

The ACCESS submission to CMIP6

www.csiro.au

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ACCESS – Australian Community Climate and Earth System Simulator

INSTITUTE: CSIRO-ARCCSS-BoM

- CSIRO Climate Science Centre
- Australian Research Council Centre of Excellence for Climate System Science (ARCCSS)
- Bureau of Meteorology

ACCESS – Australian Community Climate and Earth System Simulator

ACCESS-CM2 (AOGCM for CMIP6)

- Atmosphere – UK Met Office GA7.1 UM10.5, **currently testing with GA7.0, UM10.3**
- Ocean – NOAA/GFDL MOM5 working
- Sea ice – LANL CICE5.1 working **multi-layer (4 layers, 5 categories following UKMO)**
- Land surface – CABLE2.0.x Community Atmosphere Biosphere Land Exchange, **implementing (currently using UKMO/JULES)**

ACCESS-ESM2 (ESM for CMIP6)

ACCESS-CM2+

- Terrestrial biogeochemistry - CASA-CNP
- Oceanic biogeochemistry – WOMBAT (Matear, CSIRO)

ACCESS-CM2 Resolution

Standard Resolution

- Atmospheric resolution – N96 ($\sim 1.2^\circ$ lat; $\sim 1.8^\circ$ lon); L85
- Ocean/ice resolution – ~ 1 deg. (enhanced tropics, high latitudes); L50
- Will form basis of ACCESS-ESM2

High Resolution

- Atmospheric resolution – N216 ($\sim 0.55^\circ$ lat; $\sim 0.8^\circ$ lon), 85 levels

ESM not computationally viable for CMIP6

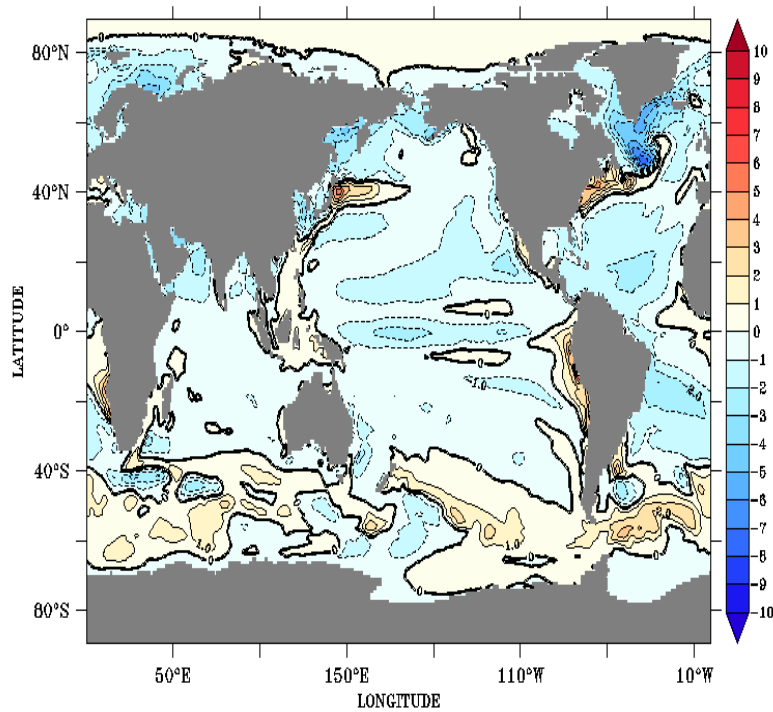
- Oceanic resolution – 0.25 degrees horizontal for DECK, historical, ScenarioMIP
- Subject to adequate computational resources
- AOGCM only

Sea Surface Temperature Bias (yrs 41-50)

ACCESS-CM1.4

ENSEMBLE Member 41
NOAA/EMSL CMAP
10-07-2015 1505500

DEPTH (m) : 5

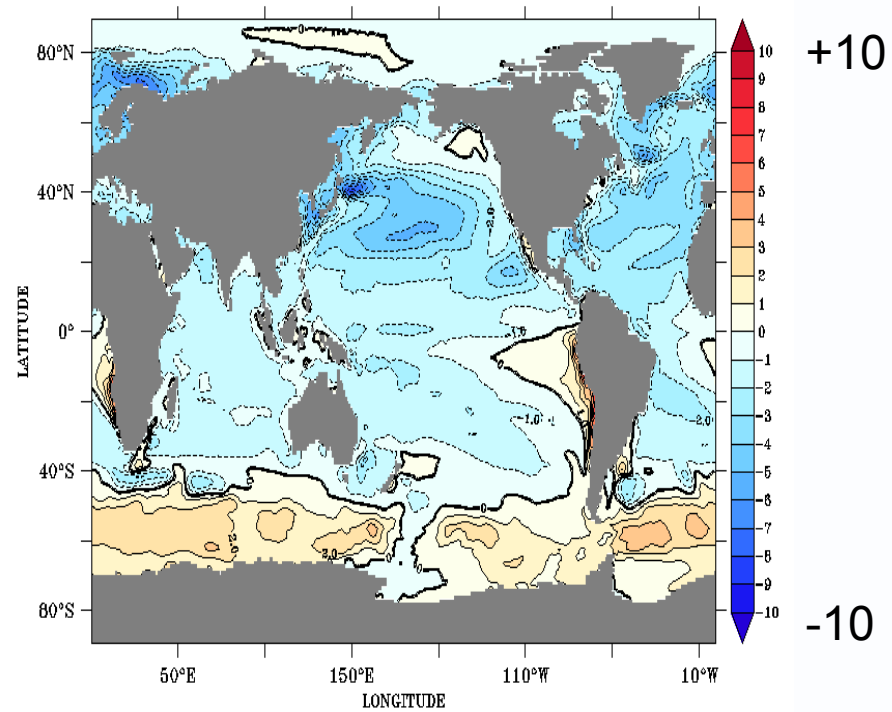


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ACCESS-CM2-GA7

ENSEMBLE Member 41
NOAA/EMSL CMAP
11-07-2015 1864467

DEPTH (m) : 5



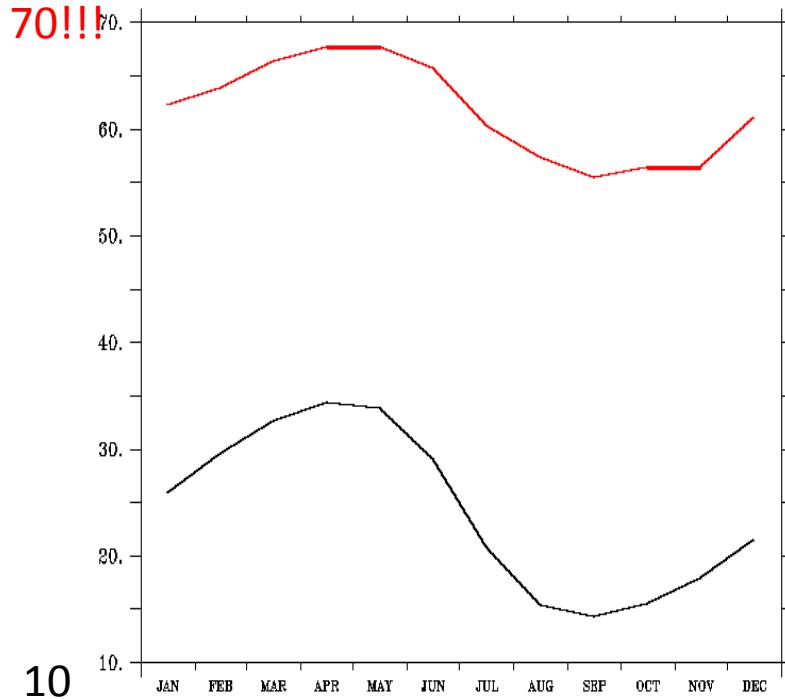
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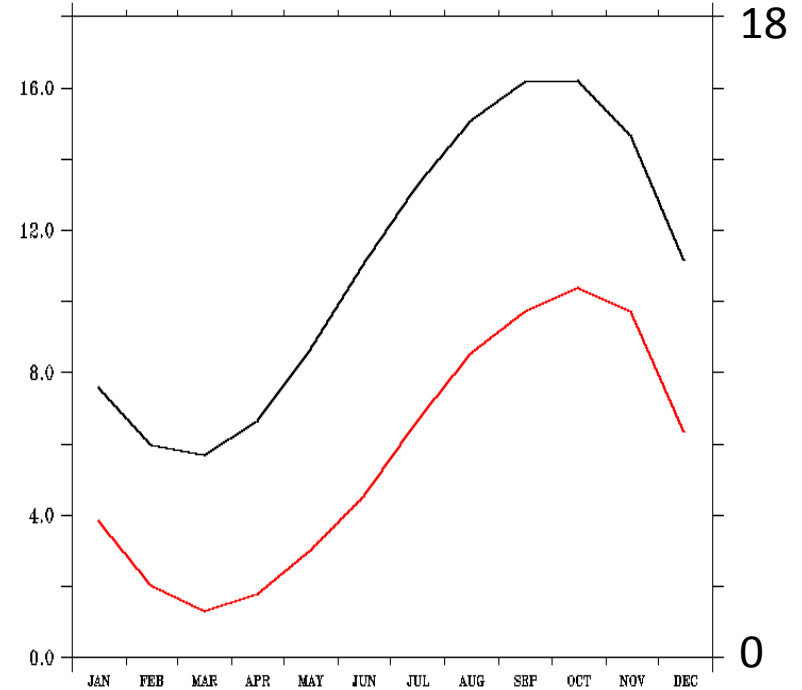
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Sea Ice Volume Climatology (yrs 41-50)

Northern Hemisphere



Southern Hemisphere



--- ACCESS-CM1.4
--- ACCESS-CM2-GA7

- Arctic too thick, Southern Ocean too thin
- Multi-layer sea-ice issues resolved with thanks to Alex West (UKMO)

ACCESS CMIP6 Participation

Why?

- Demonstrate ACCESS is a world-class system
- CMIP6 developed to address important science questions (GC's etc.)
- Large uptake via Earth System Grid

CMIP6 Model Intercomparison Project commitments

- DECK – Simon Marsland (CSIRO)
- ScenarioMIP – Simon Marsland
- DAMIP (detection/attribution) – David Karoly (ARCCSS)
- C4MIP, LS3MIP, LUMIP (land use) – Rachel Law (CSIRO) ???
- OMIP, FAFMIP (oceans) – Simon Marsland
- GeoMIP (geoengineering) – Andrew Lenton (CSIRO)
- RFMIP - Marsland

Model Name: **ACCESS-ESM2**;

Institution: **CSIRO-ARCCSS-BoM**; Country: **Australia**

Forcing Dataset	Will be used (YES/NO)	Pre-industrial		Historical	
SLCF Emissions	YES		Preliminary		Preliminary
Biomass Burning	YES		Preliminary		Preliminary
GHG Emissions	YES		Preliminary		Preliminary
Land-use	YES		Preliminary		Preliminary
GHG concentrations	YES		Preliminary		Preliminary
Ozone concentrations	YES		Preliminary		Preliminary
Nitrogen deposition	YES		Preliminary		Preliminary
Simple plume aerosol	NO				
Solar	YES		Preliminary		Preliminary
Stratospheric aerosol	YES		Preliminary		Preliminary
AMIP SST and SIC	YES		Preliminary		Preliminary

KEY:

OK	Testing	Preliminary	Unknown
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See CMIP Panel website at <https://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6> for details

Some history

1990/2

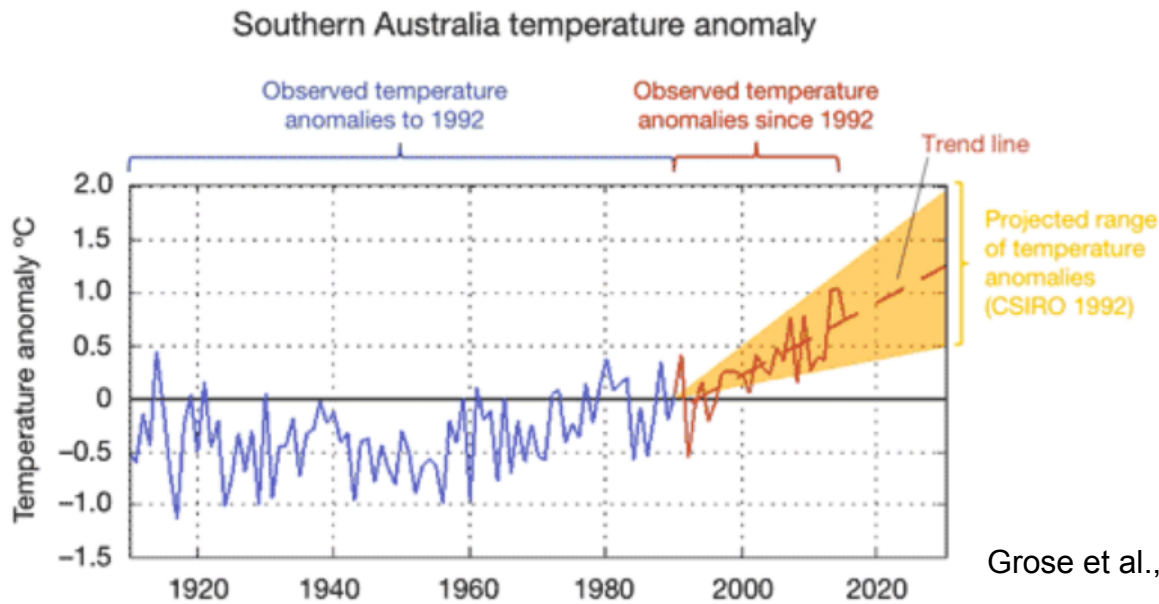
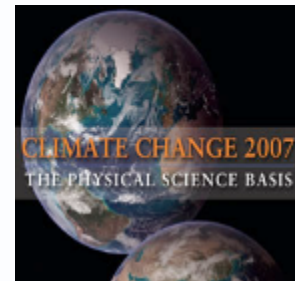
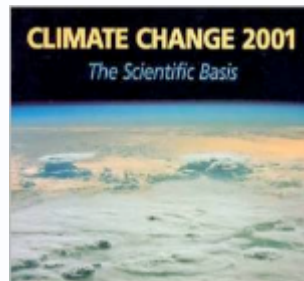
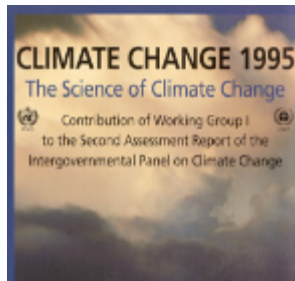
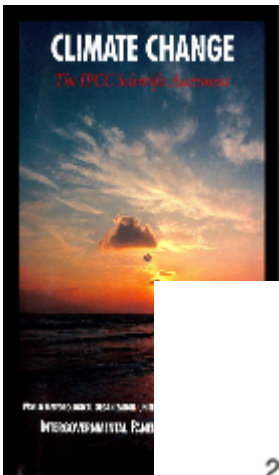
1995

2001

2007

2013

2021



Grose et al., 2016

National Environmental Science Program (NESP) Earth System and Climate Change Hub (ESCC)

Research Projects



INFORMATION PRODUCTS AND SERVICES FOR NEXT- AND END-USERS

2.8 Extreme weather projections

2.11 NCCC

2.9 Risk assessment of future carbon sources and sinks

2.7 Refining Australia's water futures

2.10 Coastal hazards

2.3 Towards an ACCESS decadal prediction system

2.6 Regional climate projections, information and services

2.5 Improving Australia's climate model (ACCESS)

2.4 Changing oceans and Australia's future climate

2.2 Enhancing Australia's capacity to manage climate variability & extremes in a changing climate

2.1 Preparing ACCESS for CMIP6

Summary and future work

Work to do

- UM10.x with GA7
- CABLE2.x implementation
- Model tuning - scientific performance (about **half** a year)

Risks

- CMIP6 funding for ACCESS-CM2 is available (NESP) – **but limited**
- Funding for ACCESS-ESM2 less certain (but likely, CSIRO) – **less likely?**
- Compute/Storage: NCI commitment to CMIP6?
- **Model untested**: Fallbacks ACCESS1.4/ESM1 and ACCESS-CM2 (UM GA6.0)
- ACCESS staffing has declined 25% over last 3 years, but more experienced and growing collaboration with ARCCSS (5x Universities in Centre of Excellence)
- **Further 33% reduction in staffing in 2016**