

# Community Earth System Model (CESM) Perspective on CMIPs

Main messages:

- Less is more,
- Earlier is better



## Timeline and pressure on resources (computer time, disk space, people, etc.)

### Concerns:

- Requirements on computer time, processing time, disk space, and people time were too high.
- Many integrations are done close to the deadlines, increasing the pressure on resources. This relates to the CMIP timeline and availability of data sets.
- There isn't enough time to address major and persistent model biases in a meaningful way in between CMIP cycles.

## Timeline and pressure on resources (computer time, disk space, people, etc.)

### Suggestions:

- Stress on cyber-infrastructure needs to be balanced with carefully thought out science goals.
- Realistic number of experiments.
- Estimate storage cost of produced data up front.
- Forcing data sets for all simulations and their extensions (to year 2300?) should be available much earlier (more on this later).
- Staggering the simulations is an option – may also help the assessment process. But if some runs are done earlier, with an earlier version of a model, then some of them need to be rerun with the latest versions.
- Selective and better prioritization of experiments should be considered.

## Experiments

General feeling is that there were too many RCP scenarios. Concerns about if these RCPs were created in a consistent way. If not, some uniformity is needed. There seems to be also some confusion about what they really mean. Fewer future scenarios with more ensemble members should be considered.

Another concern is that CMIP6 will increase rather than reduce the number of runs, e.g., the question of science gaps to explore could add a large number of runs.

Some questions regarding what will be prescribed vs. predicted, e.g., dust emissions, vegetation, ice sheets. For CMIP5, these types of questions were decided by each modeling group. This also relates to what output is in the standard fields. For example, if vegetation is prognostic in a lot of models, maybe that should be one of the standard fields.

Science gaps include understanding what we have; understanding impacts of model biases; ice sheets and sea level change.

## Forcing dataset needs – from IAMs

- Forcing datasets through present-day are needed as soon as possible.
- The extensions through 2300 weren't available until very late. This needs to be addressed.
- There were some missing / non-sensible data in these extensions to 2300, relevant for BGC. For example, wood harvesting was set to zero after 2100 (?). This affects the Carbon budget.
- CO<sub>2</sub> emissions data sets are needed for RCPs rather than regional emission totals. Spatial and temporal variations / patterns were generated by groups in ad-hoc ways.

## Output archiving

- Non-standard file naming and having fields broken up differently in terms of time periods for different modeling centers.

This was partly because there was a 4 GB limit, so people broke things up differently to fit in this limit. Hopefully, netcdf4 will be allowed for CMIP6, which would get rid of this limit.

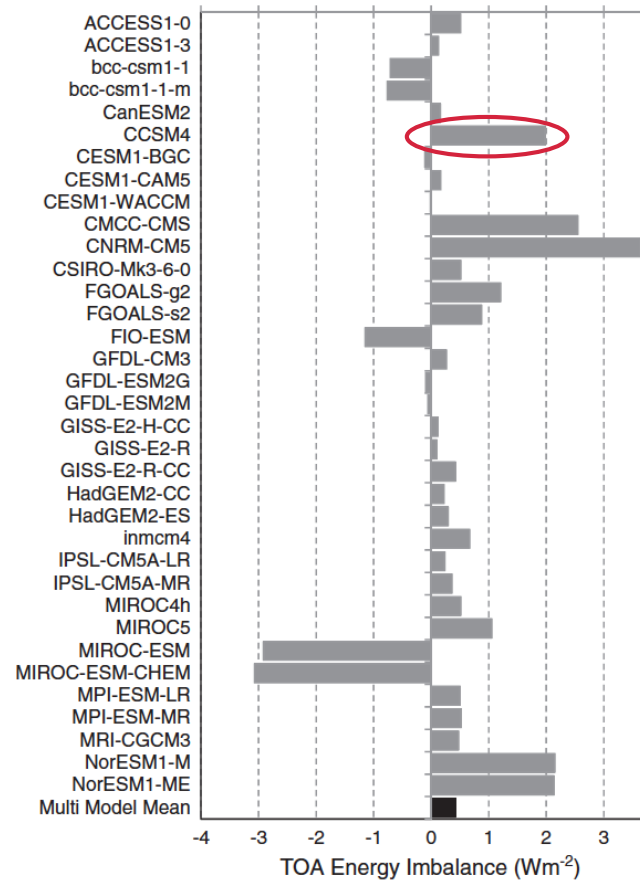
Some standardization will be useful.

- Sub-setting capability for ESG
- CMOR information earlier
- Additional output requests will be forthcoming for CMIP6. An example is a request for additional ocean BGC tracer fields. Currently 3D fields are annual and only surface fields are monthly. Request for monthly 3D fields perhaps only for near-surface (top few hundred meters).
- Some notification of updated / corrected data

# Evaluating adjusted forcing and model spread for historical and future scenarios in the CMIP5 generation of climate models

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**Figure 1.** Preindustrial TOA energy imbalance (W m<sup>-2</sup>) for the CMIP5 models. These were averaged over the entire preindustrial control period. Note additional models are included, compared to the main analysis (compare Table 1).

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# Timeline

2015 WGCM approve  
CMIP6 Design

2017: CMIP6  
Scenarios available

CESM2 Development

Jan, 2016,  
CESM2  
Finalized

PI  
Control  
Runs

June,  
2016,  
CESM2  
Release

2017:  
Scenarios Received  
Scenario Runs Over  
2017

CMIP6 Data Processing/Publishing

June 2013

June 2014

June 2015

June 2016

June 2017