from IAM groups: 2017 and start runs
CMIP6 model analysis workshop: 2018
deadline for papers assessed in IPCC AR6: 2019
WGI AR6 report published: 2020
Ongoing analysis of CMIP6 data: 2020 onward

Data management: Promote CMOR as standard protocol, output could be directly saved into CMOR format

“near-exabyte” scale of CMIP6—need to recognize and plan for how to handle that data volume

Evaluation: International approach to evaluation, metrics panel useful, expanded role, semi-regular model analysis workshops

Logistics: High frequency temporal data desirable for some experiments—perhaps have a different fields list for different experiments, prioritize fields, check what fields are being used from CMIP5

make data access easier -- secure funding for ESGF, data access and retrieval need for scriptable and need better download methods

metafor needs work in concept and application