The ACCESS submission to CMIP6

Simon Marsland | ACCESS
CSIRO Climate Science Centre, Aspendale, VIC
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 (~1.2°lat; ~1.8°lon); L85
- Ocean/ice resolution – ~1 deg. (enhanced tropics, high latitudes); L50
- Will form basis of ACCESS-ESM2

High Resolution
- Atmospheric resolution – N216 (~0.55°lat; ~0.8°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

ACCESS-CM2-GA7

REG_tEMP - OBS_tEMP
Sea Ice Volume Climatology (yrs 41-50)

- 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

<table>
<thead>
<tr>
<th>Forcing Dataset</th>
<th>Will be used (YES/NO)</th>
<th>Pre-industrial</th>
<th>Historical</th>
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<tbody>
<tr>
<td>SLCF Emissions</td>
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<td>Preliminary</td>
<td>Preliminary</td>
</tr>
<tr>
<td>Biomass Burning</td>
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<tr>
<td>GHG Emissions</td>
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<tr>
<td>Land-use</td>
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<tr>
<td>GHG concentrations</td>
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<tr>
<td>Ozone concentrations</td>
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<tr>
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<tr>
<td>Simple plume aerosol</td>
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<tr>
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<tr>
<td>AMIP SST and SIC</td>
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KEY:  
- **OK**  
- **Testing**  
- **Preliminary**  
- **Unknown**

See CMIP Panel website at [https://www.wcrp-climate.org/wgcm-c mip/wgcm-cmip6](https://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6) for details
Some history


Grose et al., 2016
2.1 Preparing ACCESS for CMIP6

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

2.3 Towards an ACCESS decadal prediction system

2.4 Changing oceans and Australia’s future climate

2.5 Improving Australia’s climate model (ACCESS)

2.6 Regional climate projections, information and services

2.7 Refining Australia’s water futures

2.8 Extreme weather projections

2.9 Risk assessment of future carbon sources and sinks

2.10 Coastal hazards

2.11 NCCC

INFORMATION PRODUCTS AND SERVICES FOR NEXT- AND END-USERS
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