A Proposal for CMIP6

from the Aspen Global Change Institute workshop participants

(brief report submitted to Eos)

WORKSHOP: NEXT GENERATION CLIMATE CHANGE EXPERIMENTS NEEDED TO ADVANCE KNOWLEDGE AND FOR ASSESSMENT OF CMIP6

August 4-9, 2013

Aspen, CO, USA

Session co-chairs: Jerry Meehl, Richard Moss, Karl Taylor

Session organizing committee members: Veronika Eyring, Ron Stouffer, Sandrine Bony

WCRP World Climate Research Programme

CMIP6: Toward understanding past, present and future climate

a distributed organization:

- Establish a set of CMIP diagnostic evaluation and "characterization" (DEC) experiments
  - done by most groups as part of the development cycle.
  - revisited whenever a new model was developed
  - The basis for the Model Intercomparison Projects
  - Evolve only slowly (10-15 yr time scales)
  - CMIP Panel continues to manage the details of these experiments,
- Around these experiments build CMIP6 with additional, specialized intercomparisons ("MIPs") that would make use of the same standards and infrastructure.
  - Individual MIPs manage details of experimental design and variable lists and etc.; each MIP would designate which experiments would be part of CMIP6 and thus targeted for wider participation of many modeling groups, and which would be other specialized experiments for their own communities
  - CMIP Panel has oversight/approval of the elements of the MIP experiments that are part of CMIP6

communication

- CMIP Panel facilitates communication between MIP co-chairs and the model group contacts to help with coordination between MIPs, and between the MIPs and the modeling groups

CMIP Panel:

- Coordinate diagnosis and evaluation simulations with the community
- approve experiments and variable lists etc. that are to be part of CMIP6
- Coordinate with WCRP Grand Challenges

MIPs:

- Address WCRP Grand Challenges and other science questions
- Suggest model simulations to address these science questions
- Output list for CMIP6 data request
- MIPs determine which experiments are run when

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Framing CMIP6 within the WCRP Grand Challenges

- Clouds, Circulation and Climate Sensitivity
- Changes in Cryosphere
- Climate Extremes
- Regional Climate Information
- Regional Sea-level Rise
- Water Availability

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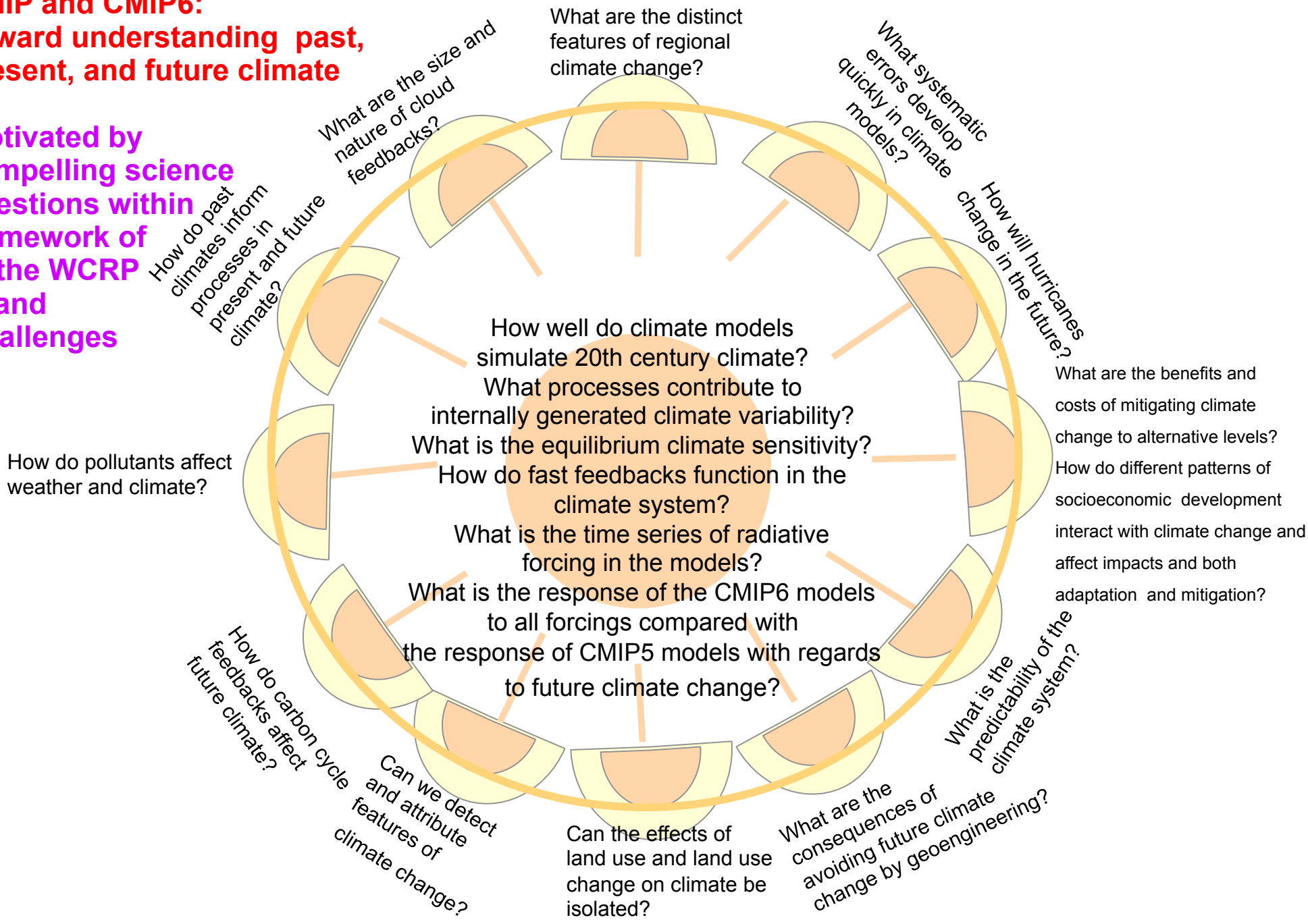
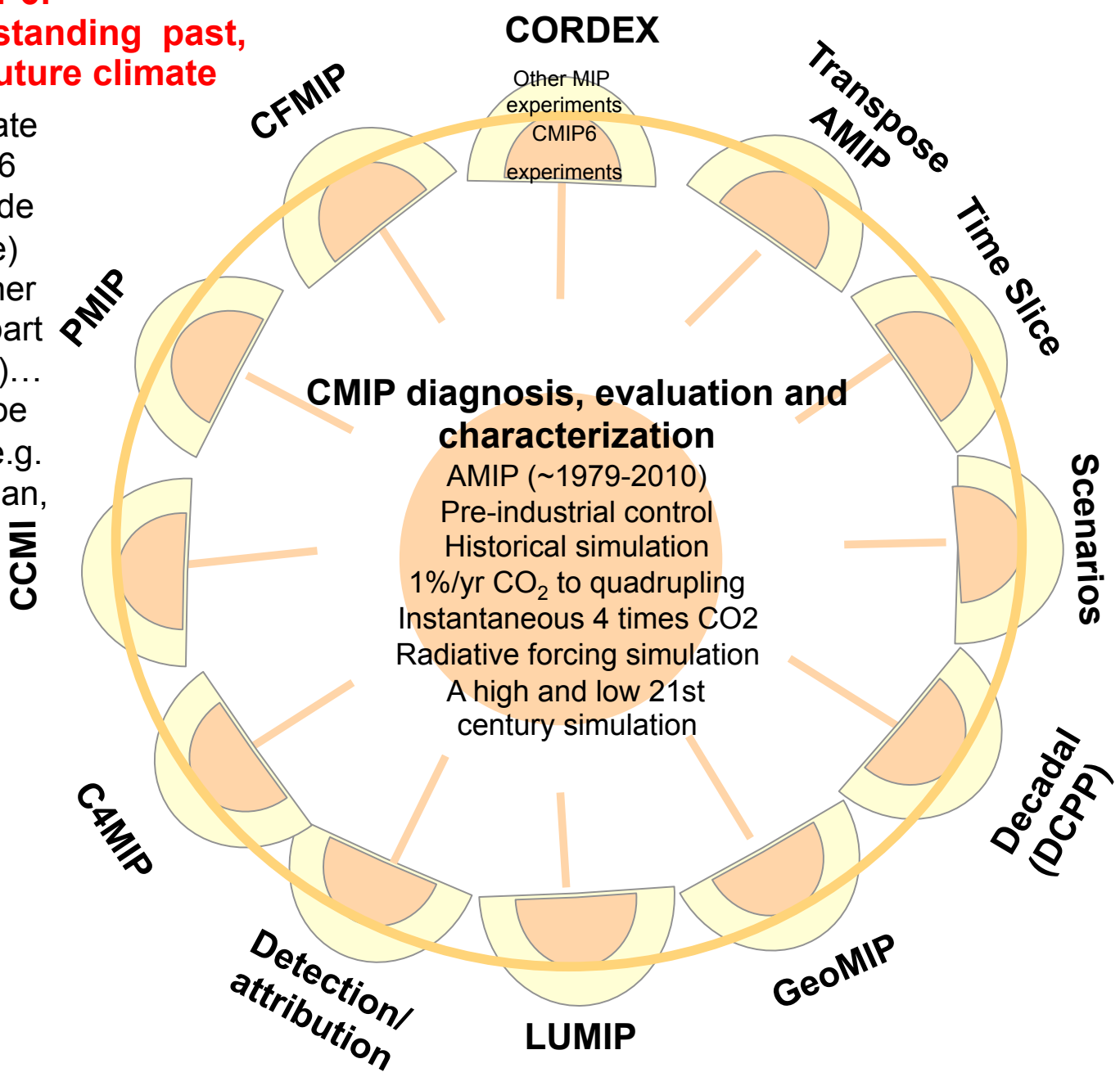
CMIP and CMIP6: Toward understanding past, present, and future climate

motivated by compelling science questions within framework of of the WCRP Grand Challenges



CMIP and CMIP6: Toward understanding past, present, and future climate

The MIPs designate which are CMIP6 experiments (inside the orange circle) and which are other experiments not part of CMIP6 (yellow)… and there could be additional MIPs (e.g. CORE-forced ocean, ENSO, etc.)



Issues

More idealized experiments? (like 1% CO2 but for land use, aerosols, etc.); need recommendations from community and demonstration experiments

Science issues:

- 1) overshoot scenarios (in which GHG concentrations peak above their eventual stabilization levels and then decline);
- (2) emissions of short-lived climate forcers;
- (3) land use and land cover change;
- (4) integrated analysis of impacts and responses.

Sampling issue of AOGCMs vs. ESMs in scenario matrix

Three elements of forcing data sets:

1. **emissions to concentrations non-CO2 (CCMI)**
2. **Emissions to concentrations CO2 (invite participation in advance)**
3. **Formulate and harmonize land use/land cover (land use community)**

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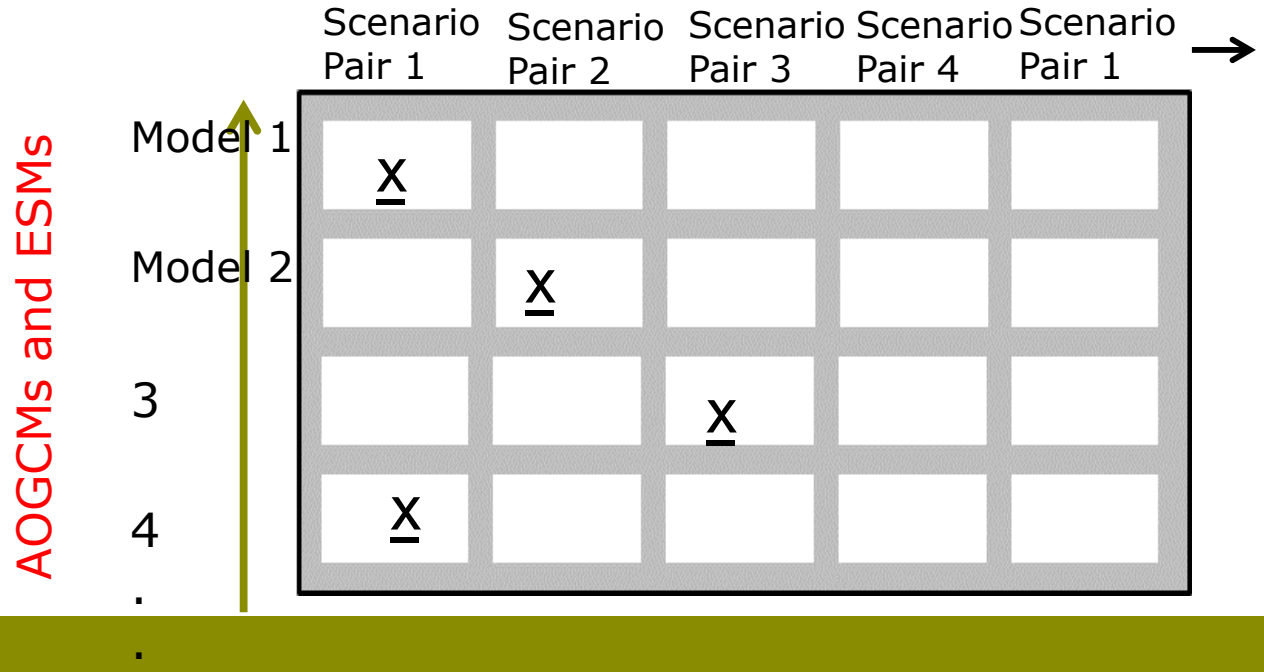
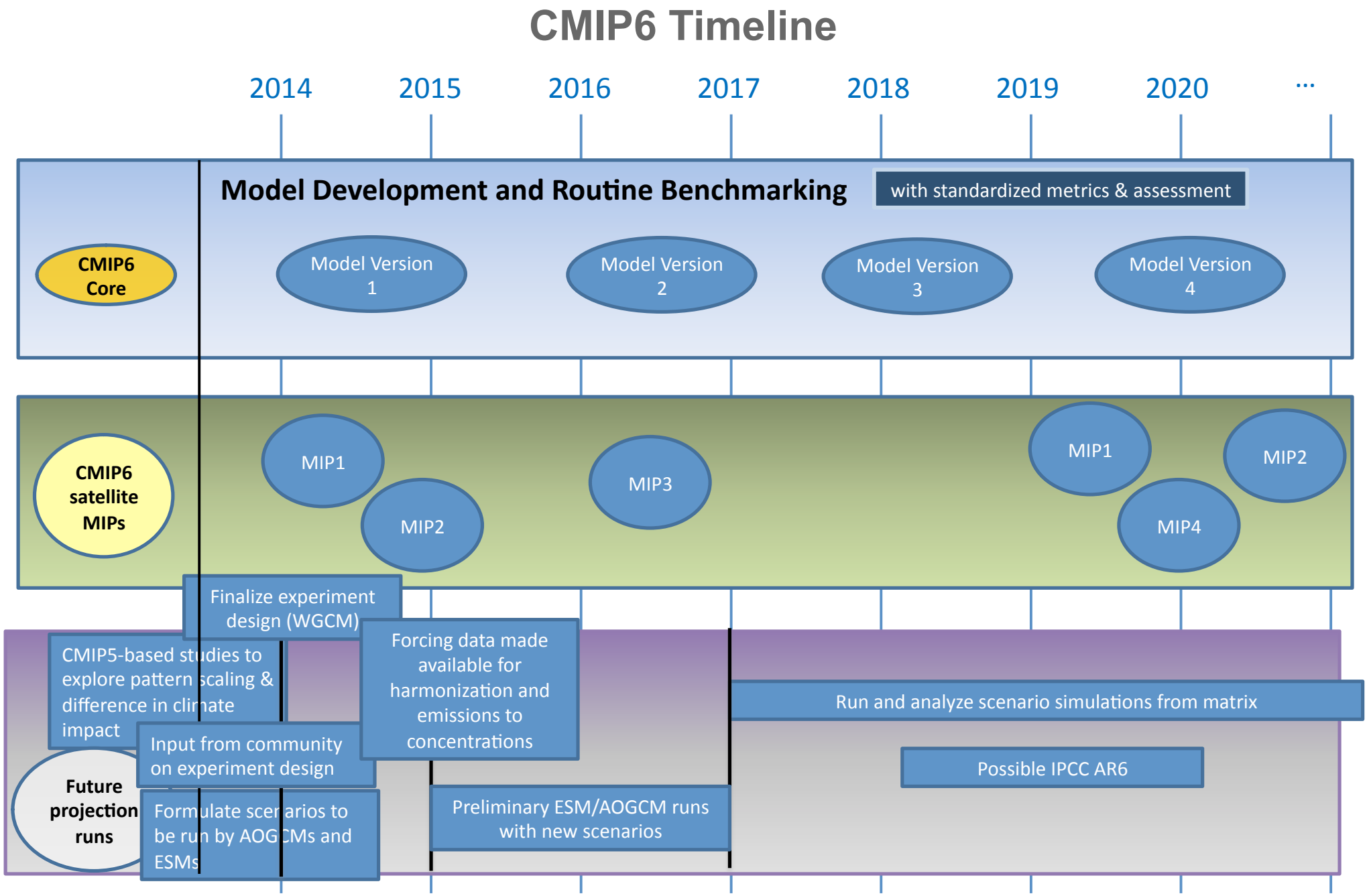
Sample different combinations of scenario pairs and AOGCMs/ESMs (sampled in an appropriate way, e.g. climate sensitivity, enough realizations)

Paired non-mitigation/mitigation scenarios



IAM and climate modeling community decides which scenario pairs make most sense:

1. baseline/mitigation scenario pairs for research on benefits of mitigation related to land use change, short lived climate forcers, etc.
2. An overshoot scenario


CMIP6 Timeline
2014
2015
2016
2017
2018
2019
2020
...
Model Development and Routine Benchmarking
with standardized metrics & assessment
CMIP6 Core
Model Version 1
Model Version 2
Model Version 3
Model Version 4
CMIP6 satellite MIPs
MIP1
MIP2
MIP3
MIP1
MIP2
MIP4
Finalize experiment design (WGCM)
CMIP5-based studies to explore pattern scaling & difference in climate impact
Forcing data made available for harmonization and emissions to concentrations
Run and analyze scenario simulations from matrix
Input from community on experiment design
Possible IPCC AR6
Future projection runs
Formulate scenarios to be run by AOGCMs and ESMs
Preliminary ESM/AOGCM runs with new scenarios