



# Getting Started with ACCESS-CM2 and ACCESS-ESM1.5

Tuesday 20<sup>th</sup> October 2020

# Getting Started

- Simon Marsland – Chair
- Martin Dix– ACCESS-CM2
- Tilo Ziehn – ACCESS-ESM1.5 overview
- Holger Wolff – ACCESS-ESM1.5 operation
- Chloe Mackallah – ACCESS CMIP6 datasets
- House rules – type “!” in chat to ask a question, or enter questions directly into the chat



# An introduction to running ACCESS CM2

Martin Dix: CSIRO Climate Science Centre

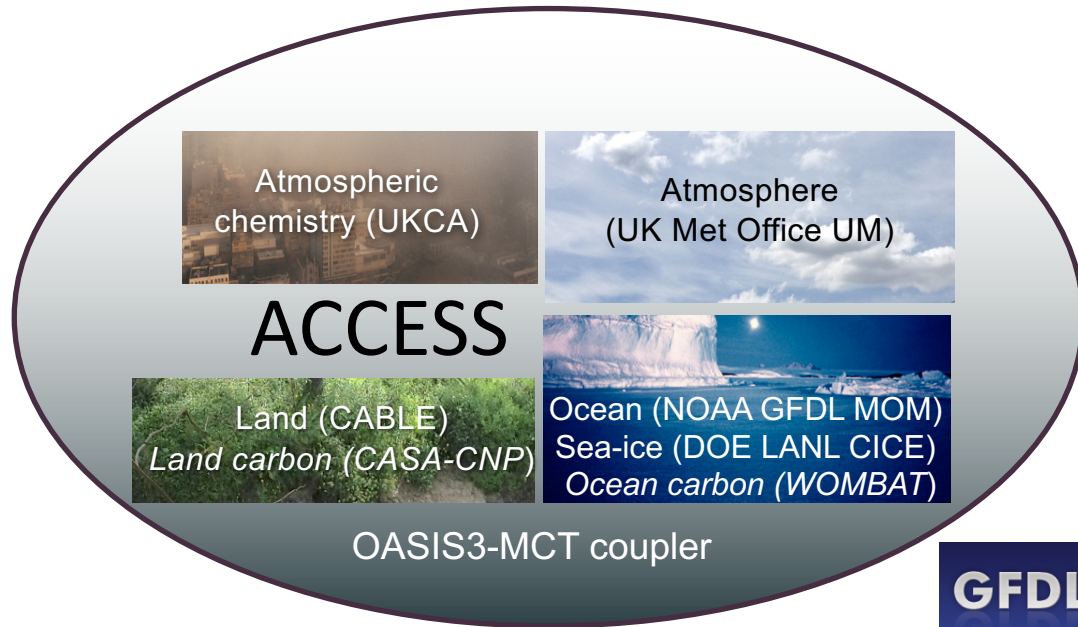
# Australian Community Climate and Earth System Simulator

## National effort since 2005

- All timescales, weather to climate
- Local and imported components
- CSIRO, BoM, Universities
- NCI

## Support from

- NESP Earth System and Climate Change Hub



Australian Government  
Australian Research Council





# Modelling environment at NCI

- Model runs on NCI peak system gadi
  - Typical configuration ~1000 cores
- Shared data in `~access, /g/data/access`
  - E.g. ancillary files, initial conditions, pre-built libraries
- NCI cloud machine `accessdev`
  - Rose/cylc for model suite control
  - Web services (cylc review)
  - Trac for access documentation and tickets for system and model development
  - Collaboratively managed by CSIRO, CLEX, BOM and NCI
- `access-svn`
  - Older code repositories

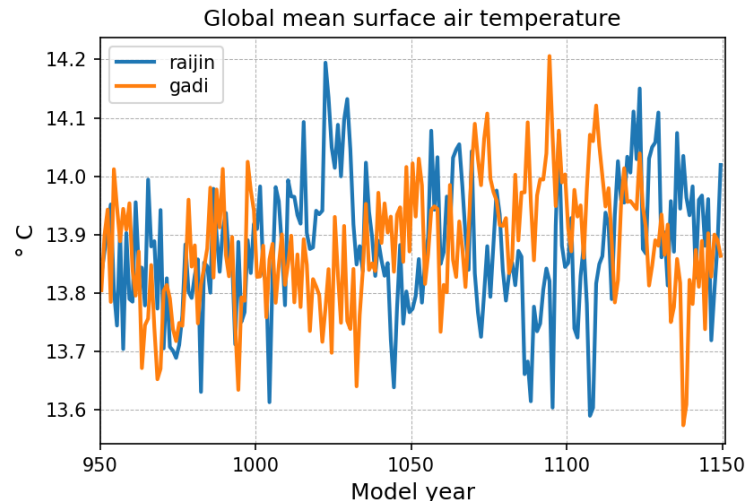


# ACCESS-CM2 configuration

- Atmosphere: UK HadGEM3-GC3.1 atmosphere but with CABLE replacing JULES
  - 1.875° x 1.25° resolution, 85 levels
  - New atmospheric model with more sophisticated chemistry/aerosol/cloud interactions
  - Physical model only – no carbon cycle
  - UM vn10.6.1 (No direct netCDF output)
- Ocean: MOM5
  - Tripolar grid, ~1° resolution, 50 levels
- CICE5
- OASIS3-mct coupler
- For details, Bi et al 2019, <https://doi.org/10.1071/ES19040>

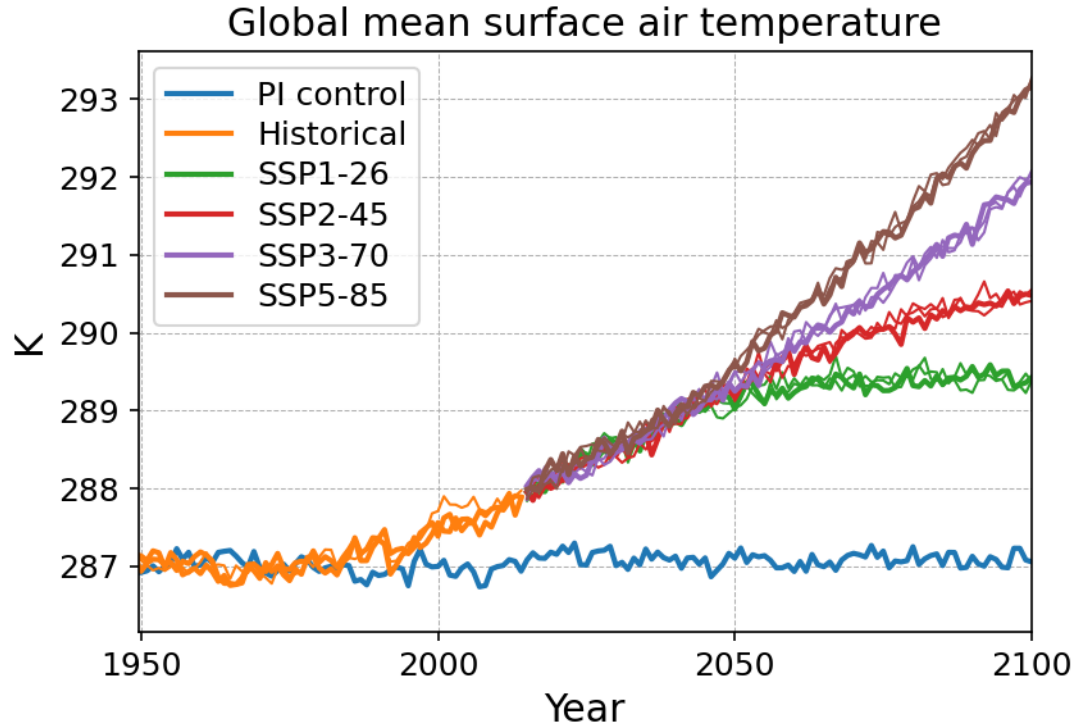
# Raijin and Gadi

- CMIP6 DECK experiments run on rajin using Intel v17 compiler
- Cannot reproduce these exactly on gadi with the 2019 compiler
- Tests show differences no larger than those expected from floating point roundoff differences



Gadi 200 year PI control repeat  
Global mean  $\Delta T = 0.004 \pm 0.04$  K

# Extra CMIP6 ensemble runs on gadi

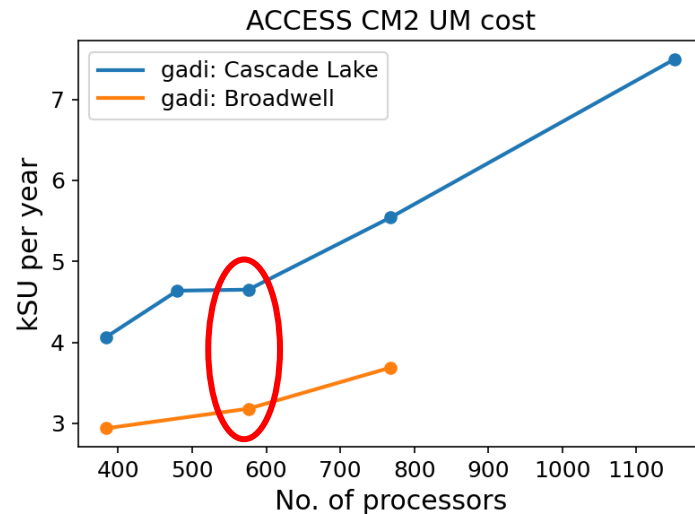
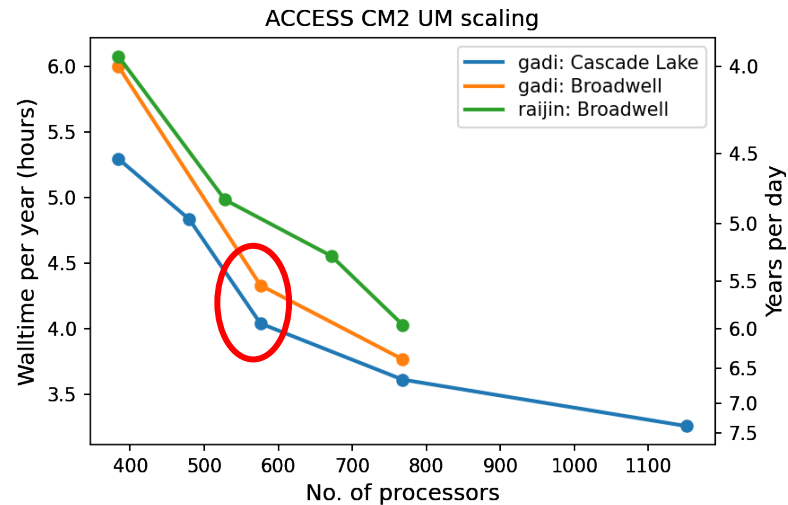


Thick lines Raijin  
Thin lines Gadi



# Scaling and cost

- CM2 typically uses ~ 1000 cores on gadi
  - ~ 4 hours per simulated year
  - 5-6 years/day throughput for a single experiment
  - Atmosphere limits scaling and dominates cost
- Originally ~25% speedup from rajin to gadi
  - Now Broadwell cores on gadi seem faster than on rajin?
- 24x24 UM decomposition seems best balance of cost and speed



# Code repositories

- UM and rose suites
  - Met Office Science Repository Service (MOSRS)
  - CM2 branches in UM and JULES repos
  - Local mirror for builds
- MOM
  - <https://github.com/mom-ocean>
- CICE
  - <https://access-svn.nci.org.au/svn/cice>
- Driver scripts
  - [https://trac.nci.org.au/svn/access\\_tools/access-cm2-drivers](https://trac.nci.org.au/svn/access_tools/access-cm2-drivers)

# Rose/cylc suites

- Task dependencies
  - Build -> Run -> Post-process -> Run ->
- Build configuration
  - Compiler and library versions
  - Component model code branches
- Model configuration
  - Namelists and data files
- Experiment configuration
  - Run length, queues
- All text files
  - Edit directly or with rose-edit

# Release suites

- PI control: u-br565
  - Historical: u-bx616
  - AMIP: u-bn157
- 
- `accessdev:~% rosie checkout u-bx616`
  - `accessdev:~% rosie copy u-bx616`



# Suite structure

u-bx616

```
├── app
│   ├── cice
│   │   └── rose-app.conf
│   ├── coupled
│   │   └── rose-app.conf
│   ├── fcm_make_drivers
│   │   ├── file
│   │   │   └── fcm-make.cfg
│   │   └── rose-app.conf
│   ├── fcm_make_um
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│   │   └── rose-app.conf
│   ├── housekeep
│   │   └── rose-app.conf
│   ├── install_ancil
│   │   ├── opt
│   │   │   └── rose-app-ozone.conf
│   │   └── rose-app.conf
│   ├── install_cold
│   │   └── rose-app.conf
│   ├── make2_cice
│   │   ├── file
│   │   │   └── Macros.Linux.raijin
│   │   └── rose-app.conf
```

```
├── mom
│   ├── opt
│   │   └── rose-app-mom-impose-init.conf
│   └── rose-app.conf
├── netcdf_conversion
│   └── rose-app.conf
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│   └── rose-app.conf
├── retrieve_ozone
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├── ozone.rc
├── rose-suite.conf
├── rose-suite.info
└── suite.rc
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**Overall  
control**

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UM branches &  
compiler options

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Compiler &  
library versions  
MOM & CICE  
branches

**Build**

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**Model  
namelists**



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## Start-up

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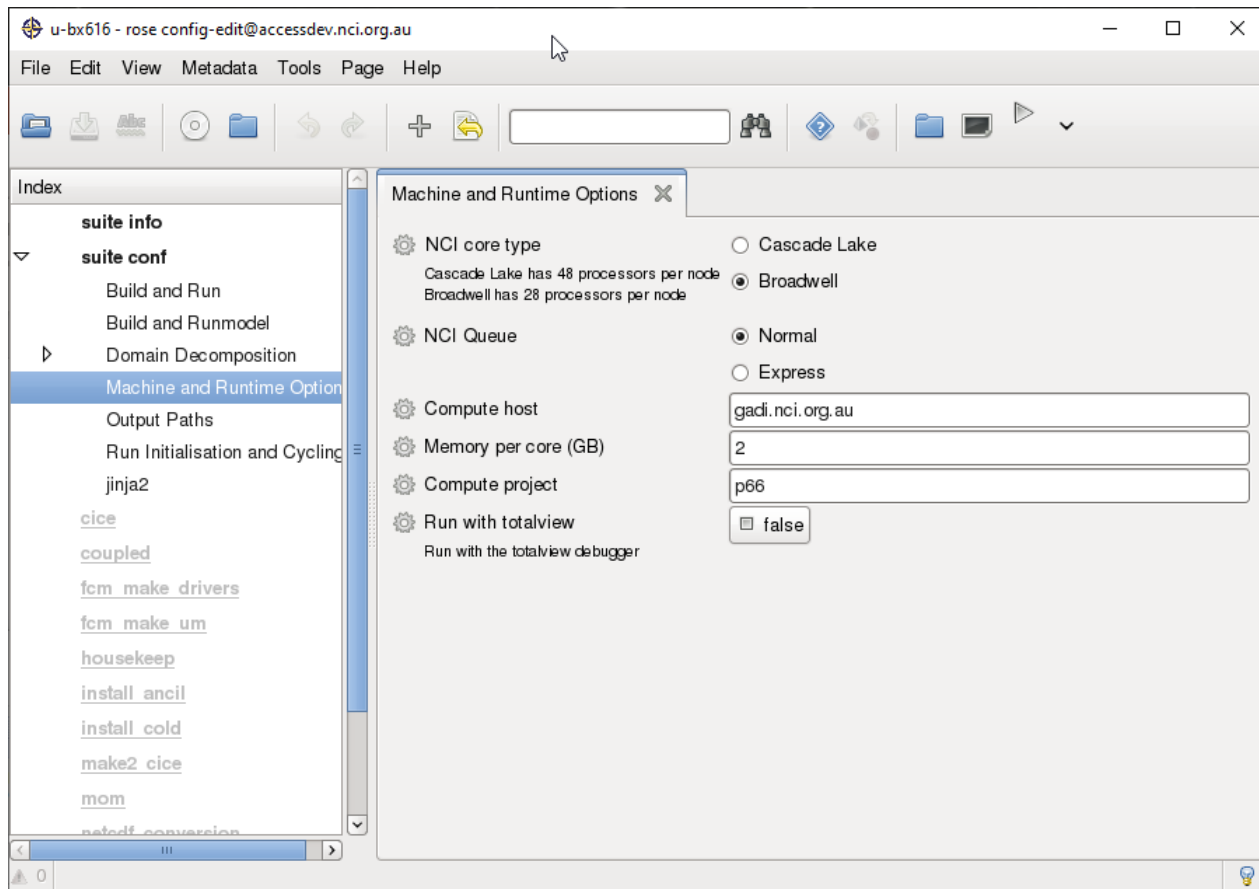
**Post-proc**

Conversion of UM  
STASH to netCDF

# Special features/limitations

- Gregorian calendar with optimised UM climate mean calculation
  - Must run in multiples of months.
  - Can only save monthly means (no seasonal or annual)
- UM config still has JULES namelists but these are ignored
- CABLE vegetation parameters set in code
- Results are sensitive to MOM decomposition and to restart frequency
- Not all control files are in suite
  - E.g. OASIS namcouple and MOM diag table

# Rose edit: Machine and run time options



In `rose-suite.conf`

```
COMPUTE_HOST='gadi.nci.org.au'  
CORE='broadwell'  
MEMORY_PER_CORE=2
```



# Rose edit: Build and run options

The screenshot shows the Rose edit interface for a configuration named 'u-bx616 - rose config-edit@accessdev.nrc.org.au'. The left sidebar contains a tree view with the following structure:

- Index
  - suite info
  - suite conf
    - Build and Run (selected)
    - Build and Runmodel
    - Domain Decomposition
    - Machine and Runtime Option
    - Output Paths
    - Run Initialisation and Cycling
    - jinja2
  - cice
  - coupled
  - fcm make drivers
  - fcm make um
  - housekeep
  - install ancil
  - install cold
  - make2 cice
  - mom
  - netcdf\_conversion

The main panel displays the 'Build and Run' configuration options:

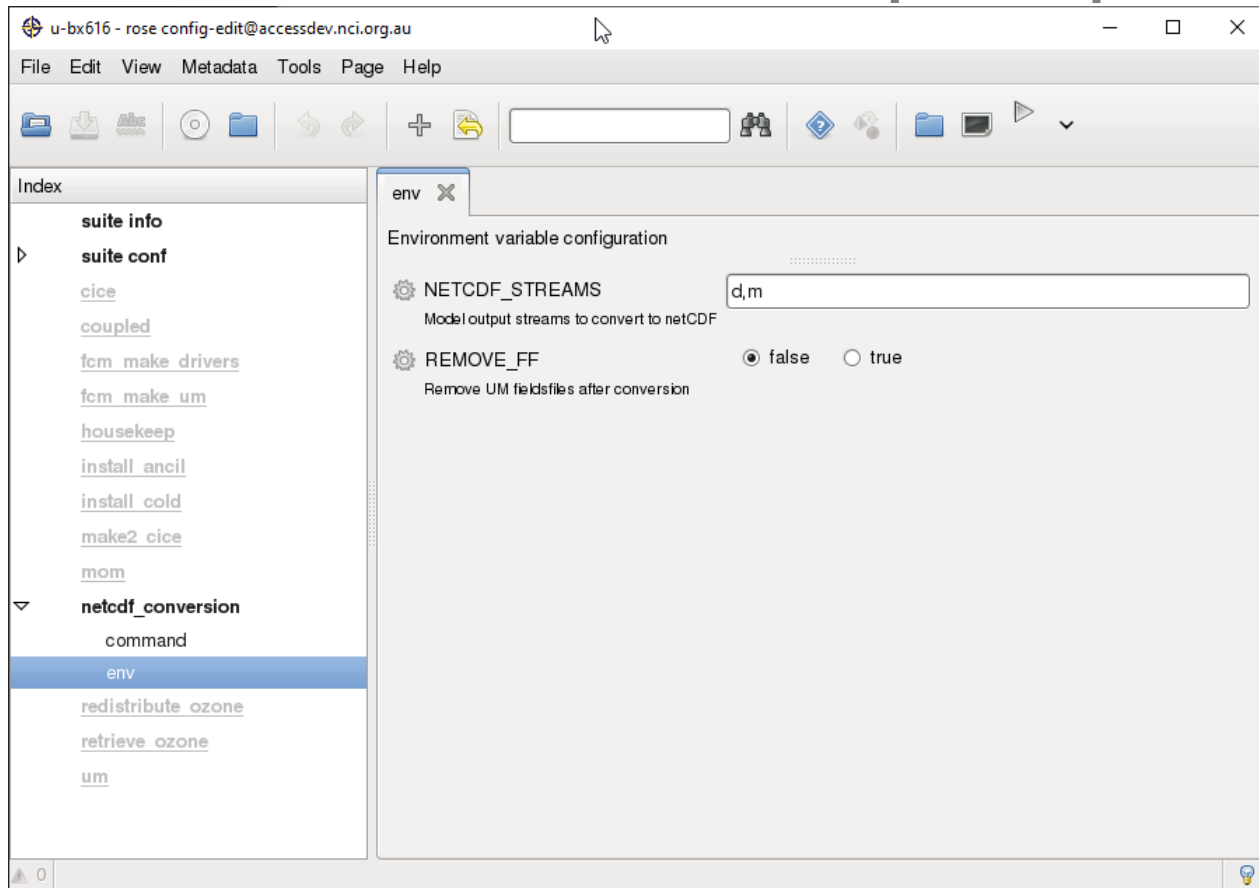
Option	Value
Build UM Build UM Reconfiguration and Atmosphere executable	<input checked="" type="checkbox"/> true
Build MOM Build MOM executable	<input checked="" type="checkbox"/> true
MOM: Build option	<input checked="" type="radio"/> 'OPT' <input type="radio"/> 'REPRO' <input type="radio"/> 'DE'
Build CICE Build CICE executable	<input checked="" type="checkbox"/> true
Install driver scripts Install coupled model control scripts	<input checked="" type="checkbox"/> true
Run Reconfiguration	<input type="checkbox"/> false
Run Model	<input checked="" type="checkbox"/> true
netCDF Post Processing Convert UM stash output to netCDF	<input checked="" type="checkbox"/> true
Housekeeping	<input checked="" type="checkbox"/> true

# Rose edit: Run options

The screenshot shows the Rose edit application window titled "u-bx616 - rose config-edit@accessdev.nci.org.au". The interface includes a menu bar (File, Edit, View, Metadata, Tools, Page, Help) and a toolbar with various icons. On the left, an "Index" pane lists configuration sections: "suite info", "suite conf" (expanded), "Build and Run", "Build and Runmodel", "Domain Decomposition", "Machine and Runtime Option", "Output Paths", "Run Initialisation and Cycling" (selected), "jinja2", "cice", "coupled", "fcm make drivers", "fcm make um", "housekeep", "install ancil", "install cold", "make2 cice", "mom", and "netcdf conversion". The main area displays the "Run Initialisation and Cycling" configuration window with the following settings:

Parameter	Value
Model basis time <small>iso8601 date time point</small>	18500101
Total Run length <small>From model basis time: iso8601 date period</small>	P165Y
Cycling frequency <small>Automatic resubmission frequency as per cycling period</small>	P6M
Wallclock time <small>For each model run task: Hours:Mins:Secs</small>	PT4H30M
Warm restart	<input checked="" type="checkbox"/> true
Warm restart date <small>Model date to restart from</small>	09500101
Warm restart directory <small>Parent directory of the warm restart files</small>	/projects/access/access-cm2/cmip6_restarts/bi88
Warm restart as nrun <small>Restart as NRUN (allows changes to STASH)</small>	<input checked="" type="checkbox"/> true
Warm restart run ID <small>5 character name used in restart filenames</small>	bi889

# Rose edit: netCDF post-processing



In `app/netcdf_conversion/rose-app.conf`

```
[env]  
NETCDF_STREAMS=d,m  
REMOVE_FF=false
```

# Rose edit: CABLE

The screenshot shows the Rose edit interface for the CABLE model. The left sidebar displays a tree view of the configuration structure, with 'um' expanded and 'cable' selected. The main panel shows the configuration for 'um cable' with various parameters and their values.

Parameter	Value
um cable cable_user%diag_soil_resp	'ON'
um cable cable_user%fwsoil_switch	'Haverd2013'
um cable cable_user%gs_switch	'medlyn'
um cable cable_user%gw_model	.false.
um cable cable_user%l_rev_corr	.true.
um cable cable_user%l_revised_coupling	.true.
um cable cable_user%or_evap	.false.
um cable cable_user%soil_thermal_fix	.true.
um cable cable_user%ssnow_potev	'HDM'
um cable icycle	0
um cable l_casacnp	.false.
um cable redistrib	.false.
um cable satuparam	0.8
um cable wiltparam	0.5

In app/um/rose-app.conf

```
[namelist:cable]
cable_user%diag_soil_resp='ON'
cable_user%fwsoil_switch='Haverd2013'
cable_user%gs_switch='medlyn'
cable_user%gw_model=.false.
cable_user%l_rev_corr=.true.
cable_user%l_revised_coupling=.true.
cable_user%or_evap=.false.
cable_user%soil_thermal_fix=.true.
cable_user%ssnow_potev='HDM'
icycle=0
l_casacnp=.false.
redistrib=.false.
satuparam=0.8
wiltparam=0.5
```

# Rose edit: CO<sub>2</sub>

u-bx616 - rose config-edit@accessdev.nci.org.au

File Edit View Metadata Tools Page Help

fcm\_make2\_drivers.18500101(01) succeeded

Index

- Processing parameters and their...
- Coupling
- IO System Settings
- Model Input and Output
- ▼ UM Science Settings
  - General Physics Options
  - Planet Constants
  - ▼ Section 01 - 02 - Radiation
    - Shortwave
    - Longwave
    - Cloud
    - Aerosol
    - ▼ Gas MMRs
      - ▼ Varying gas MMR
        - Varying CO2
        - Varying CH4
        - Varying N2O
        - Varying CFC
        - Varying CFC
        - Varying SO4

Varying CO2 MMR

clmchfcg: Time-varying CO2 mass mixing ratio used in radiation.

clmchfcg: Time-varying CO2 mass mixing ratio used in radiation.

clim\_fcg\_levels\_co2

List of values for growth for active gas CO2

4.3155e-04

4.3174e-04

4.3192e-04

4.3214e-04

4.3235e-04

4.3254e-04

4.3270e-04

4.3285e-04

4.3305e-04

4.3329e-04

4.3355e-04

4.3383e-04

4.3413e-04

4.3440e-04

4.3466e-04

In `app/um/rose-app.conf`

`[namelist:clmchfcg]`

`clim_fcg_years_co2=1849,1850,1851,`  
`=1861,1862,1863,`  
`=1873,1874,1875,`  
`=1885,1886,1887,`  
`=1897,1898,1899,`

...

`clim_fcg_levels_co2=4.3155e-04,4.31`  
`=4.3254e-04,4.32`  
`=4.3355e-04,4.33`  
`=4.3492e-04,4.35`  
`=4.3615e-04,4.36`

...

# Rose edit: STASH

u-bx616 - rose config-edit@accessdev.nci.org.au

File Edit View Metadata Tools Page Help

Index

- [netcdf conversion](#)
- [redistribute ozone](#)
- [retrieve ozone](#)
- um
  - command
  - env
  - file
  - namelist
    - Top Level Model Control
    - Reconfiguration and Ancil
    - Coupling
    - IO System Settings
    - Model Input and Output
      - Dumping and Meaning
      - Model Output Streams
      - STASH Requests and
        - Domain Profiles
        - STASH Requests**

! 00002\_ef65db4

STASH Requests

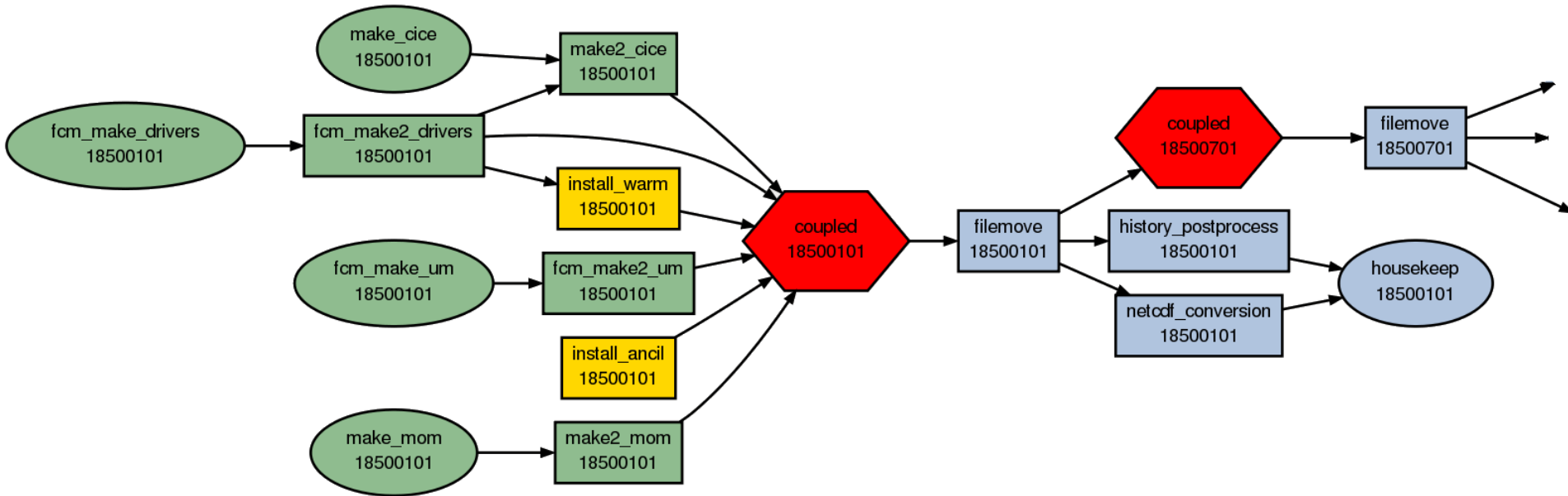
Macros

Group: Filter:

New Packages

Info	Incl?	isec	item	dom_name	tim_name	use_name	package	Index
! U COMPNT OF WIND AFTER TIMESTEP	<input type="checkbox"/>	^ 0	^ 2	^ 'DALLRH'	^ 'T6HR'	^ 'UP7'	^ 'HistExtra'	! 00002_ef65db42
! V COMPNT OF WIND AFTER TIMESTEP	<input type="checkbox"/>	^ 0	^ 3	^ 'DALLRH'	^ 'T6HR'	^ 'UP7'	^ 'HistExtra'	! 00003_3e8c1e31
THETA AFTER TIMESTEP	<input checked="" type="checkbox"/>	0	4	'DALLTH'	'TDMPMN'	'UPMEAN'	"	00004_909bff04
SPECIFIC HUMIDITY AFTER TIMESTEP	<input checked="" type="checkbox"/>	0	10	'DALLTH'	'TDMPMN'	'UPMEAN'	"	00010_5c893fff
! SPECIFIC HUMIDITY AFTER TIMESTEP	<input type="checkbox"/>	^ 0	^ 10	^ 'DALLTH'	^ 'T6HR'	^ 'UP7'	^ 'HistExtra'	! 00010_02e2de72
SURFACE TEMPERATURE AFTER TIMESTEP	<input checked="" type="checkbox"/>	0	24	'DIAG'	'TDMPMN'	'UPMEAN'	"	00024_0c98b824
SURFACE TEMPERATURE AFTER TIMESTEP	<input checked="" type="checkbox"/>	0	24	'DIAG'	'TDAYM'	'UPD'	"	00024_e57ec590
LAND MASK (No halo) (LAND=TRUE)	<input checked="" type="checkbox"/>	0	30	'DIAG'	'T6HDMPM'	'UPMEAN'	"	00030_b95437e4
FRAC OF SEA ICE IN SEA AFTER TSTEP	<input checked="" type="checkbox"/>	0	31	'DIAG'	'TDAYM'	'UPD'	"	00031_07076f26
FRAC OF SEA ICE IN SEA AFTER TSTEP	<input checked="" type="checkbox"/>	0	31	'DIAG'	'TDMPMN'	'UPMEAN'	"	00031_fd29db66
SEA ICE DEPTH (MEAN OVER ICE) M	<input checked="" type="checkbox"/>	0	32	'DIAG'	'TDMPMN'	'UPMEAN'	"	00032_68be071a
OROGRAPHY (/STRAT LOWER BC)	<input checked="" type="checkbox"/>	0	33	'DIAG'	'T6HDMPM'	'UPMEAN'	"	00033_a400a327
! OROGRAPHY (/STRAT LOWER BC)	<input type="checkbox"/>	^ 0	^ 33	^ 'DIAG'	^ 'TDAYM'	^ 'UPD'	^ "	! 00033_bb7fd725
SEA-ICE TEMPERATURE AFTER TIMESTEP	<input checked="" type="checkbox"/>	0	49	'DIAG'	'TDAYM'	'UPD'	"	00049_d1e40b26
! SEA-ICE TEMPERATURE AFTER TIMESTEP	<input type="checkbox"/>	^ 0	^ 49	^ 'DIAG'	^ 'T3HR'	^ 'UP8'	^ 'HistExtra'	! 00049_40e49942

# Suite graph



u-bx616

# Input file locations on gadi

- CM2 ancillaries. E.g., CM2 land/sea mask
  - ~access/data/ancil/access\_cm2\_n96e/O1
- Restart files, OASIS grid definitions etc
  - ~access/access-cm2
- CMIP6 forcing
  - /g/data/access/TIDS/CMIP6\_ANCIL/data/ancils/n96e
    - ssp126
    - ssp245
    - ssp370
    - ssp585
    - timeseries\_1850-2014



# Structure of running model on gadi

```
cylc-run/u-bx616
|-- app
|   ....
|-- log -> log.20201016T043258Z
|-- log.20201016T043258Z
|   |-- job
|       |-- 18510101
|           |-- coupled
|               |-- 01
|                   |-- job
|                   |-- job.err
|                   |-- job.out
|                   |-- job.status
|               |-- NN -> 01
|   ....
|-- share -> /scratch/p66/mrd599/cylc-run/u-bx616/share
|-- suite.rc
|-- suite.rc.processed
|-- work -> /scratch/p66/mrd599/cylc-run/u-bx616/work
```

# Structure of running model on gadi

cylc-run/u-bx616/work/

```
|-- 18500701
|   |-- ...
|-- 18510101
|   |-- coupled
|       |-- ATM_RUNDIR
|           |-- History_Data
|           |-- history_archive
|           |-- pe_output
|       |-- CPL_RUNDIR
|       |-- ICE_RUNDIR
|           |-- HISTORY
|           |-- INPUT
|           |-- RESTART
|       |-- OCN_RUNDIR
|           |-- HISTORY
|           |-- INPUT
|           |-- RESTART
|-- netcdf_conversion
|-- 18510701
|-- ...
```

cylc-run/u-bx616/share

```
|-- cice
|   |-- ...
|-- cycle
|   |-- ...
|-- data
|   |-- etc
|-- fcm_make_drivers
|   |-- build
|-- fcm_make_um
|   |-- build-atmos
|-- mom
|-- ...
```

archive/bx616

```
|-- history
|   |-- atm
|   |-- cpl
|   |-- ice
|   |-- ocn
|-- restart
|   |-- atm
|   |-- cpl
|   |-- ice
|   |-- ocn
```

Restart files copied from archive to  
work at start of each cycle.

New ones copied from work to archive  
at end

# Monitoring running model with gcylc

u-bx616 - accessdev.nci.org.au:43094

File View Control Suite Help

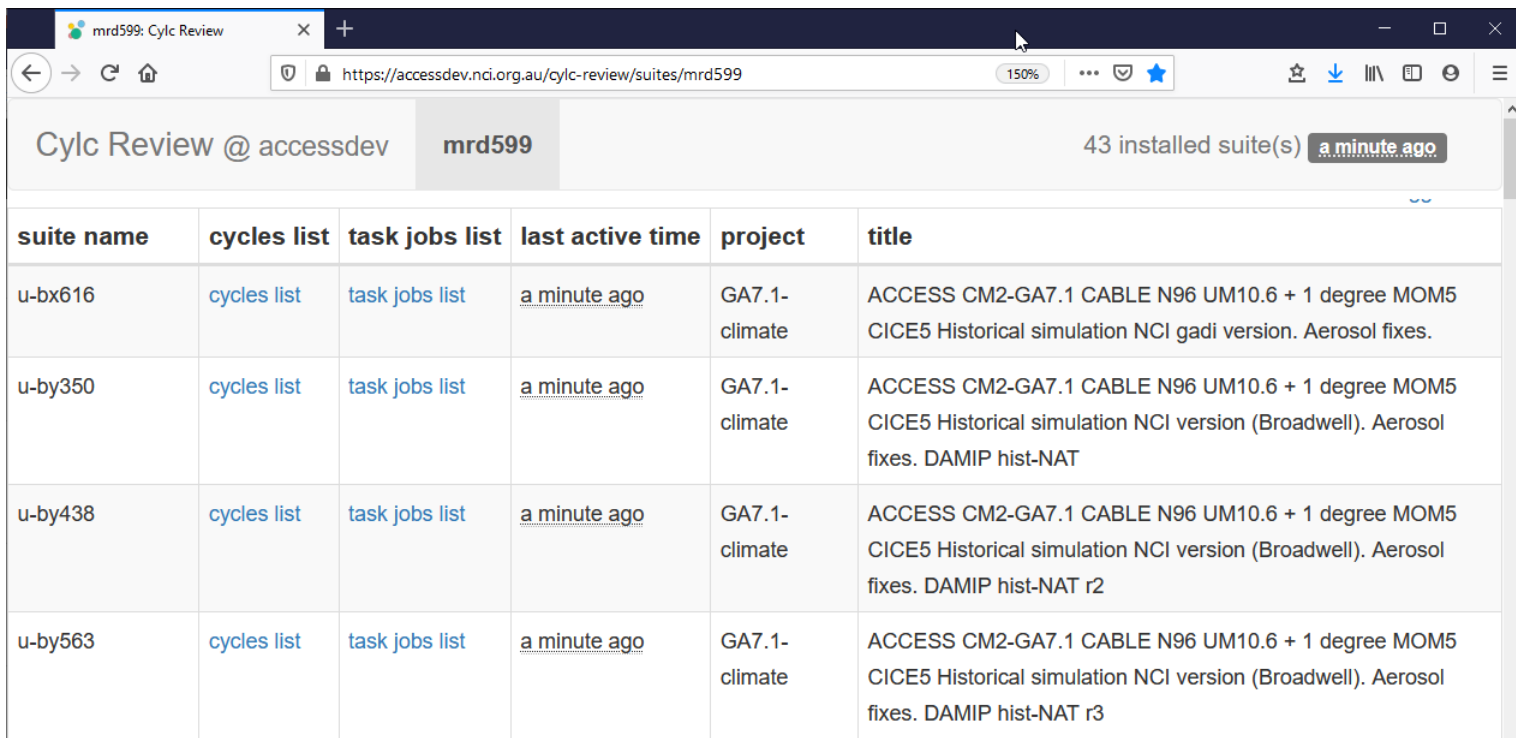
Hold Stop Suite Connect Now View 1: View 2: None Layout

task	state	host	job system	job ID	T-submit	T-start	T-finish
18500101	submitted						
BUILD	succeeded						
install_ancil	succeeded	gadi.nci.org.au	background	3410972	04:33:28Z	04:33:29Z	04:33:35Z
install_warm	succeeded	gadi.nci.org.au	pbs	12454049.gadi-pbs	05:22:39Z	05:22:59Z	05:23:21Z
coupled	submitted	gadi.nci.org.au	pbs	12454132.gadi-pbs	05:23:24Z	*	*
POSTPROC	waiting						
filemove	waiting	*	*	*	*	*	*
housekeep	waiting	*	*	*	*	*	*
history_postprocess	waiting	*	*	*	*	*	*
netcdf_conversion	waiting	*	*	*	*	*	*
18500701	waiting						

running to stop at 18501231 (filtered: live) (next connect: PT10S) 2020-10-16T16:23:24+11:00

# Monitoring running model with cylc-review

<https://accessdev.nci.org.au/cylc-review/>



The screenshot shows a web browser window with the URL <https://accessdev.nci.org.au/cylc-review/suites/mrd599>. The page title is "Cylc Review @ accessdev" and the suite name "mrd599" is highlighted. It indicates "43 installed suite(s)" and "a minute ago". Below this is a table with 6 columns: suite name, cycles list, task jobs list, last active time, project, and title. The table lists four suites, all with the project "GA7.1-climate" and the same title: "ACCESS CM2-GA7.1 CABLE N96 UM10.6 + 1 degree MOM5 CICE5 Historical simulation NCI gadi version. Aerosol fixes.".

suite name	cycles list	task jobs list	last active time	project	title
u-bx616	<a href="#">cycles list</a>	<a href="#">task jobs list</a>	<a href="#">a minute ago</a>	GA7.1-climate	ACCESS CM2-GA7.1 CABLE N96 UM10.6 + 1 degree MOM5 CICE5 Historical simulation NCI gadi version. Aerosol fixes.
u-by350	<a href="#">cycles list</a>	<a href="#">task jobs list</a>	<a href="#">a minute ago</a>	GA7.1-climate	ACCESS CM2-GA7.1 CABLE N96 UM10.6 + 1 degree MOM5 CICE5 Historical simulation NCI version (Broadwell). Aerosol fixes. DAMIP hist-NAT
u-by438	<a href="#">cycles list</a>	<a href="#">task jobs list</a>	<a href="#">a minute ago</a>	GA7.1-climate	ACCESS CM2-GA7.1 CABLE N96 UM10.6 + 1 degree MOM5 CICE5 Historical simulation NCI version (Broadwell). Aerosol fixes. DAMIP hist-NAT r2
u-by563	<a href="#">cycles list</a>	<a href="#">task jobs list</a>	<a href="#">a minute ago</a>	GA7.1-climate	ACCESS CM2-GA7.1 CABLE N96 UM10.6 + 1 degree MOM5 CICE5 Historical simulation NCI version (Broadwell). Aerosol fixes. DAMIP hist-NAT r3


# Monitoring running model with cylc-review























u-by350~mrd599: Cylc Review X

https://accessdev.nci.org.au/cylc-review/cycles/mrd599/?suite=u-by350 150%

Cylc Review @ accessdev

mrd599 u-by350 cycles list task jobs list broadcasts list cylc files rose files


Suite  is running on accessdev:43080, last activity a few seconds ago







cycle point	last active time	 # tasks	 # jobs	 # tasks	 # jobs	 # tasks	 # jobs	 log/job-CYCLE.tar.gz
19020701	<a href="#">7 minutes ago</a>	 1	 1	0	None	0	None	
<a href="#">19020101</a>	<a href="#">7 minutes ago</a>	0	0	 6	 6	0	0	
19010701	<a href="#">2 hours ago</a>	0	0	 4	 4	0	0	
19010101	<a href="#">4 hours ago</a>	0	0	 6	 6	0	0	 log/job-19010101.tar.gz
19000701	<a href="#">6 hours ago</a>	0	0	 4	 4	0	0	 log/job-19000701.tar.gz
19000101	<a href="#">8 hours ago</a>	0	0	 6	 6	0	0	 log/job-19000101.tar.gz

# Monitoring running model with cylc-review

u-by350~mrd599: Cylc Review X

https://accessdev.nci.org.au/cylc-review/taskjobs/mrd599?suite=u-by350&cycles=19020101

Suite  is running on accessdev:43080, last activity a few seconds ago [toggle Δt](#)

task status	job status	cycle point	task name	job #	submit time	queue Δt	run Δt	job host	job batch	job logs
✓ succeeded		19020101	housekeep	1 of 1	8 minutes ago	0:02	0:06	accessdev.nci.org.au	background[30437]	<a href="#">job</a> <a href="#">job-activity.log</a> <a href="#">job.err</a> <a href="#">job.out</a> <a href="#">job.status</a>
✓ succeeded		19020101	history_postprocess	1 of 1	24 minutes ago	4:54	11:26	gadi.nci.org.au	pbs[12453799.gadi-pbs]	<a href="#">job</a> <a href="#">job-activity.log</a> <a href="#">job.err</a> <a href="#">job.out</a> <a href="#">job.status</a>
✓ succeeded		19020101	filemove	1 of 1	29 minutes ago	3:48	1:03	gadi.nci.org.au	pbs[12453693.gadi-pbs]	<a href="#">job</a> <a href="#">job-activity.log</a> <a href="#">job.err</a> <a href="#">job.out</a> <a href="#">job.status</a>
✓ succeeded		19020101	coupled	1 of 1	2 hours ago	3:31	106:26	gadi.nci.org.au	pbs[12449662.gadi-pbs]	<a href="#">job</a> <a href="#">job-activity.log</a> <a href="#">job.err</a> <a href="#">job.status</a>
✓ succeeded		19020101	redistribute_ozone	1 of 1	2 hours ago	4:39	4:20	gadi.nci.org.au	pbs[12449415.gadi-pbs]	<a href="#">job</a> <a href="#">job-activity.log</a> <a href="#">job.err</a> <a href="#">job.out</a> <a href="#">job.status</a>
✓ succeeded		19020101	retrieve_ozone	1 of 1	3 hours ago	3:57	0:49	gadi.nci.org.au	pbs[12449262.gadi-pbs]	<a href="#">job</a> <a href="#">job-activity.log</a> <a href="#">job.err</a> <a href="#">job.out</a> <a href="#">job.status</a>

Result loaded a few seconds ago Page 1 of 1 Entries 1-6

# Documentation and help

- [access\\_help@nf.nci.org.au](mailto:access_help@nf.nci.org.au)
  - Seen by NCI, CSIRO, BOM and CLEX staff
- Access wiki <https://accessdev.nci.org.au/trac/wiki/access>
- CM2 experiments and documentation  
<https://accessdev.nci.org.au/trac/wiki/access/ACCESS-CM2>
- CLEX CMS team wiki <http://climate-cms.wikis.unsw.edu.au>
- MOSRS <https://code.metoffice.gov.uk>
- Cylc <https://github.com/cylc/cylc>
- Rose <https://github.com/metomi/rose>

# Future work

- Other science configurations
  - UKCA, Single Column Model
- Higher resolution
  - 0.25 degree ocean, N216 atmosphere
- ACCESS NRI





**FOR MORE INFORMATION**

Martin Dix: [martin.dix@csiro.au](mailto:martin.dix@csiro.au)

[www.nespcclimate.com.au](http://www.nespcclimate.com.au)

The Earth Systems and Climate Change Hub is funded by the Australian Government's National Environmental Science Program, with co-investment from the following partner agencies



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University



THE UNIVERSITY OF  
MELBOURNE



UNSW  
SYDNEY



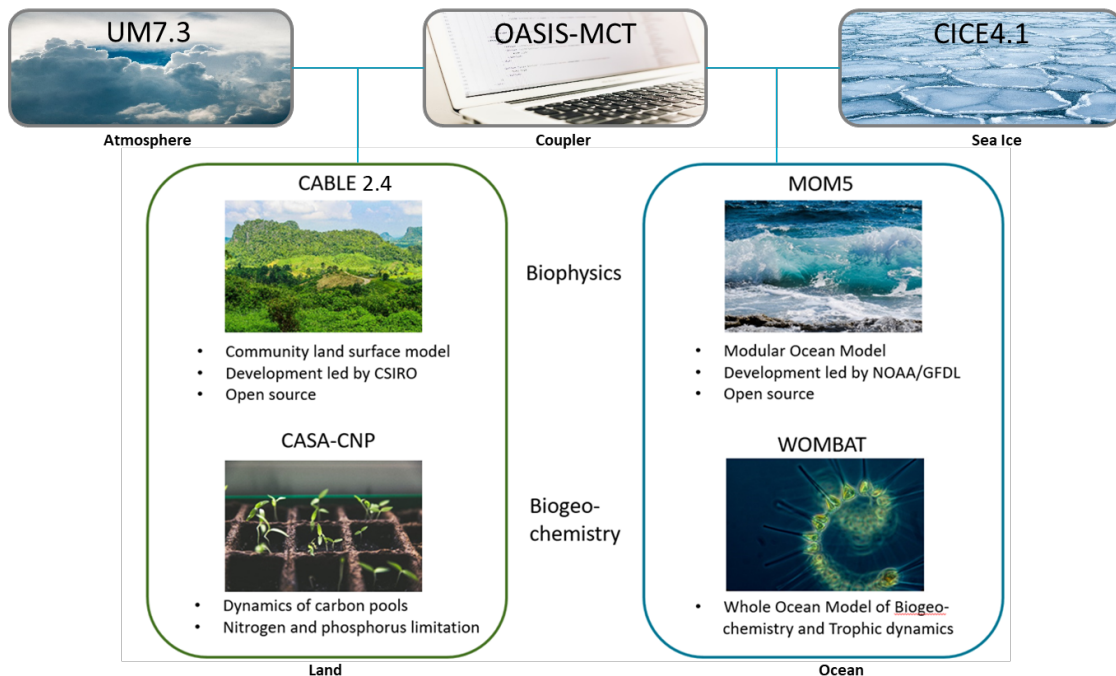
UNIVERSITY of  
TASMANIA



# ACCESS-ESM1.5

Tilo Ziehn | CSIRO Climate Science Centre

# ACCESS-ESM1.5 - Components



T. Ziehn, M. A. Chamberlain, R. Law, A. Lenton, R. W. Bodman, M. Dix, L. Stevens, Y.-P. Wang, and J. Srbinovsky:  
The Australian Earth System Model: ACCESS-ESM1.5, J. South. Hemisphere Earth Syst. Sci., doi:10.1071/ES19035, 2020.

# ACCESS-ESM1.5 – Set up

- **Ocean** model (MOM5) resolution: **1°, 50 levels**
- **Atmosphere** (UM7.3) N96 resolution (**1.875° x 1.25°, 38 levels**)
- **Land** (CABLE2.4) same horizontal resolution as atmosphere (**1.875° x 1.25°**)

Set-up and performance on gadi (cascade lake nodes):

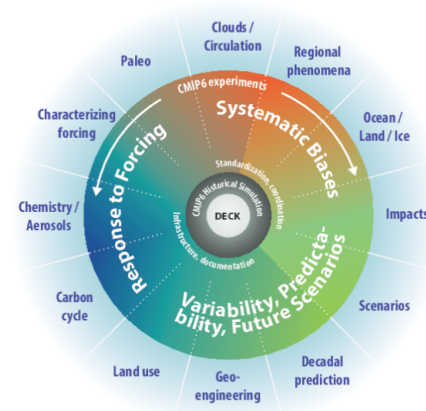
- **384 cores** (192 atmosphere/land, 180 ocean, 12 sea-ice)
- costs: **1.1 kSU/yr**; walltime: 1h25min/yr; **16 yrs/day**
- **192 cores** (atmosphere only)
- costs: **0.5kSU/yr**; walltime: 1h20min/yr; **16 yrs/day**

Equilibrium Climate Sensitivity (ECS): **3.87 K**

# ACCESS-ESM1.5 – CMIP6

- ~**40** different **experiments** (DECK + historical + 8 MIPs)
- ~**10000** simulations **years**
- ~**500 TB** of (raw) **output**
- ~**2 million downloads** from ESGF so far

- **ScenarioMIP** – 4 future Scenarios (SSP126, SSP245, SSP370, SSP585)
- **C4MIP** – Coupled Climate Carbon Cycle MIP
- **ZECMIP** – Zero Emissions Commitment MIP
- **CDRMIP** – Carbon Dioxide Removal MIP
- **DAMIP** – Detection and Attribution MIP
- **RFMIP** – Radiative Forcing MIP
- **PMIP** – Paleoclimate MIP (UNSW contribution)
- **COVIDMIP** (in progress)



Eyring et al. (2016)





## FOR MORE INFORMATION

[name] | [email]  
[phone]

[www.nespcclimate.com.au](http://www.nespcclimate.com.au)

The Earth Systems and Climate Change Hub is funded by the Australian Government's National Environmental Science Program, with co-investment from the following partner agencies



Australian  
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University



MONASH  
University



THE UNIVERSITY OF  
MELBOURNE



UNSW  
SYDNEY



UNIVERSITY of  
TASMANIA

# Holger Wolff – Monash/CLEX/CMS



**ACCESS-ESM1.5** is controlled via the CLEX *payu* interface. Instructions are available at the github repository:

<https://github.com/coecms/esm-pre-industrial>

<http://climate-cms.wikis.unsw.edu.au/Home>

## ACCESS-ESM with payu

### Quickstart Guide

Get payu:

```
module use /g/data/hh5/public/modules
module load conda/analysis3-unstable
```

Create a directory in which to keep the model configurations:

```
mkdir -p ~/access-esm
cd ~/access-esm
git clone https://github.com/coecms/esm-pre-industrial
cd esm-pre-industrial
```

Run the model:

```
payu run
```

Check the output:

```
ls archive/
```

The default configuration is a 1 year per model run. To run the model for, say, 25 years:

```
payu run -n 25
```



# ACCESS datasets for CMIP6

Chloe Mackallah | CSIRO O&A Climate Science Centre



# CMIP6 experiments with ACCESS

MIP	Expt	CM2	ESM1.5
CMIP	piControl	500y	900y (2000y)
	1pctCO2	1	1
	abrupt-4xCO2	1	2
	amip	4	3
	historical	3	10 (30)
	esm-piControl		500y
	esm-historical		10
ScenarioMIP	ssp126	3	10
	ssp245	3	10 (30)
	ssp370	3	10

# CMIP6 experiments with ACCESS

MIP	CM2	ESM1.5	OM2	OM2-025
FAFMIP	7			
C4MIP		10		
CDRMIP		3		
PMIP		1		
RFMIP	5	6		
DAMIP	(14)	9		
(OMIP)			(1)	(1)
CovidMIP		(60+)		

# Data now available at NCI & ESGF

## Web portal:

- <https://esgf.nci.org.au>



Home Contact Us Data Modes Status

MIP Era +  
Activity +  
Model Cohort +  
Product +

WARNING: Not all models include a variant "r1i1p1f1", and datasets were used in each variant, please check modelin

CMIP6 project data downloads are unrestricted. Please us

Enter Text:

Source ID

☐ ACCESS-CM2 (7362)

☐ ACCESS-ESM1-5 (28615)

☐ Show All Replicas

- ☐ BCC-CSM2-MR (18867)
- ☐ BCC-ESM1 (4614)
- ☐ CAMS-CSM1-0 (1627)
- ☐ CESM1-1-CAM5-CMIP5 (378399)
- ☐ CESM2 (118553)
- ☐ CESM2-FV2 (2003)
- ☐ CESM2-WACCM (20867)
- ☐ CESM2-WACCM-FV2 (2033)
- ☐ CIESM (124)
- ☐ CMCC-CM2-HR4 (517)
- ☐ CMCC-CM2-VHR4 (517)
- ☐ CMCC-ESM2-SR5 (895)
- ☐ CNRM-CM5-1 (53500)
- ☐ CNRM-CM5-1-HR (3113)
- ☐ CNRM-ESM2-1 (44470)
- ☐ CanESM5 (634052)

Institution ID

Source Type

Nominal Resolution

- **ACCESS-CM2 & ESM1.5:**  
NCI via project **fs38** on Gadi:  
  
`/g/data/fs38/publications/CMIP6/`

- **Other CMIP6 models:**  
NCI via project **oi10** on Gadi:  
  
`/g/data/oi10/replicas/CMIP6`

- We can provide assistance to anyone wanting to use CMIP6 data

# CleF Climate Finder tool on Gadi

- Developed by ARCCSS and CLEX.
- Python module to search for, and access climate data (including CMIP) at NCI.
- <https://clef.readthedocs.io/en/latest/>
- Can search by:
  - remote: all ESGF datasets
  - local: datasets available on NCI
  - missing: datasets not on NCI
  - request: request NCI to download datasets

Chloe Mackallah | Climate Science Centre

- E.g.: (CMIP6 CVs)

```
$ clef cmip6 --model ACCESS-  
CM2 \  
--activity CMIP \  
--experiment  
historical \  
--source_type
```

AOGCM \  
--table Amon \  
--variable tas \  
--variable sfcWind

# CleF Climate Finder tool on Gadi

- E.g.

```
$ clef cmip6 --activity CMIP \  
             --experiment historical \  
             --source_type AOGCM \  
             --table AERmon \  
             --variable od550aer
```

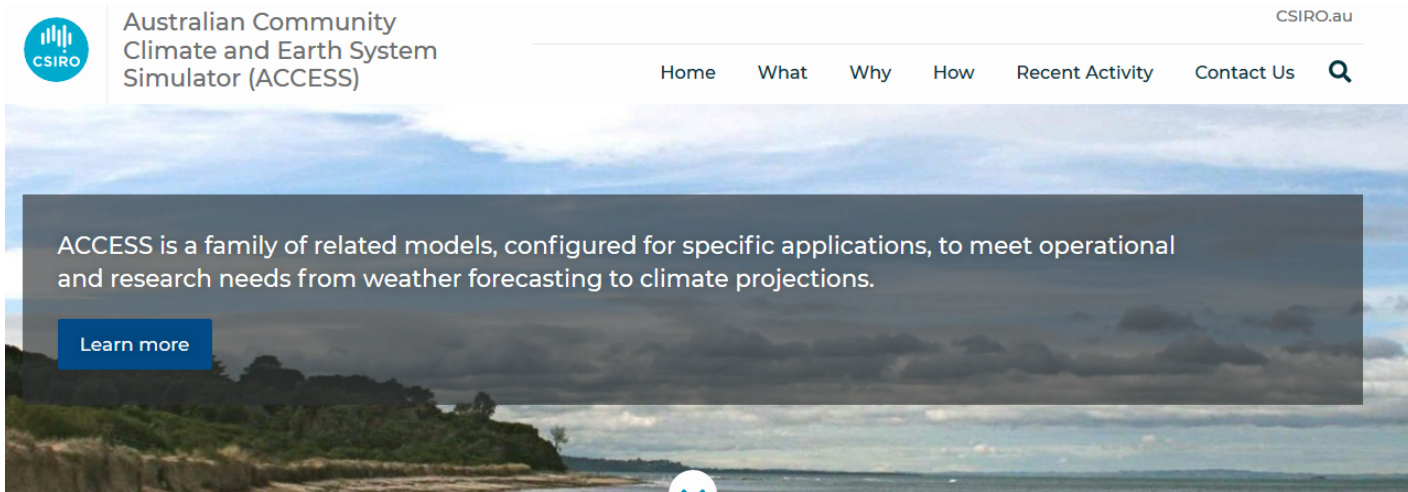
```
/g/data/fs38/publications/CMIP6/CMIP/CSIRO/ACCESS-ESM1-5/historical/r1i1p1f1/AERmon/od550aer/gn/v20200611/  
/g/data/oi10/replicas/CMIP6/CMIP/NCAR/CESM2-WACCM-FV2/historical/r1i1p1f1/AERmon/od550aer/gn/v20191120/
```

Available on ESGF but not locally:

CMIP6.CMIP.MIROC.MIROC6.historical.r1i1p1f1.AERmon.od550aer.gn.v20200918

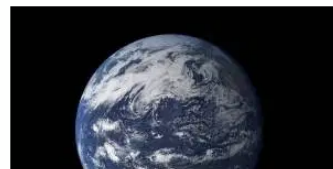
( activity\_id ).( institution\_id ).( source\_id ).( experiment\_id ).( variant\_label ).( table ).( variable\_id ).( grid\_label ).( version )

# research.csiro.au/access/



Australia's economic sensitivity to weather and climate is estimated at \$65 billion or 4% of the GDP with an increasing number of planning and financial decisions relying on weather and climate risk information.

Accurate continental and regional climate and weather forecasts provide expected levels and range of temperatures, precipitation, wind, humidity and sunshine that can improve our adaptations to weather risk and climate change as well as to the efficiency of our industries.



# research.csiro.au/access/cmip6-submission/

Links to:

- ACCESS version details
- CMIP6 data (ACCESS + others)
- Errata documentation
- ACCESS-related papers (incl model description papers)
- ACCESS experiment status tracking ---->

## CM2 submission status

MIP	Experiment	Ensemble members	Status	Published?
<a href="#">CMIP</a>	<a href="#">piControl</a>	1 (500 yrs)	Complete	Yes
	<a href="#">1pctCO2</a>	1	Complete	Yes
	<a href="#">abrupt-4xCO2</a>	1	Complete	Yes
	<a href="#">historical</a>	3	Complete	Yes
	<a href="#">amip</a>	4	Complete	Yes
<a href="#">EAFMIP</a>	<a href="#">faf-all</a>	1	Complete	Yes
	<a href="#">faf-heat</a>	1	Complete	Yes
	<a href="#">faf-passiveheat</a>	1	Complete	Yes
	<a href="#">faf-stress</a>	1	Complete	Yes
	<a href="#">faf-water</a>	1	Complete	Yes

# Useful links

## DKRZ dataset citations:

CM2: <https://cera-www.dkrz.de/WDCC/ui/cersearch/cmip6?input=CMIP6.CMIP.CSIRO-ARCCSS.ACCESS-CM2>

ESM1.5: <https://cera-www.dkrz.de/WDCC/ui/cersearch/cmip6?input=CMIP6.CMIP.CSIRO.ACCESS-ESM1-5>

All: [https://redmine.dkrz.de/projects/cmip6-lta-and-data-citation/wiki/CMIP6\\_Data\\_References\\_-\\_ModelMIP](https://redmine.dkrz.de/projects/cmip6-lta-and-data-citation/wiki/CMIP6_Data_References_-_ModelMIP)

## ESGF:

NCI node: <https://esgf.nci.org.au/search/cmip6-nci/>

Main node: <https://esgf-node.llnl.gov/search/cmip6/>

## CMIP6 Data Info:

Data request: <http://clipc-services.ceda.ac.uk/dreq/index.html>

CV & DRS: [https://docs.google.com/document/d/1h0r8RZr\\_f3-8egBMMh7aqLwy3snpD6\\_MrDz1q8n5XUk/edit](https://docs.google.com/document/d/1h0r8RZr_f3-8egBMMh7aqLwy3snpD6_MrDz1q8n5XUk/edit)

Errata: <https://errata.es-doc.org/>

## ES-DOC (model documentation):

CM2: <https://github.com/ES-DOC-INSTITUTIONAL/csiro-arccss-bom/> (Institution name incorrect)

ESM1.5: <https://github.com/ES-DOC-INSTITUTIONAL/csiro/>

## Model description papers:

CM2: <https://www.publish.csiro.au/es/ES19040>

ESM1.5: <https://www.publish.csiro.au/es/ES19035>

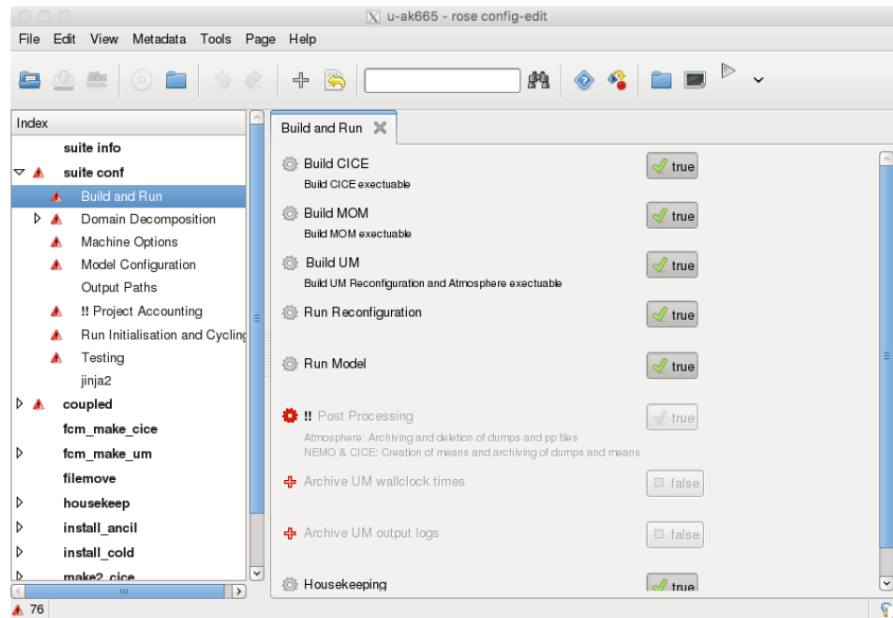


# Getting started with ACCESS-CM2 Document

## PREPARING TO RUN ACCESS

Requirements for running ACCESS-CM2:

- A working institutional email address with an organisation that allows access to NCI, e.g. CSIRO, a university etc;
- Access to NCI compute/storage;
- A computer with an internet connection;
- A computer with a command line terminal eg:
  - Terminal on MacOS with XQuartz and command line tools installed;
  - Putty, Cygwin or similar XWindows compatible program on a PC;
  - Unix or Linux computer.



# Australian Community Climate and Earth System Simulator





## FOR MORE INFORMATION

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SYDNEY



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TASMANIA

# Questions?

- House rules – type “!” in chat to ask a question , or enter questions directly into the chat
- Simon Marsland – Chair
- Martin Dix– ACCESS-CM2
- Tilo Ziehn – ACCESS-ESM1.5 overview
- Holger Wolff – ACCESS-ESM1.5 operation
- Chloe Mackallah – ACCESS CMIP6 datasets