



**Earth Systems and
Climate Change
Hub**

National Environmental Science Programme



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

Tuesday 20th 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



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An introduction to running ACCESS CM2

Martin Dix: CSIRO Climate Science Centre

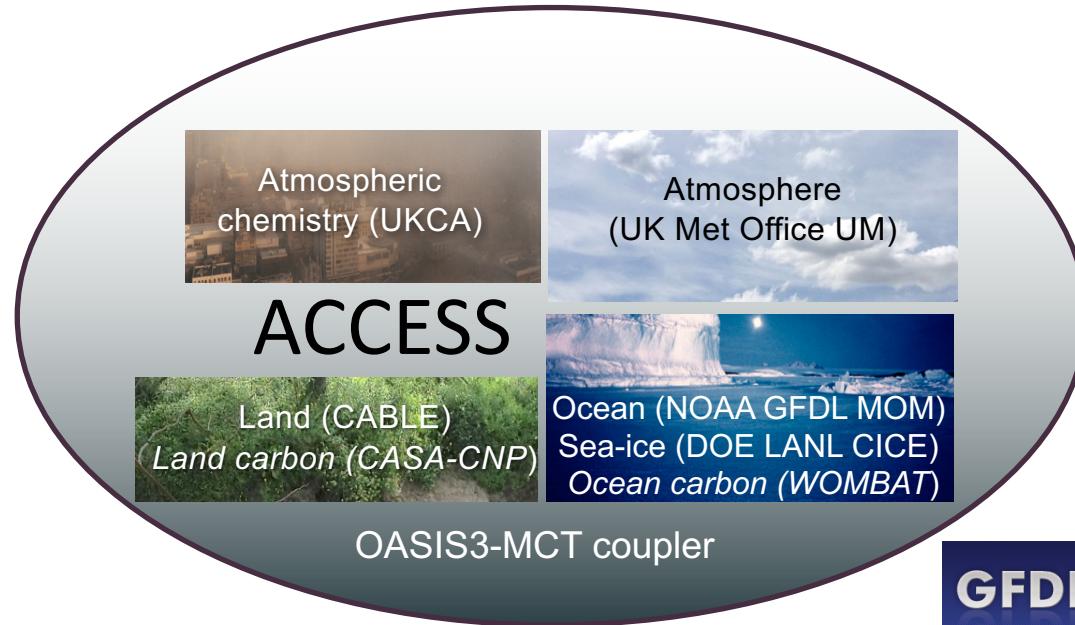
Australian Community Climate and Earth System Simulator

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

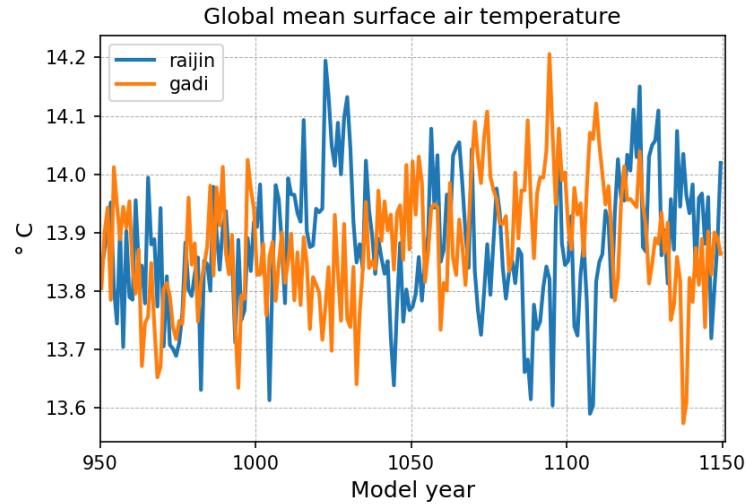


ACCESS-CM2 configuration

- Atmosphere: UK HadGEM3-GC3.1 atmosphere but with CABLE replacing JULES
 - $1.875^\circ \times 1.25^\circ$ 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, $\sim 1^\circ$ resolution, 50 levels
- CICE5
- OASIS3-mct coupler
- For details, Bi et al 2019, <https://doi.org/10.1071/ES19040>

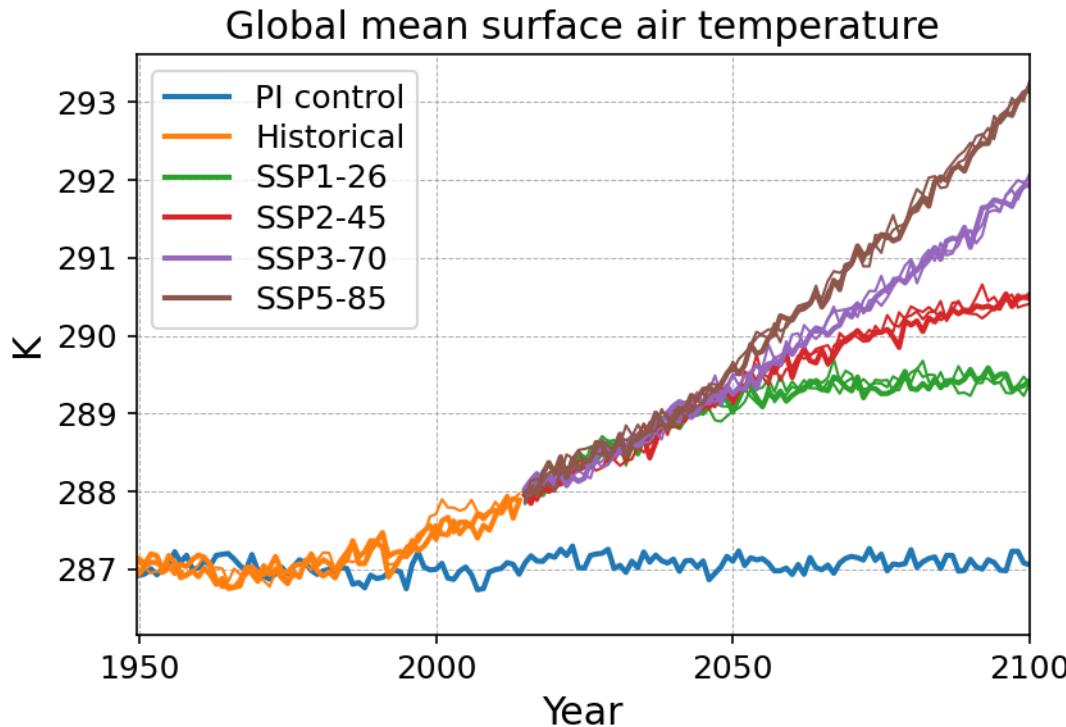
Raijin and Gadi

- CMIP6 DECK experiments run on raijin 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

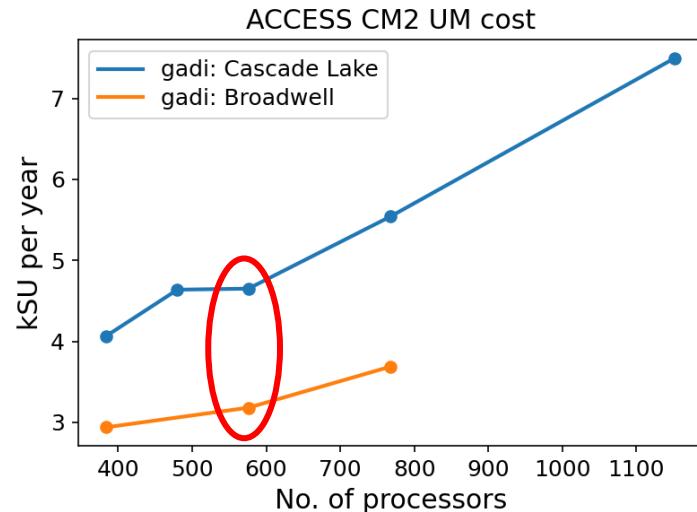
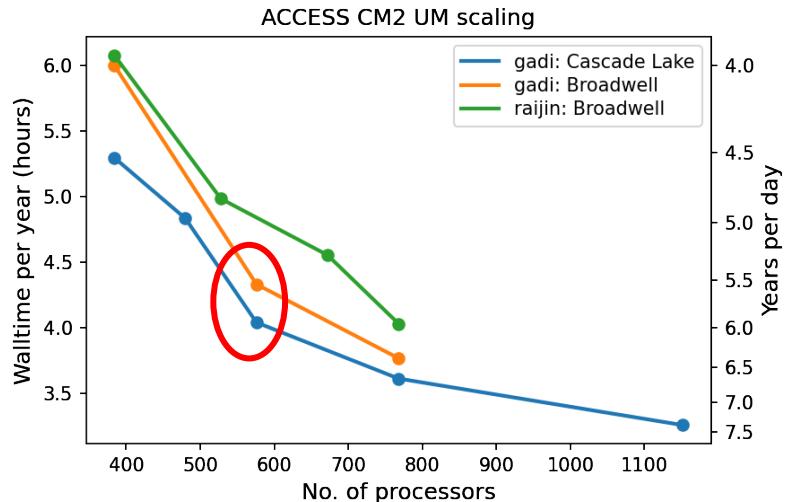
Extra CMIP6 ensemble runs on gadi



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 raijin to gadi
 - Now Broadwell cores on gadi seem faster than on raijin?
- 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

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
    │   ├── file
    │   │   └── fcm-make.cfg
    │   └── 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.rajin
    │   └── rose-app.conf
```

```
└── mom
    ├── opt
    │   └── rose-app-mom-impose-init.conf
    │   └── rose-app.conf
    ├── netcdf_conversion
    │   └── rose-app.conf
    ├── redistribute_ozone
    │   └── rose-app.conf
    ├── retrieve_ozone
    │   ├── bin
    │   │   └── retrieve_ozone.sh
    │   ├── opt
    │   │   └── rose-app-updated.conf
    │   └── rose-app.conf
    └── um
        ├── file
        │   └── STASHmaster_A
        ├── opt
        │   ├── rose-app-nrun-restart.conf
        │   ├── rose-app-ozone.conf
        │   └── rose-app-recon.conf
        └── rose-app.conf
    └── meta
        └── rose-meta.conf
    └── ozone.rc
    └── rose-suite.conf
    └── rose-suite.info
    └── suite.rc
```



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ozone.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



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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

The screenshot shows the Rose edit software interface. The title bar reads "u-bx616 - rose config-edit@accessdev.nci.org.au". The menu bar includes File, Edit, View, Metadata, Tools, Page, and Help. The toolbar contains various icons for file operations. The left sidebar is an "Index" tree view with nodes like "suite info", "suite conf" (with "Build and Run", "Build and Runmodel", "Domain Decomposition" children), "Machine and Runtime Option" (selected), "Output Paths", "Run Initialisation and Cycling", "jinja2", "cice", "coupled", "fcm_make drivers", "fcm_make um", "housekeep", "install ancil", "install cold", "make2 cice", "mom", and "netcdf conversion". The main content area is titled "Machine and Runtime Options" and contains the following configuration:

- NCI core type:** Cascade Lake (radio button) is selected. A note says "Cascade Lake has 48 processors per node" and "Broadwell has 28 processors per node".
- NCI Queue:** Normal (radio button) is selected.
- Compute host:** gadi.nci.org.au
- Memory per core (GB):** 2
- Compute project:** p66
- Run with totalview:** false (checkbox)

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 with the title bar "u-bx616 - rose config-edit@accessdev.ntri.org.au". The menu bar includes File, Edit, View, Metadata, Tools, Page, and Help. The toolbar contains icons for file operations like Open, Save, and Print. The left sidebar is an "Index" tree view with sections such as suite info, suite conf, Build and Run, cice, coupled, fcm_make_drivers, fcm_make_um, housekeep, install_ancil, install_cold, make2_cice, mom, netcdf_conversion, and netcdf_reconversion. The main panel is titled "Build and Run" and lists several configuration options:

Option	Description	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



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Rose edit: Run options

The screenshot shows the Rose edit software interface. The title bar displays the session name "u-bx616 - rose config-edit@accessdev.nci.org.au". The menu bar includes File, Edit, View, Metadata, Tools, Page, and Help. The toolbar contains various icons for file operations like Open, Save, and Copy. The left sidebar is an "Index" tree view with categories such as suite info, suite conf (Build and Run, Build and Runmodel, Domain Decomposition, Machine and Runtime Options, Output Paths), Run Initialisation and Cycling (selected), jinja2, cice, coupled, fcm_make_drivers, fcm_make_um, housekeep, install_ancil, install_cold, make2_cice, mom, netcdf_conversion, and netcdf4c. The main panel is titled "Run Initialisation and Cycling" and contains the following configuration options:

Model basis time	18500101
Total Run length	P165Y
Cycling frequency	P6M
Wallclock time	PT4H30M
Warm restart	<input checked="" type="checkbox"/> true
Warm restart date	09500101
Warm restart directory	/projects/access/access-cm2/cmip6_restarts/bi88
Warm restart as nrnn	<input checked="" type="checkbox"/> true
Warm restart run ID	bi889



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Rose edit: netCDF post-processing

The screenshot shows the Rose edit application window. The title bar indicates the user is editing a configuration file at `u-bx616 - rose config-edit@accessdev.nci.org.au`. The menu bar includes File, Edit, View, Metadata, Tools, Page, and Help. The toolbar contains various icons for file operations like Open, Save, and Copy. The left sidebar is an index with a tree view of configuration sections:

- suite info
- suite conf
- cice
- coupled
- fcm make drivers
- fcm make um
- housekeep
- install ancil
- install cold
- make2 cice
- mom
- netcdf_conversion
 - command
 - env
 - redistribute ozone
 - retrieve ozone
 - um

The "env" section is currently selected and expanded. It contains two configuration items:

- NETCDF_STREAMS**: A dropdown menu set to "d,m".
Model output streams to convert to netCDF
- REMOVE_FF**: A radio button group where "false" is selected.
Remove UM fieldsfiles after conversion

In app/netcdf_conversion/
rose-app.conf

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

Rose edit: CABLE

The screenshot shows the Rose edit application window. The title bar reads "u-bx616 - rose config-edit@accessdev.nci.org.au". The menu bar includes File, Edit, View, Metadata, Tools, Page, and Help. The toolbar contains various icons for file operations like Open, Save, and Find. The left sidebar is an "Index" tree view with categories: 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, UM Science Settings, JULES Science Settings, Data Assimilation), cable, easy_aerosol, and snamelist. The "cable" node is currently selected and expanded. The main workspace displays a configuration editor for the "cable" section. It lists parameters with their current values:

Parameter	Value
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.
redistrb	.false.
satuparam	0.8
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.
redistrb=.false.
satuparam=0.8
wiltparam=0.5
```



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Rose edit: CO₂

The screenshot shows the Rose edit software interface. The title bar indicates the user is editing a configuration file at `u-bx616 - rose config-edit@accessdev.nci.org.au`. A message in the status bar says "fcm_make2_drivers.18500101(01) succeeded". The main window displays a hierarchical tree view of configuration sections. The "Varying CO2 MMR" section is currently selected. This section contains a description: "clmchfcg: Time-varying CO2 mass mixing ratio used in radiation." Below this is a list titled "clim_fcgs_levels_co2" which describes itself as "List of values for growth for active gas CO2". A plus sign icon followed by a list of 20 numerical values is shown. The values are: 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, and 4.3466e-04.

In app/um/rose-app.conf

```
[namelist:clmchfcg]
clim_fcgs_years_co2=1849,1850,1851,
                     =1861,1862,1863,
                     =1873,1874,1875,
                     =1885,1886,1887,
                     =1897,1898,1899,
                     ...
                     ...
clim_fcgs_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

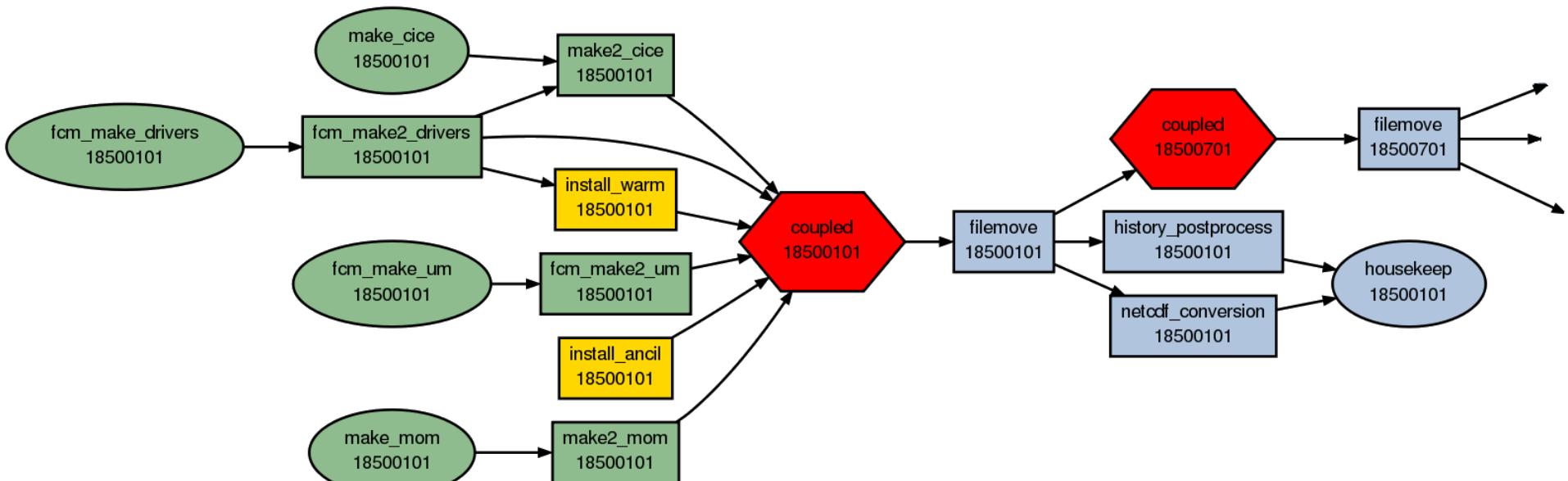
STASH Requests X

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



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Monitoring running model with gcylc

The screenshot shows the gcylc monitoring interface. At the top, there's a toolbar with icons for Hold, Stop Suite, Connect Now, View 1 (dropdown), Layout (arrow icon), View 2 (dropdown set to None), and standard window controls (minimize, maximize, close). Below the toolbar is a table header with columns: task, state, host, job system, job ID, T-submit, T-start, and T-finish.

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						
filmove	waiting	*	*	*	*	*	*
housekeep	waiting	*	*	*	*	*	*
history_postprocess	waiting	*	*	*	*	*	*
netcdf_conversion	waiting	*	*	*	*	*	*
18500701	waiting						

At the bottom, there's a status bar with the message "running to stop at 18501231" and a "filtered" checkbox. To the right of the status bar, it says "(next connect: PT10S) 2020-10-16T16:23:24+11:00" with a yellow warning icon.



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Monitoring running model with cylc-review

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

suite name	cycles list	task jobs list	last active time	project	title
u-bx616	cycles list	task jobs list	a minute ago	GA7.1-climate	ACCESS CM2-GA7.1 CABLE N96 UM10.6 + 1 degree MOM5 CICE5 Historical simulation NCI gadi version. Aerosol fixes.
u-by350	cycles list	task jobs list	a minute ago	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	cycles list	task jobs list	a minute ago	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	cycles list	task jobs list	a minute ago	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



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Monitoring running model with cylc-review

The screenshot shows a web browser window titled "u-by350~mrd599: Cylc Review". The URL is <https://accessdev.nci.org.au/cylc-review/cycles/mrd599/?suite=u-by350>. The page displays the "Cylc Review @ accessdev" interface. At the top, there are tabs for "cycles list", "task jobs list", "broadcasts list", "cylc files", and "rose files". Below this, a message states "Suite is running on accessdev:43080, last activity a few seconds ago". A table titled "cycle point" lists six rows of data:

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

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Monitoring running model with cylc-review

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]	job.log job-activity.log job.err job.out job.status
✓ succeeded	○	19020101	history_postprocess	1 of 1	24 minutes ago	4:54	11:26	gadi.nci.org.au	pbs[12453799.gadi-pbs]	job.log job-activity.log job.err job.out job.status
✓ succeeded	○	19020101	filmove	1 of 1	29 minutes ago	3:48	1:03	gadi.nci.org.au	pbs[12453693.gadi-pbs]	job.log job-activity.log job.err job.out job.status
✓ succeeded	○	19020101	coupled	1 of 1	2 hours ago	3:31	106:26	gadi.nci.org.au	pbs[12449662.gadi-pbs]	job.log job-activity.log job.err job.out job.status
✓ succeeded	○	19020101	redistribute_ozone	1 of 1	2 hours ago	4:39	4:20	gadi.nci.org.au	pbs[12449415.gadi-pbs]	job.log job-activity.log job.err job.out job.status
✓ succeeded	○	19020101	retrieve_ozone	1 of 1	3 hours ago	3:57	0:49	gadi.nci.org.au	pbs[12449262.gadi-pbs]	job.log job-activity.log job.err job.out job.status



Documentation and help

- 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-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>



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Future work

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



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FOR MORE INFORMATION

Martin Dix: martin.dix@csiro.au

www.nespclimate.com.au

The Earth Systems and Climate Change Hub is funded by the Australian Government's National Environmental Science Program,
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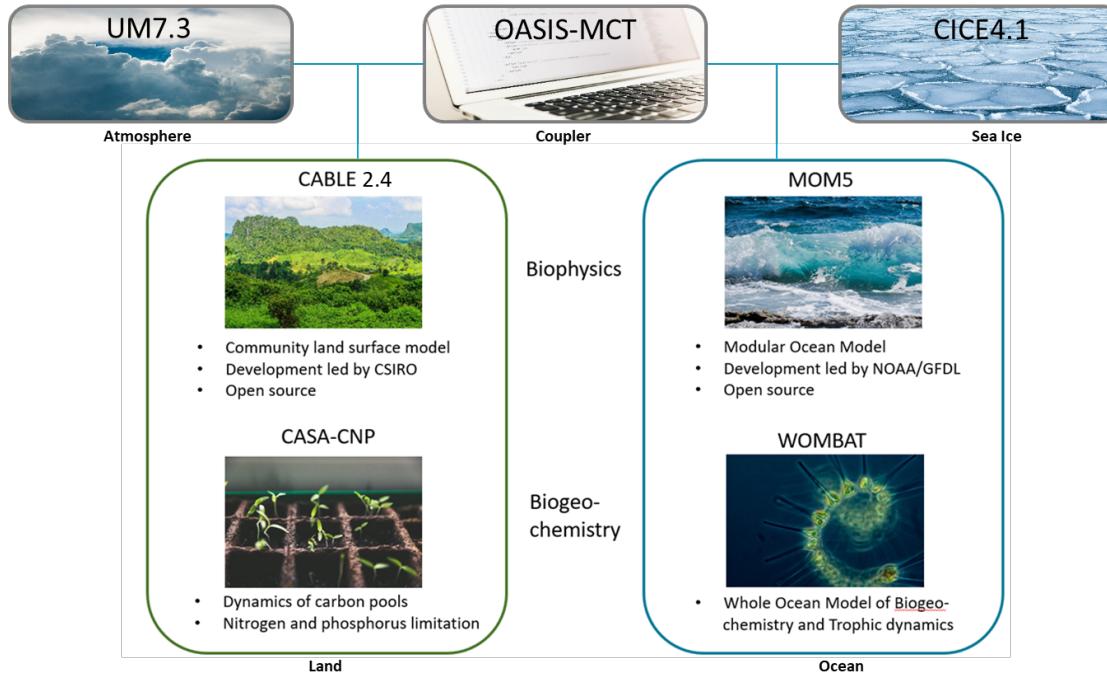
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ACCESS-ESM1.5

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°**)

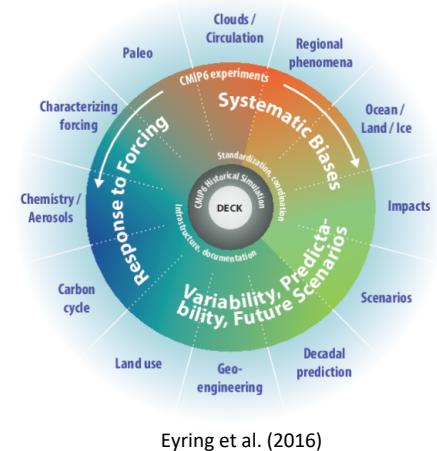
Set-up and performance on gadi (cascade lake nodes):

- **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



Eyring et al. (2016)

- **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)



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FOR MORE INFORMATION

[name] | [email]
[phone]

www.nespclimate.com.au

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Australian
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MONASH
University



THE UNIVERSITY OF
MELBOURNE



UNSW
SYDNEY



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>

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
```

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



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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
ScenarioMI P	ssp126	3	10
	ssp245	3	10 (30)
	270	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+)		



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Data now available at NCI & ESGF

Web portal:

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

The screenshot shows the WCRP CMIP6 web interface. At the top, there are dropdown menus for MIP Era, Activity, Model Cohort, Product, Source ID, and Institution ID. Below these is a search bar labeled 'Enter Text'. A warning message states: 'WARNING: Not all models include a variant "r1i1p1f1", and datasets were used in each variant, please check modeln'. To the right, it says 'CMIP6 project data downloads are unrestricted. Please us'. There is also a link 'Show All Replicas'.

The main area displays a list of CMIP6 models. Two specific models are highlighted with a red oval: ACCESS-CM2 (7362) and ACCESS-ESM1-5 (28615). A scrollable list of other models follows, including BCC-CSM2-MR, BCC-ESM1, CAMS-CM1-0, CESM1-CAM5-CMIP5, CESM2, CESM2-FV2, CESM2-WACOM, CESM2-WACCM-V2, CIESM, CMCC-CM2-HR4, CMCC-CM2-VHR4, CMCC-ESM2-SR5, CNRM-CM6-1, CNRM-CM6-1-HR, and CanESM5.

Model	Number of Variants
ACCESS-CM2	7362
ACCESS-ESM1-5	28615
BCC-CSM2-MR	18867
BCC-ESM1	4914
CAMS-CM1-0	1627
CESM1-CAM5-CMIP5	378399
CESM2	116553
CESM2-FV2	2003
CESM2-WACOM	20867
CESM2-WACCM-V2	2033
CIESM	124
CMCC-CM2-HR4	517
CMCC-CM2-VHR4	517
CMCC-ESM2-SR5	695
CNRM-CM6-1	53500
CNRM-CM6-1-HR	3113
CNRM-ESM2-1	44470
CanESM5	634052

- **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

- 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/



Australian Community
Climate and Earth System
Simulator (ACCESS)

CSIRO.au

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ACCESS is a family of related models, configured for specific applications, to meet operational and research needs from weather forecasting to climate projections.

[Learn more](#)

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 adaptions to weather risk and climate change as well as to the efficiency of our industries.



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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?
CMIP	piControl	1 (500 yrs)	Complete	Yes
	1pctCO2	1	Complete	Yes
	abrupt-4xCO2	1	Complete	Yes
	historical	3	Complete	Yes
	amip	4	Complete	Yes
FAFMIP	faf-all	1	Complete	Yes
	faf-heat	1	Complete	Yes
	faf-passiveheat	1	Complete	Yes
	faf-stress	1	Complete	Yes
	faf-water	1	Complete	Yes



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Useful links

DKRZ dataset citations:

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

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

All: 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

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>

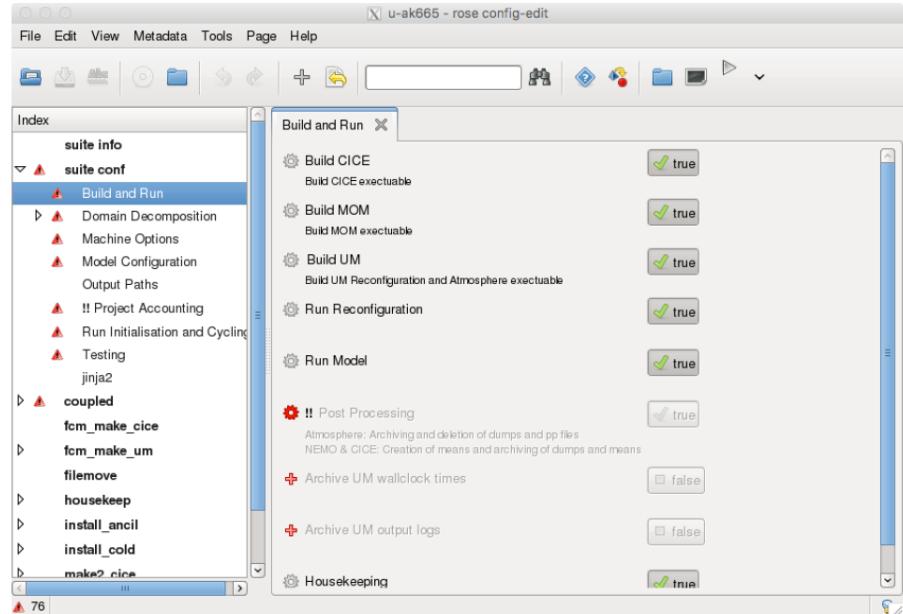
ESM1.5: <https://www.publish.csiro.au/es/ES19035>

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





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FOR MORE INFORMATION

Chloe Mackallah | chloe.mackallah@csiro.au
03 9239 4455

www.nespclimate.com.au

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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