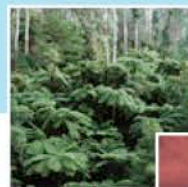# Australian CMIP5 modelling activities

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25 September 2012

Australian Government
Bureau of Meteorology

The Centre for Australian Weather and Climate Research
A partnership between CSIRO and the Bureau of Meteorology

Outline

- **Coupled modelling for CMIP5**

    - CSIRO Mk3.6

    - ACCESS
        - ACCESS1.0
        - ACCESS1.3

- **CMIP5 – what worked and could work better**

Australian Government
Bureau of Meteorology

CSIRO

CSIRO-Mk3.6: Long-term experiments (Rotstayn et al. 2012; Jeffrey et al. 2012)

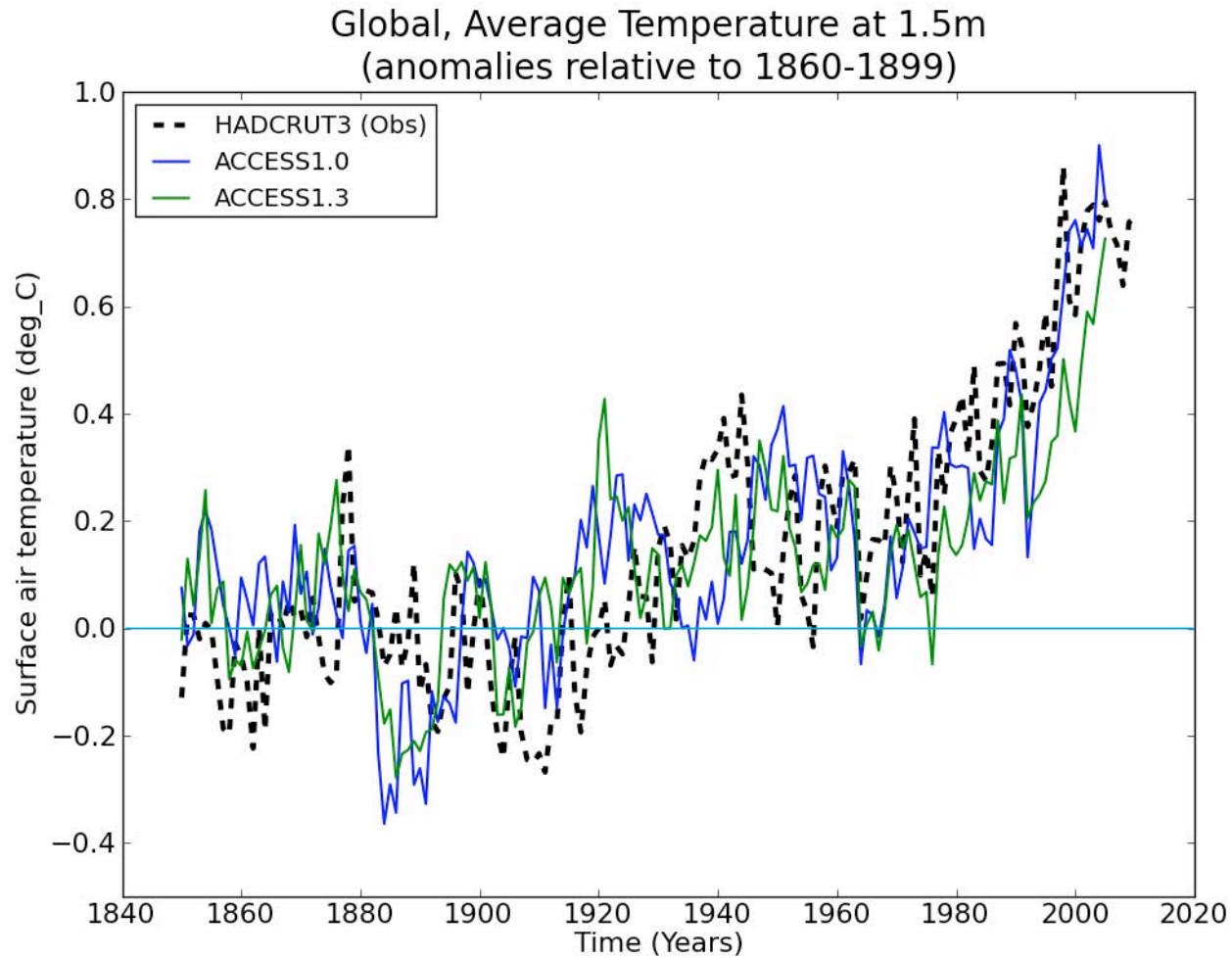| Experiment	Length	Ens.
Control	500 yr (160 yr spin up)	1
Historical	1850-2005	10
AMIP	1979-2009 (30 yr spin up)	10
Mid-Holocene	100 yr (300 yr spin up)	1
RCPs 2.6, 4.5, 8.5, 6.0	2006-2100 *(RCPs 4.5 & 8.5: 3x 2100-2300)*	10
1%/yr CO_2 to 4x	140	1
AGCM + control SSTs	30	1
AGCM + control SSTs + 4x CO_2	30	1
4x CO_2	150 + 5	1+11
AGCM + control SSTs + AA	30	1
AGCM + control SSTs + SA	30	1
Historical (natural)	1850-2012	10
Historical (GHGs)	1850-2012	10
Historical (anthropogenic)	1850-2012	10
Historical (all except ozone)	1950-2012	10
Historical (all except AA)	1850-2012	10
Historical (AA)	1850-2012	10
Historical (Asian aerosols)	1850-2012	10

ACCESS1.0 and 1.3
CMIP5 'core' simulations

Experiment	Length	Ensemble
Preindustrial Control	500 yr	1
Historical	1850-2005	2 – 3 +
RCP 4.5	2006-2100	1
RCP 8.5	2006-2100	1
1%/yr CO_2 increase to 4x	140 yr	1
Abrupt $4xCO_2$ increase	150 yr	1
AMIP	1979 - 2008	1

- sstClim** experiments yet to be done
- Output fields published on the NCI node of the ESG.
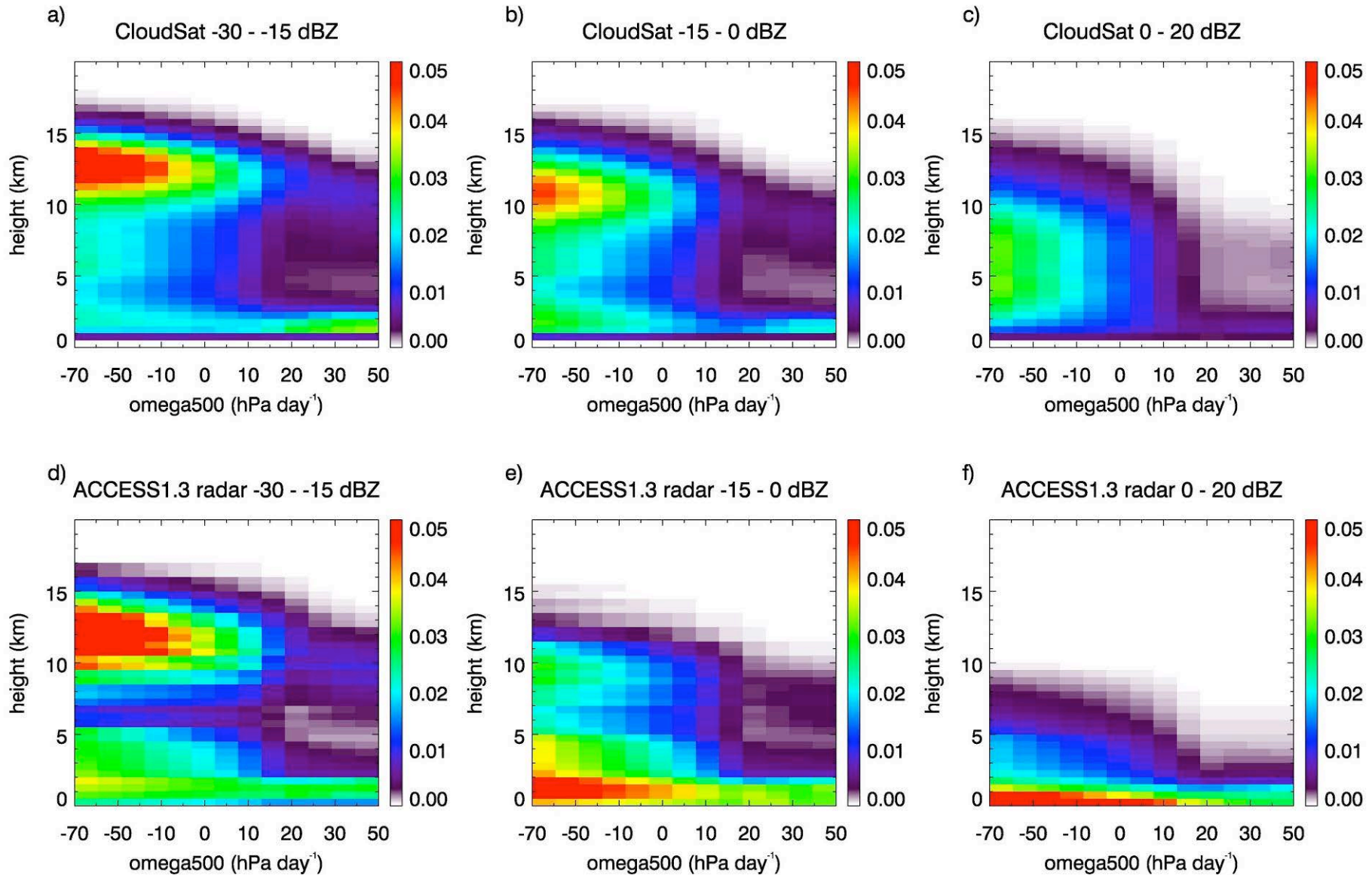
Reference: Bi et al. (2012, submitted), Dix et al. (2012, submitted)

Annual Mean surface air temperature in the Historical Runs

Global, Average Temperature at 1.5m (anomalies relative to 1860-1899)

Legend:
- HADCRUT3 (Obs)
- ACCESS1.0
- ACCESS1.3

Dix et al. (2012, submitted)

a) CloudSat -30 - -15 dBZ

b) CloudSat -15 - 0 dBZ

c) CloudSat 0 - 20 dBZ

d) ACCESS1.3 radar -30 - -15 dBZ

e) ACCESS1.3 radar -15 - 0 dBZ

f) ACCESS1.3 radar 0 - 20 dBZ

Franklin (2013, in prep.)

Further plans for CMIP5 for ACCESS

- Perform expanded set of experiments from 'Tier 1' and 'Tier 2' set and publish output on ESG
  - Choose following consultation with stakeholders

- CFMIP

- CMIP5 ESM

- CMIP5 decadal prediction (using seasonal pred. system)

- Potential – Transpose AMIP

- Potential – CMIP5 atmospheric chemistry

- Potential if Univ. collaboration – PMIP

What has worked and not worked so well for CMIP5 for Australian researchers
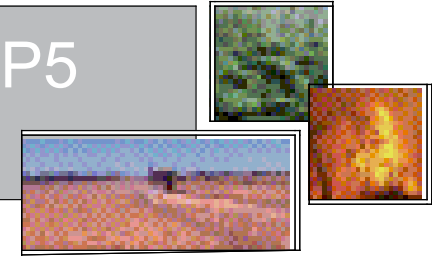
- **Data upload and access**

    - Overall, much better experience than CMIP3/IPCC AR4.

    - Prefer not to have to un-publish data before publishing additional fields

    - CMIP5 questionnaire seen as 'difficult', contributing to delay in completion

    - Software delays resulted in delays/extra work for analysts.

        – Concern about how a putative "near-Exabyte" of output for a CMIP6 may be handled.

- **CMIP5 data scope/specification**

    - Need a prioritisation of atmospheric fields, to allow modelling groups to prioritise their processing. Suggest survey the usage of fields in CMIP5.

    - More information about the spin-up methodologies used by the modelling groups would help analysts study residual climate drifts in the piControl simulations.

    - Certain additional fields would be helpful to analysts

What has worked and not worked so well for CMIP5 for Australian researchers
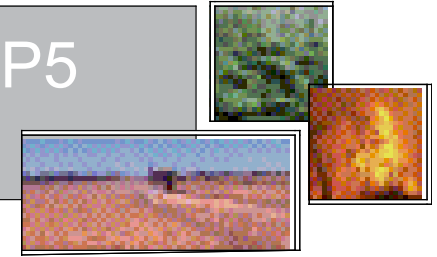
- **Experimental design**

    - RCPs do not sample the range of plausible pathways for some key forcings, e.g., no case has aerosol emissions remaining high for several more decades.

    - Need to consider further the background stratospheric volcanic aerosol loading for the piControl. Zero loading seems inappropriate, affecting especially SLR.

    - Details of land-use change specification in the RCPs largely left to the individual groups. Some positives and negatives here. Appears to have very large impact on the range of terrestrial carbon uptake in ESMs.

- **Other**

    - International approach to model evaluation would be helpful.

    - Ongoing effort needed to ensure adequate recognition for modelling groups.

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