Australian CMIP6 model plans

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Outline

• Coupled modelling plans for CMIP6
• Points from CMIP5 survey
• Comments on CMIP6
The Centre for Australian Weather and Climate Research
A partnership between CSIRO and the Bureau of Meteorology

**ACCESS-CM2**
AOGCM for CMIP6

**Coupling**
OASIS-MCT
Atmosphere
Met Office GA6.0

**Land Surface**
CABLE 2

**Ocean**
GFDL MOM5 or MOM6

**Sea Ice**
CICE 5

CSIRO and BoM through CAWCR
Centre of Excellence for Climate System Science
Prototype
Current status

Accessibility
Coupling
JULES framework

Land Surface
CABLE 2

Atmosphere
Met Office ~ GA1.0

Awaiting release of GA6.0

Ocean
GFDL MOM4p1

Sea Ice
CICE 4

Awaiting timing of of MOM6 release

Coupling
OASIS-MCT

CICE5 release – being implemented
Low resolution configuration

• Atmospheric resolution – N96 (~1.2°lat; ~1.8°lon); 85 levels
  • CMIP5 version – N96; 38 levels
• Oceanic resolution – compare ~1 deg., 0.25 deg. horizontal resolution
  • Initial configuration will have the ~1deg. – same as CMIP5 version

High resolution configuration – subsequent

• Atmospheric resolution – N216 (~0.55°lat; ~1.8°lon), 85 levels
• Oceanic resolution – 0.25 deg. horizontal
• Subject to adequate computation, and scalability
Plan – ACCESS-ESM2

- Carbon cycle coupled to N96 version of ACCESS-CM2
  - CASA-CNP terrestrial biogeochemistry
  - Matear CSIRO ocean biogeochemistry
- Include atmospheric chemistry (UKCA) when ready

Potential CMIP6 submissions - current view

- ACCESS-ESM2 (at N96)
  - Perform extensive set ~2016/17/18
- ACCESS-CM2-hr (at N216)
  - Perform limited set ~2017/18
CMIP5 survey

- **CMIP5 experimental design**
  - Multi-tier approach was very useful in prioritisation
  - RCP2.6 very widely used – low end as “core”
  - Idealised experiments extremely useful
    - 4xCO2 – extend for several centuries as Tier 1?
    - sstClim-style experiments to understand radiative forcings of individual changes

- **Forcings historical/RCPs**
  - Specification is required for historical extension, to benefit detection/attrition studies. For CMIP6, an extension protocol should be defined through 2020 at least.
  - Aerosol future spread not well sampled in scenarios.
  - Some additional specification required, e.g., level of background stratospheric volcanic aerosol in piControl
CMIP5 survey

• **Standard output**
  - Prioritisation of atmospheric variables would be helpful. Suggest survey the usage of fields in CMIP5.
  - Suggest save monthly mean 3-D fields of moisture transport $u_q$ and $v_q$.

• **Data volume**
  - Concern about volume of data for CMIP6. Systems are only recently working adequately for CMIP5 volume.
Further comments regarding CMIP6

- **Experimental design**
  - Concept of limited “CMIP characterisation” set is broadly endorsed
  - Focus on WCRP Grand Challenges is supported, but matching to some of the Grand Challenges (e.g., Extremes) is not yet clear.

- **Forcings historical/RCPs**
  - High- and low-end scenarios in characterisation set is supported. Encourage more ensemble members in preference to more scenarios.
  - The characterisation scenarios should be robust, to likely “stand the test of time” so as to be meaningful over multiple development cycles.
    - RCP8.5 could do as high end
    - Low end needs revision from current RCP2.6?
  - Additional scenarios, e.g., a mid-range scenario and a scenario with different aerosol management assumptions, are useful but can lie in a separate ‘scenarios’ sub-project.
Further comments regarding CMIP6

• **Science**
  - Simulations that explore systematic errors in simulating climate “drivers” in more detail (monsoon, blocking, hemispheric modes, ENSO, etc.) would have support.
  - Experimentation to systematically explore variation of climate sensitivity between model versions would have support. Parameter perturbation experimentation?

• **Evaluation**
  - International approach to basic model evaluation would be helpful.
Further comments regarding CMIP6

• More information on the models would benefit (user views)
  • More information on model “family tree” would be useful – differences and similarities between model components in different models and versions.
  • More information on model tuning would be useful – do not want to have to second guess what the modellers may have tuned for.

• Australian CMIP user community would like to be a part of the discussion on CMIP6 planning