

The Decadal Climate Prediction Project (DCPP) and the Coupled Model Intercomparison Project (CMIP6)

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Modelling and Analysis

Decadal Climate Prediction Project

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Decadal Climate Prediction Project

The term "decadal prediction" encompasses predictions on annual, multi-annual to decadal timescales. The possibility of making skilful forecasts on these timescales, and the ability to do so, is investigated by means of predictability studies and retrospective predictions (hindcasts) made using the current generation of climate models as well as by means of statistical approaches. Skilful decadal prediction of relevant climate parameters is a Key Deliverable of the WCRP's Grand Challenge of providing Regional Climate Information.



Organized by the DCPD Panel

Coupled Model Intercomparison Project Phase 6 (CMIP6): Design and Organization

Veronika Eyring, Jerry Meehl, Bjorn Stevens, Ron Stouffer, Karl Taylor
(CMIP Panel)

Sandrine Bony and Cath Senior (WGCM Co-chairs)

V. Balaji (WGCM Infrastructure Panel co-chair with K. Taylor)

16 January 2015 (*updates to CMIP6 Data Request Timeline on Slide 9*)

Please see the CMIP Panel website for additional information and updates:

<http://www.wcrp-climate.org/index.php/wgcm-cmip/about-cmip>

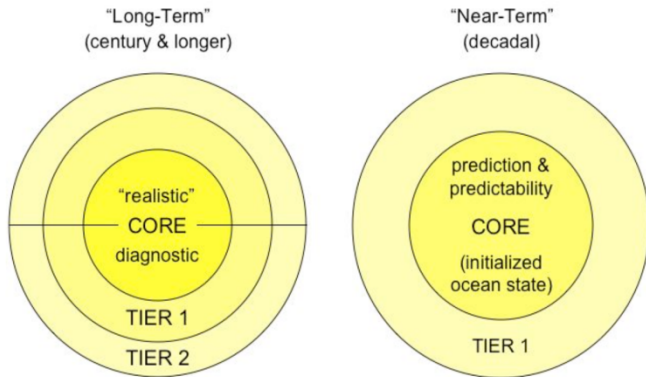
Contact for questions: CMIP Panel Chair Veronika Eyring (email: Veronika.Eyring@dlr.de)

The final CMIP6 Design, possibly with small modifications to the here presented figures and wording, will be published in a GMD Special Issue together with a description of the CMIP6-Endorsed MIPs and the forcing datasets. This Special Issue will open 30 April 2015.

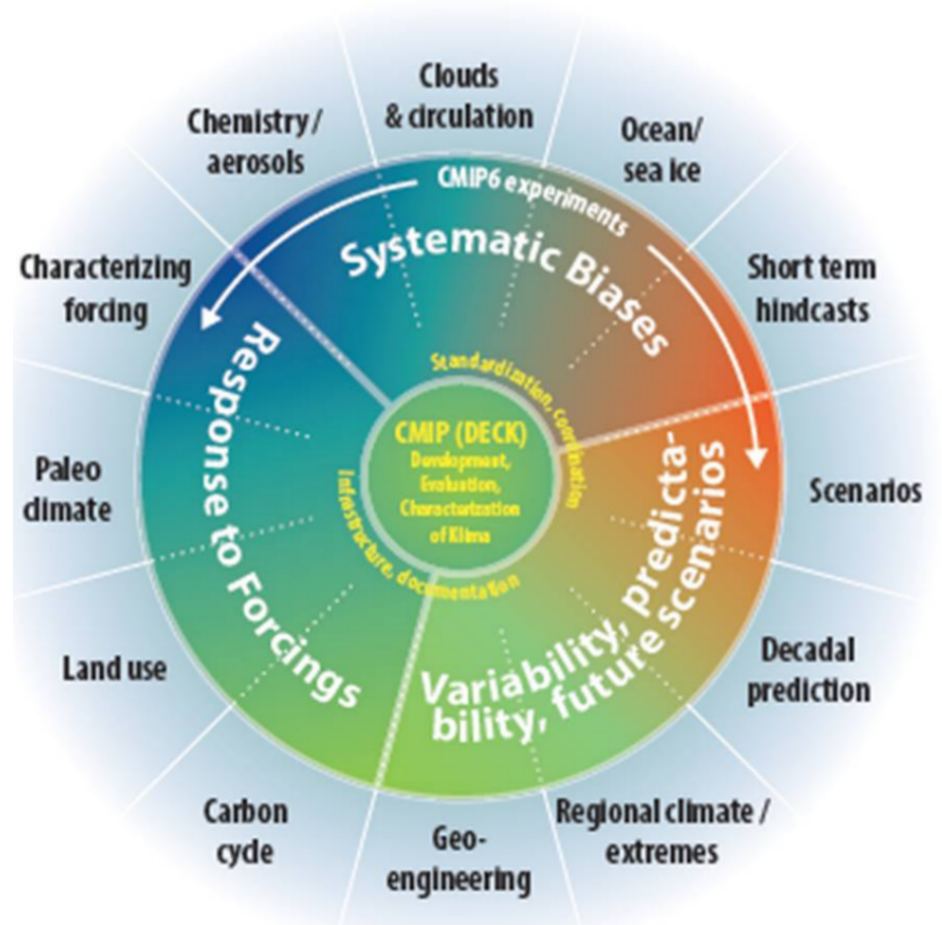
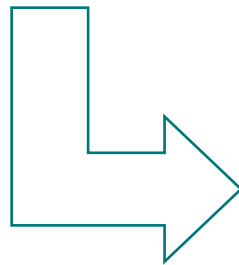


The new CMIP approach

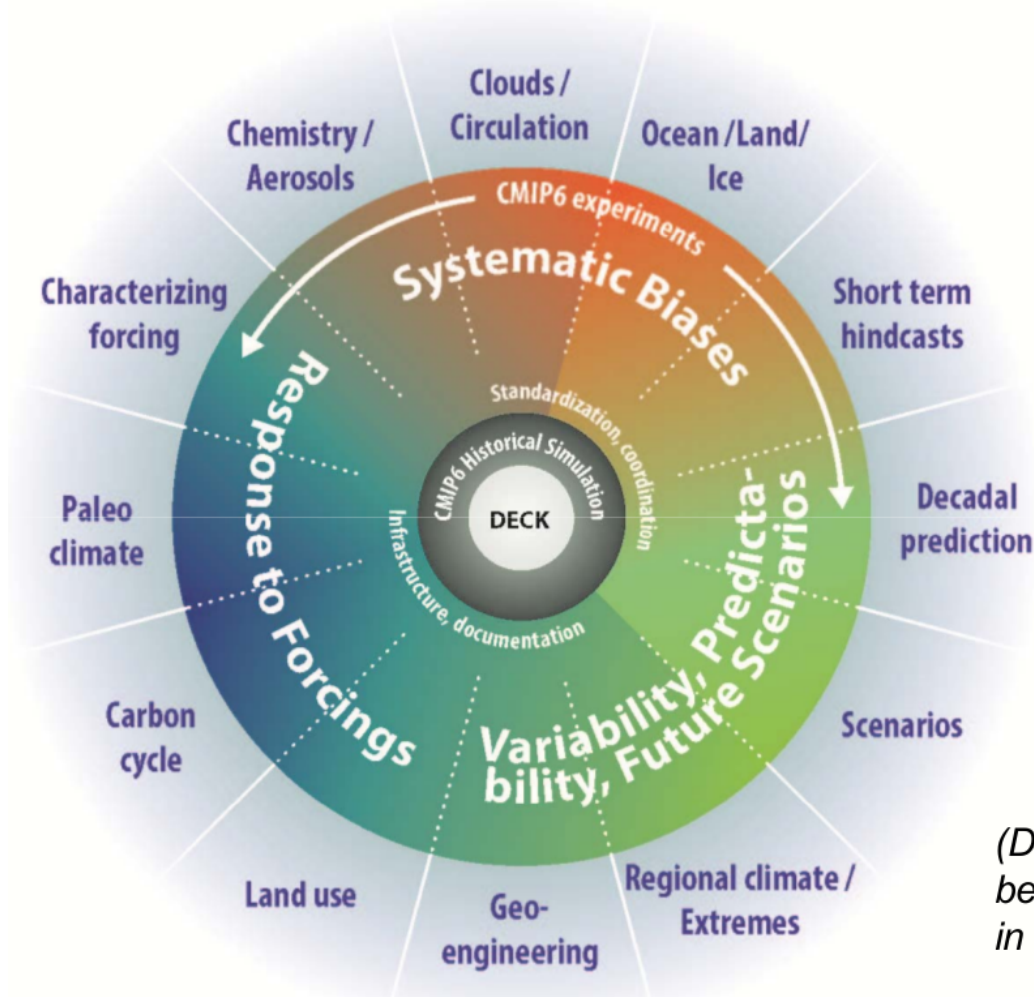
CMIP5 Experiment Design



Also "time-slice" experiments for 2030-2040



WCRP Grand Challenges: (1) Clouds, circulation and climate sensitivity, (2) Changes in cryosphere, (3) Climate extremes, (4) Regional climate information, (5) Regional sea-level rise, and (6) Water availability, plus an additional theme on “Biogeochemical forcings and feedbacks”



DECK (entry card for CMIP)

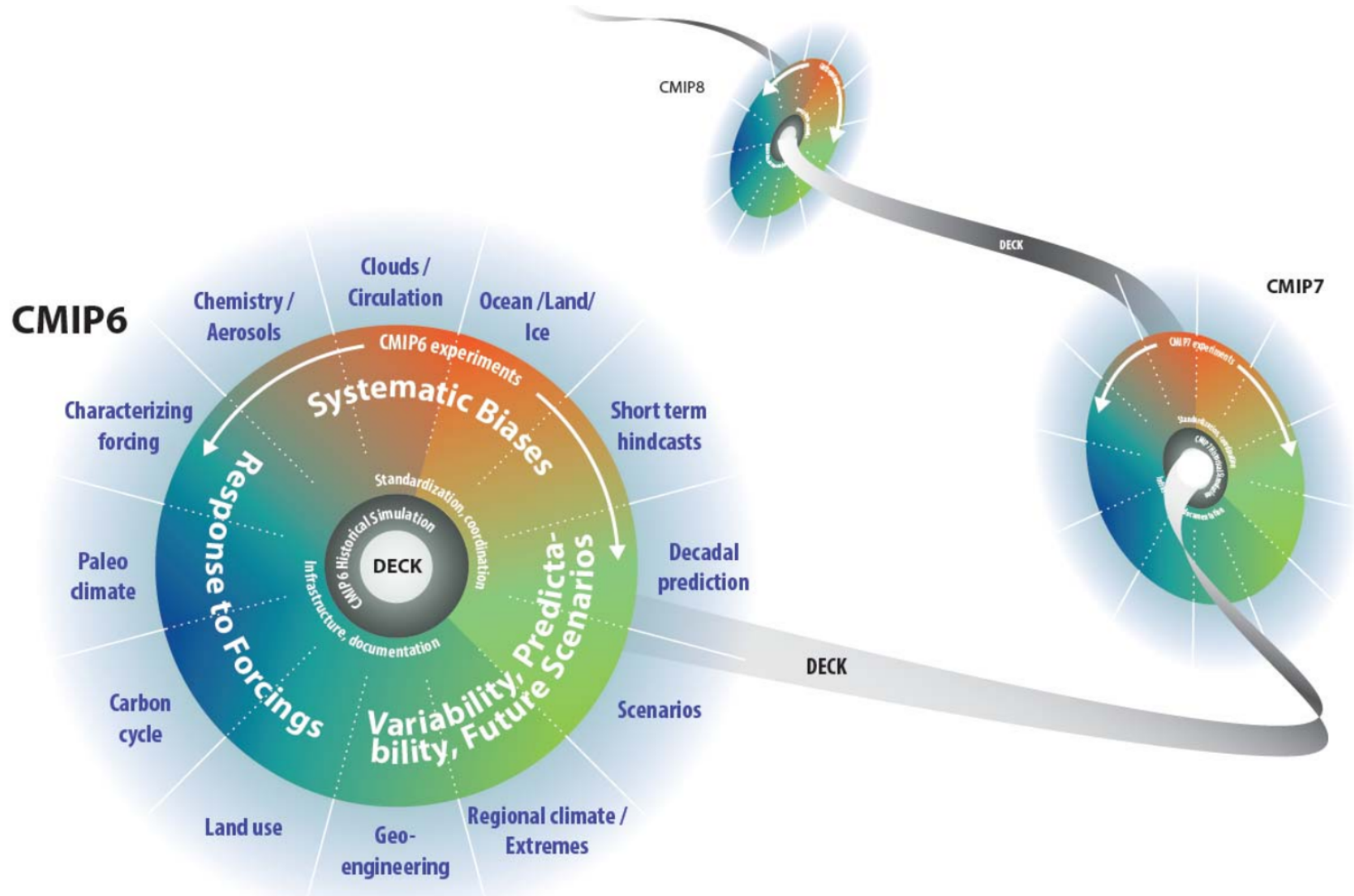
- i. AMIP simulation (~1979-2014)
- ii. Pre-industrial control simulation
- iii. 1%/yr CO₂ increase
- iv. Abrupt 4xCO₂ run

CMIP6 Historical Simulation (entry card for CMIP6)

- v. Historical simulation using CMIP6 forcings (1850-2014)

(DECK & CMIP6 Historical Simulation to be run for each model configuration used in the subsequent CMIP6-Endorsed MIPs)

CMIP Continuity



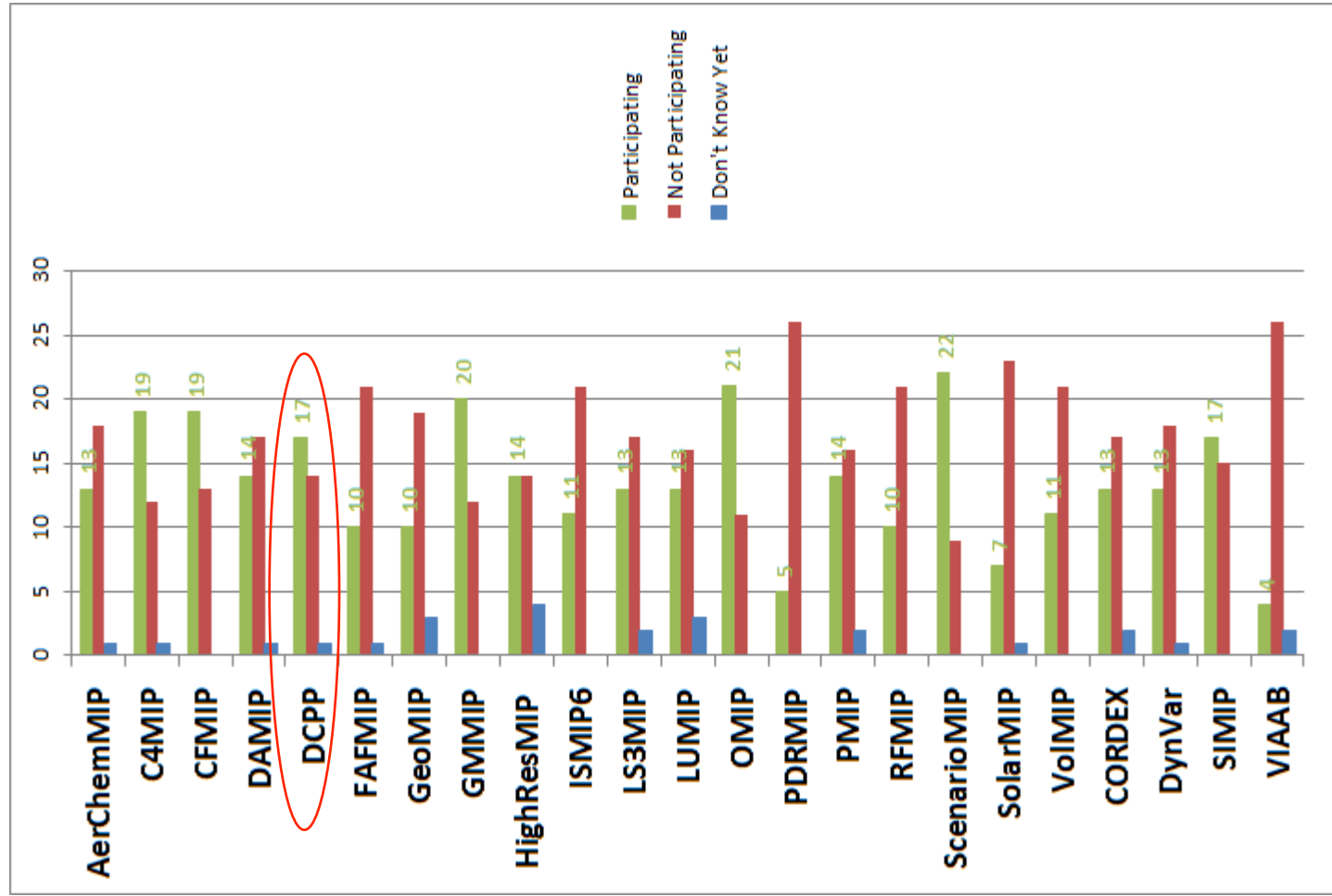
CMIP6-Endorsed MIPs

Main Criteria for Endorsement

- ✓ 1. The MIP and its experiments address at least one of the key science questions of CMIP6.
- ✓ 2. The MIP demonstrates connectivity to the DECK experiments and the CMIP6 Historical Simulation.
- ✓ 3. The MIP adopts the CMIP modeling infrastructure standards and conventions. **Forcing data ESGF etc.**
- ✓ 4. All experiments are tiered, well-defined, and useful in a multi-model context and don't overlap with other CMIP6 experiments. *
- ✓ 5. Unless a Tier 1 experiment differs only slightly from another well-established experiment, it must already have been performed by more than one modeling group.
- ✓ 6. A sufficient number of modelling centers (~8) are committed to performing all of the MIP's Tier 1 experiments and providing all the requested diagnostics needed to answer at least one of its science questions.
- ✓ 7. The MIP presents an analysis plan describing how it will use all proposed experiments, any relevant observations, and specially requested model output to evaluate the models and address its science questions.
- ✓ 8. The MIP has completed the MIP template questionnaire.
- ✓ 9. The MIP contributes a paper on its experimental design to the CMIP6 Special Issue.
- ✓ 10. The MIP considers reporting on the results by co-authoring a paper with the modelling groups.

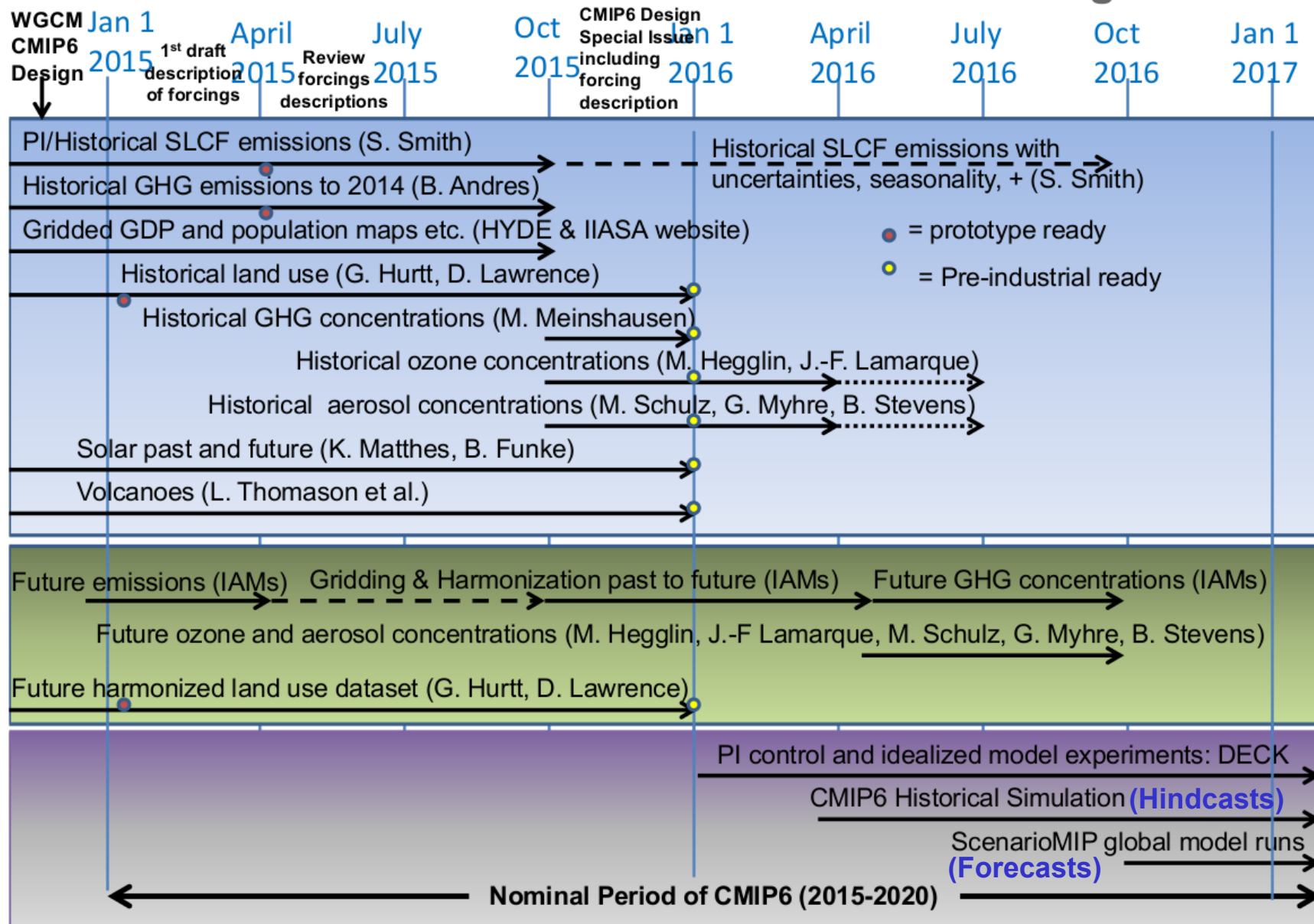
* DCPD Components A, B, C separately tiered. Groups are invited to participate in any or all.

Latest Participation Survey



Finalize scenario choice, March 2015 (O'Neill, Tebaldi, van Vuuren)

CMIP6 Forcing Timeline



WGCM Synthesis of Comments on MIPs Proposals for CMIP6 (18 Feb)

5. DCP

1. Which MIP experiments will be the most relevant to address the main science questions of your Grand Challenge or core project? Why? Can you identify any gaps? or missed opportunities?

From CLIVAR: DCP is relevant to the CLIVAR goal of improving our understanding of decadal variability and predictability.

From CLIVAR ENSO RF: DCP is a relevant MIP addressing ENSO low frequency processes and predictability.

From US CLIVAR ETOS WG: DCP is highly relevant to understanding equatorial SST biases and their consequences.

From CLIC and Cryosphere GC: The DCP priority 1 experiments are the most pertinent of the DCP experiments.

From SPARC: Some potential predictability may be communicated via the stratosphere at the time-scales of DCP. This is in particular true for solar cycle variability (provided that forecast skill for solar activity exists) and effects of volcanic eruptions (when included after an eruption has occurred). Hence, SPARC activities like SolarMIP and SIRC/VolMIP can provide knowledge on this potential predictability and in turn benefit a lot from the proposed DCP experiments. In order to allow for an analysis of effects of dynamical troposphere-stratosphere coupling I would recommend to DCP to seriously consider the output requirements formulated by DynVar.

The experiments listed under point 4 in Table 2 of DCP Component A are of particular interest for these SPARC activities. A comparison of the DCP priority 1 hindcast experiments (with historical forcings) with these experiments without information on future volcanoes and solar irradiance variability would allow a better understanding and quantification of these effects.

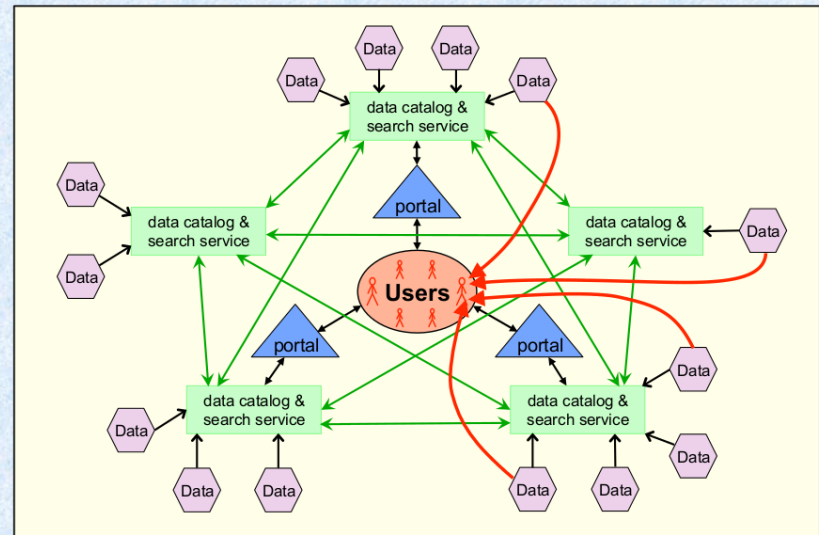
The DCP component B seems of less relevance for SPARC activities.

From Regional Climate Information (RCI) GC: All three components of this MIP are highly relevant to the RCI GC major theme of the provision of reliable regional climate information from predictions and projections. An essential component of this theme is the development of a framework to translate climate data and output into information and guidance for risk management and decision making – in this context DCP component B is particularly relevant. We note the DCP view that dynamical downscaling is not considered a priority (consistent with the CORDEX position), but suggest that the RCI GC could provide an appropriate vehicle for any potential “test case”.

Data aspects

- Earth System Grid (ESG) data approach is general for CMIP6
- CMIP panel and WGCM Infrastructure Panel (WIP)
- vital part of CMIP

Through a single data portal, users seek and harvest data directly from multiple data nodes.



WGCM 17
2 October 2013

K. E. Taylor
PCMDI

Where are we with CMIP?

- DCPP CMIP submission
 - first iteration to CMIP (31 Jan 2015)
 - second iteration (31 March 2015)
 - final iteration with Aspen input to Component C (26 June 2015)
- CMIP queries
 - connectivity to DECK and historical simulation
 - a few details on tiers and connection to other MIPs
 - experiment design for Component C
 - analysis “plan”
- Timeline
 - data requirements to CMIP(28 February 2015)
 - final DCPP design (26 June 2015)
 - CMIP6 endorsement
 - availability of historical forcing data determines start of DCPP integrations (in 2016)
 - GMD Special Issue on the CMIP6 experimental design and the CMIP6 forcings (December 2015)

What do we want from CMIP?

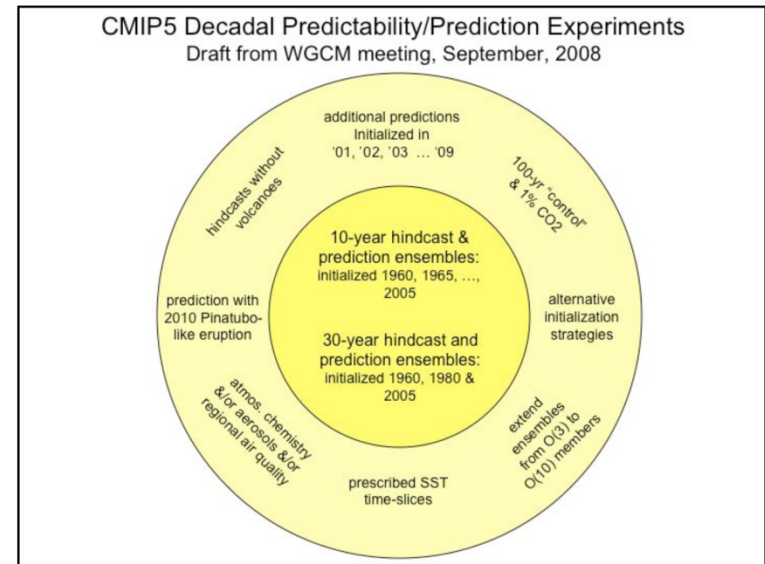
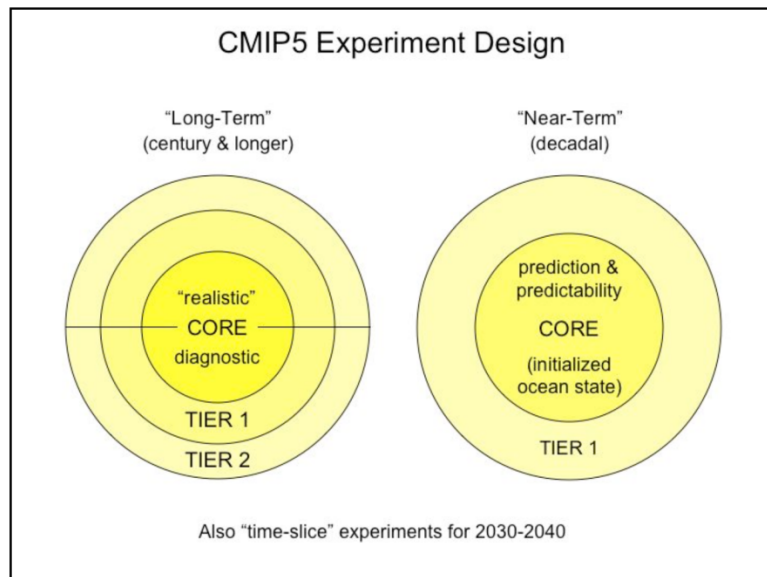
- more infrastructure (less structure?)
 - timely historical and future forcing scenarios
 - timely data/ESGF specifications and treatment
- forcing
 - avoid CMIP5 forcing data delays
 - smooth connection between historical and “future” forcing
 - useful and modest range of scenarios
- data treatment and ESGF
 - “basic common data set”?
 - monthly means of sfc state quantities
 - fluxes of heat, momentum, moisture across interfaces between components
 - restricted atmos and ocean dynamical variables
 - variable names, units, formats etc.
 - ease of data “publication”
 - ease of data downloads, etc.
- suggestions from Aspen?

end of presentation

Antecedent CMIP5 decadal component

○ WGCM Paris (2008):

- CMIP5 decadal prediction component adopted
- formation of a “Joint **WGCM-WGSIP** Contact Group on Decadal Predictability/Prediction”



(Taylor et al. 2009...11)

Decadal Climate Prediction “Panel”

- Origin
 - a child of WGSIP and WGCM and the decadal prediction component of CMIP5
- Focus
 - the development and support of both the science and practice of decadal prediction
 - the provision of an archive of decadal prediction information for research and applications
 - to provide advice on CMIP5 *practicalities*
 - drift adjustment
 - every year initial conditions
 - data priorities
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