CABLE in ACCESS-CM2:
Plans and progress

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CABLE video conference

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CABLE in ACCESS

Name	Components
ACCESS1.3 (Used for CMIP5)	UM7.3 (N96:1.875x1.25, 38 levels), CABLE1.8, MOM4p1, CICE4.1, OASIS3.25
ACCESS1.3b	CABLE2.0 replaces CABLE1.8
ACCESS1.4 ACCESS-ESM1	CABLE2.2.3, OASIS3-MCT, WOMBAT (ocean carbon)
ACCESS-CM2	UM8.5+ (GA6 atmospheric settings), CABLE2.x, MOM5, CICE5, OASIS3-MCT Resolution: Atmosphere: N96, 85 levels or N216, 85 levels Ocean: ~1 degree or ~0.25 degree

NB: UM7.3-UM8.5: MOSES-JULES
→ re-couple CABLE

CABLE via JULES

- Single site : Loobos, Netherlands
- Two runs
    - CABLE offline interface (started with case submitted to PLUMBER)
    - CABLE via JULES interface (started with example from JULES repos)
- First tests not encouraging – soil moisture looked like JULES ……. because using JULES soil level thickness
    - Changed soil depths (dzsoil) from [/0.1, 0.25, 0.65, 2.0, 3.0, 4.0/] to [/0.022, 0.058, 0.154, 0.409, 1.085, 2.872/] in ancillaries.nml.
- Better but …
- Confirm that really running comparable tests
- CABLE code: trunk@r797
- Single year (1997), same forcing from PALS, no spin-up
- Still differences
    - smaller soil temp diurnal cycle in CABLE-JULES
    - Offset in soil moisture (CABLE-JULES higher)

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# Tracking down other differences

Changes made to JULES-CABLE:

- Use l_cable to switch off calls to jules routines 'snow' and 'hydrol' in control.F90.
- Changed tile fractions from 35.5% ENL and EBL, 20.8% C3G and 8.2% BGr to 100% C3G – same as CABLE, in data/tile_fractions.dat.
- Changed canopy height for C3 Grass from 16.38 to 0.567 – same as CABLE, in pft_params.nml.
- Changed in ancillaries.nml:
    - Parameter B : 6.63 $\rightarrow$ 5.2227 (Param. b in Campbell eqn.)
    - satcon : 0.004715 $\rightarrow$ 0.009305 (Hydraulic cond. @sat, mm/s)
    - sm_sat : 0.458150 $\rightarrow$ 0.4079 (vsmc@sat , m^3/m^3)
    - sm_crit : 0.242433 $\rightarrow$ 0.2134 (vsmc@fcap, m^3/m^3)
    - sm_wilt : 0.136328 $\rightarrow$ 0.1028 (vsmc@wilt , m^3/m^3)
    - hcap : 1185676.0 $\rightarrow$ 803588.3 (soil spec. heat cap., J/kg/K)

Changes made to CABLE-CABLE@r797:

- Set default LAI to constant = 4.0, for C3 Grass – same as JULES, in cable_driver.F90.
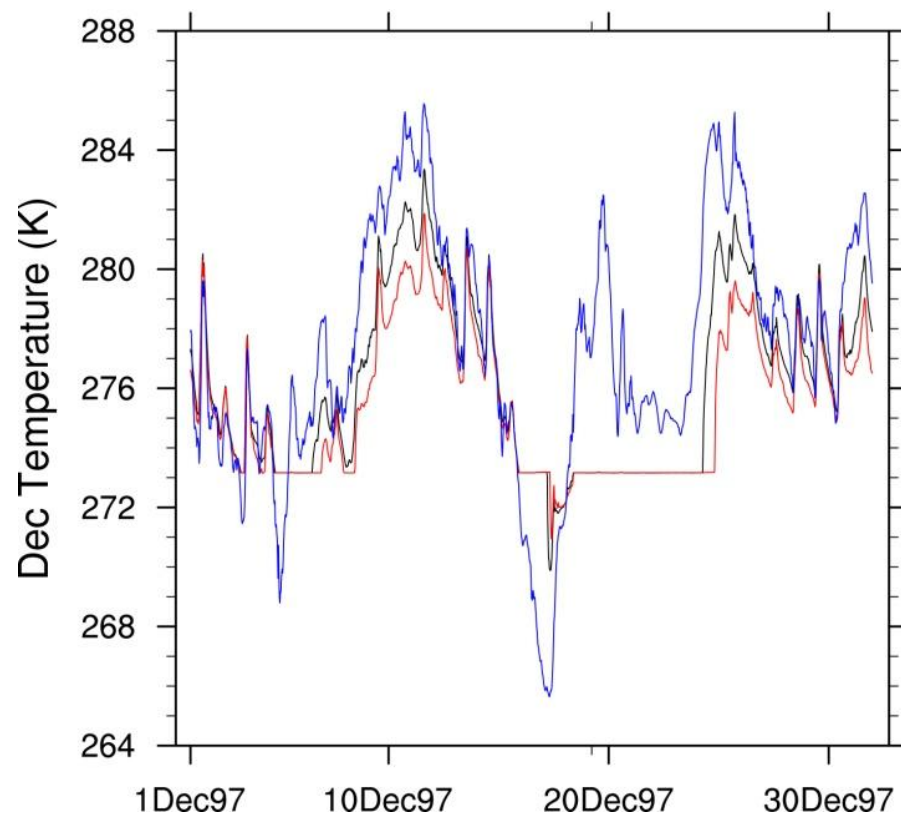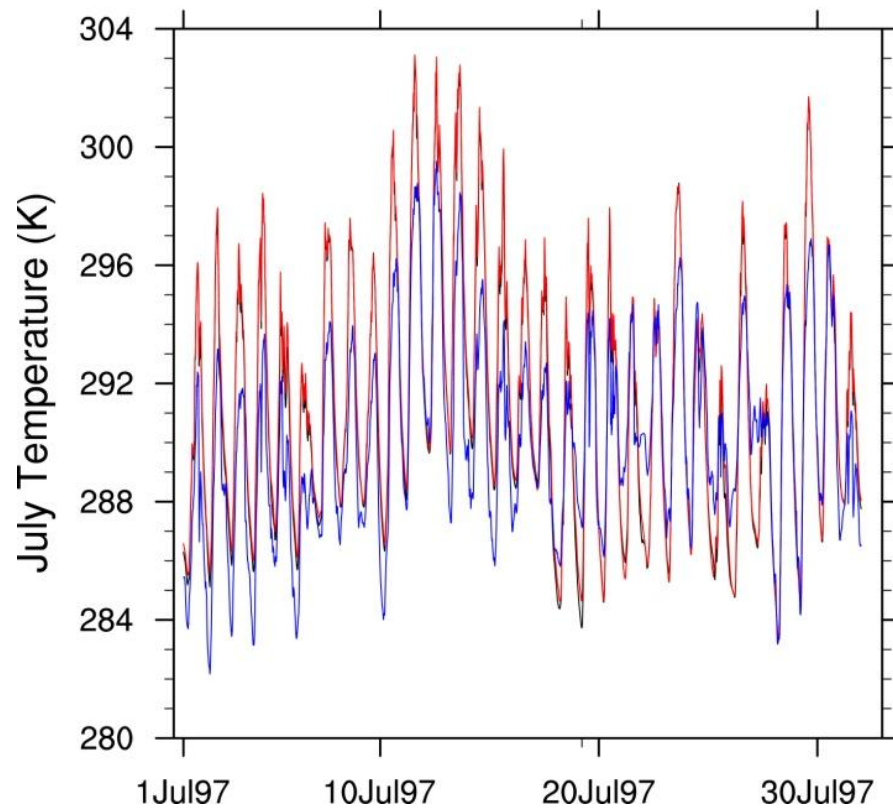
Current status (this morning)
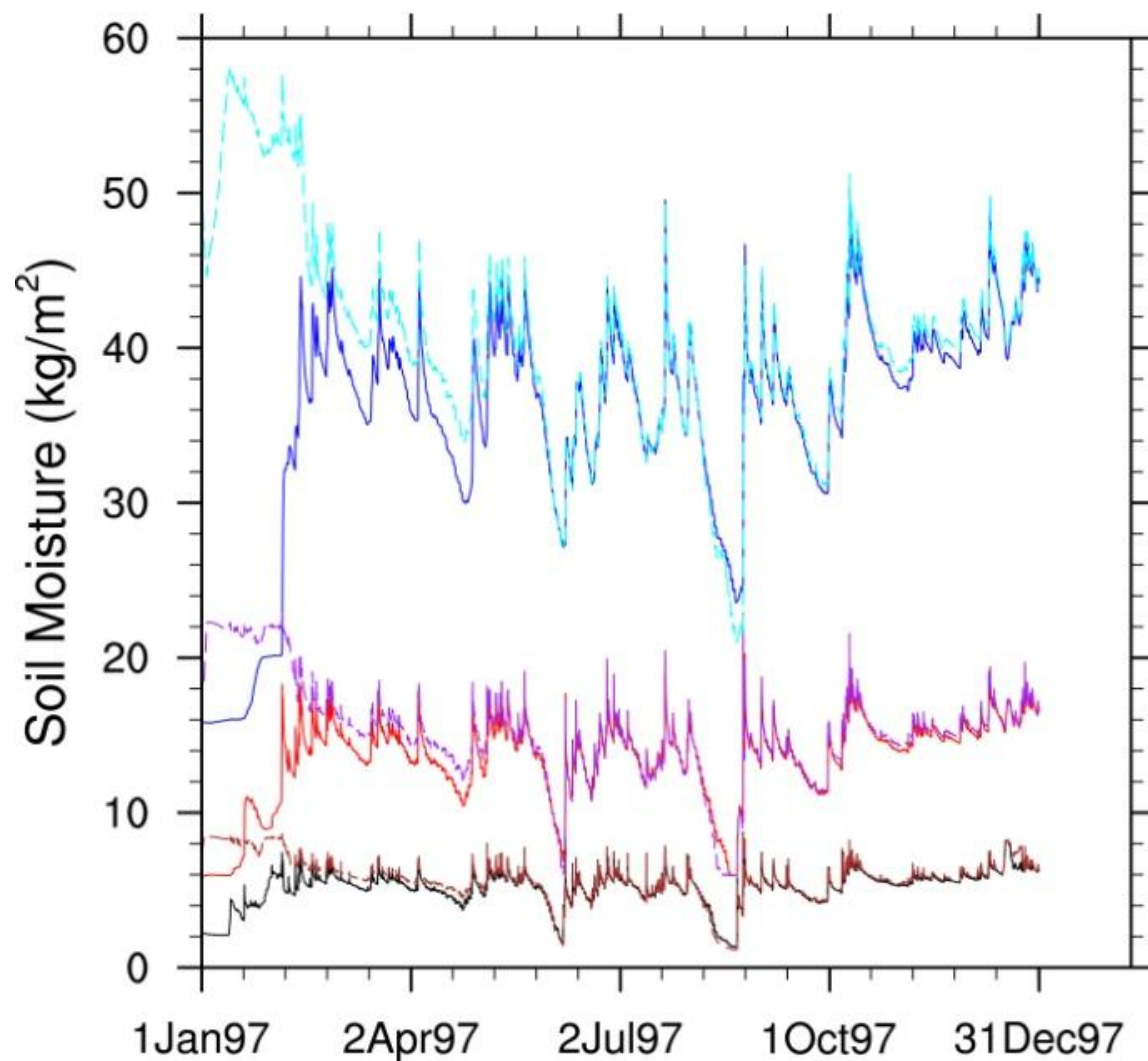
Legend:
- ___ smcl_L1 (J-C)
- ___ smcl_L2 (J-C)
- ___ smcl_L3 (J-C)
- ___ smcl_L1 (C-C)
- ___ smcl_L2 (C-C)
- ___ smcl_L3 (C-C)

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Current status (this morning)

___ tsoil_L1 (J-C)
___ tsoil_L1 (C-C)
___ Tair

Next steps

- Investigate other parameters
  - hcon
  - sathh
  - albedo (vis/nir or single band) etc.
- Check initialisation.
- How to put CABLE parameters through JULES namelist
- Ensure we understand which parameters values are being filled from where e.g.
  - CABLE input files
 - set in code
  - JULES namelists

CABLE in UM8.5

- CABLE is successfully coupled to the UM via JULES, however using contrived initialization

- UM8.5 uses ENDGAME dynamics, effectively shifting the grid by half a cell to the N and E

- ACCESS-CM2 assumes yet another land-sea mask for which ancillaries have been created

- Currently including these ancillaries in ACCESS-CM2+CABLE configuration

- Revised coupling of CABLE-JULES-UM
  - Minimizes points of contact between the models
  - CABLE code resides inside JULES - no libcable.a
  - Utilizes host models' IO to fill a data module which then feeds CABLE
  - Consistent with plans for CABLE-JULES interoperability
  - A more comprehensive description will follow at a later date as well as making this available to the community

ACCESS-CM2 (with JULES) tests: SST biases (2nd decade – Pre-Industrial)

SH sea-ice area seasonality
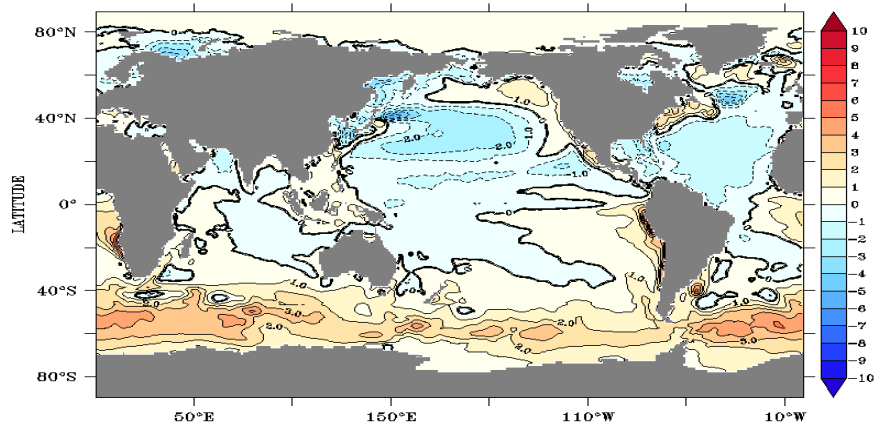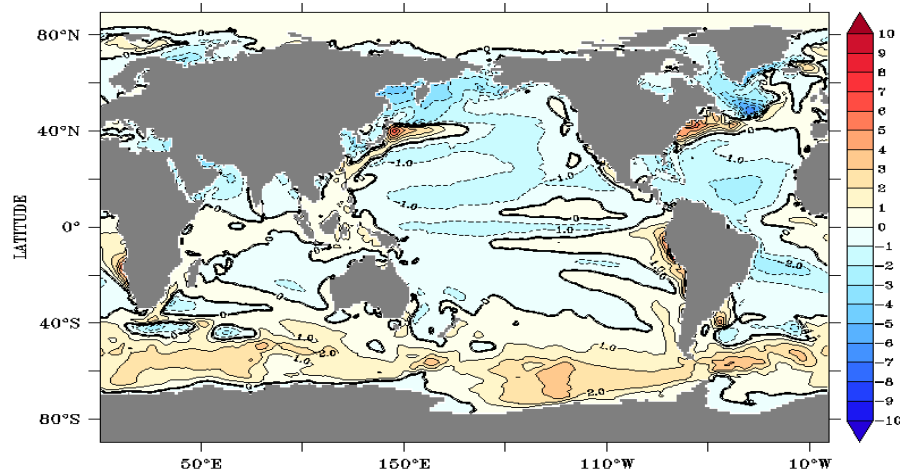
ACCESS1.4

ACCESS-CM2, standard res
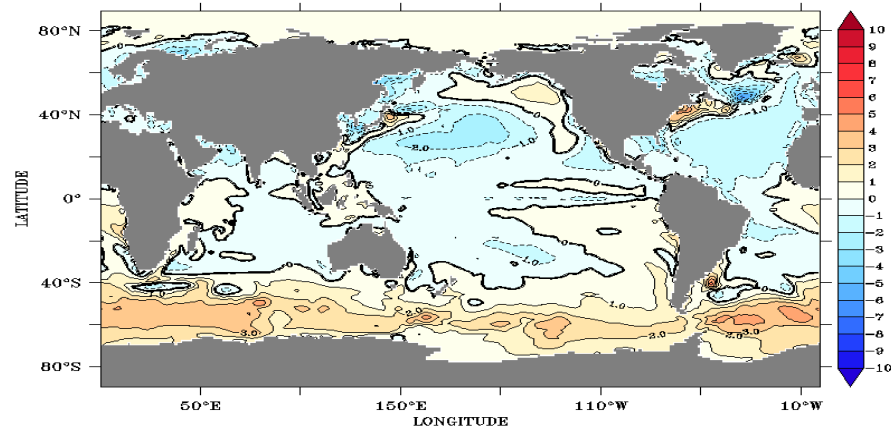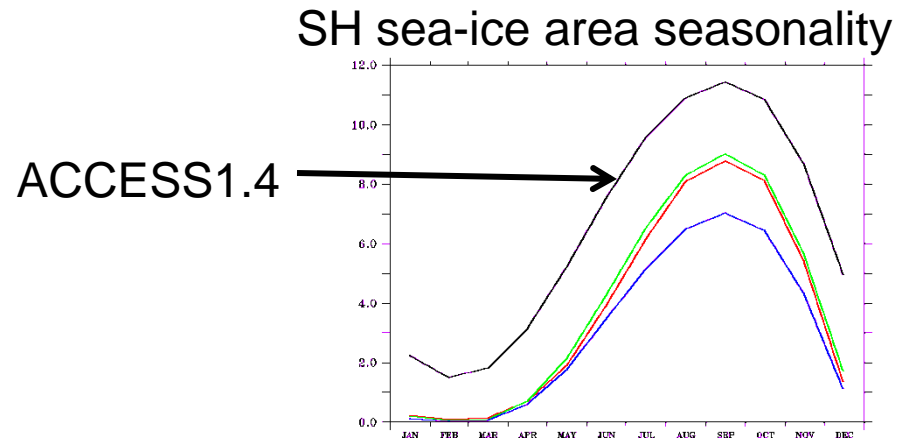
ACCESS-CM2, high res atmos

Figures; D. Bi

Plans for CABLE in ACCESS-CM2

- https://trac.nci.org.au/trac/cable/wiki/ACCESS-CM2

This is a working document to describe plans and testing for the CABLE configuration for ACCESS-CM2, the next version of the ACCESS coupled model which is expected to participate in CMIP6.

Configuration of CABLE for ACCESS-CM2

A number of alternative parameterisations have been added to CABLE over recent years. There are also a number of known limitations to our current CABLE configuration. In planning for ACCESS-CM2, it is helpful to prioritise and systematically test different CABLE configurations and parameter settings to determine an appropriate CABLE configuration for CMIP6 simulations. Systematic testing requires some means of determining what constitutes a better simulation. It is anticipated that the majority of testing will be in atmosphere-only ACCESS cases and can utilise the UMPLOT package. Key metrics that should be checked include

- energy balance
- water balance
- ...

Alternate parameterisations/parameters for testing (generally simpler changes first)

1. Runoff speed

- allows runoff speed to be influenced by altitude/topography
- Coding complete and in trunk
- Switch: cable_user%l_new_runoff_speed
- Testing for ACCESS1.3 needs to be repeated since impact might be different with ACCESS-CM2 climate/configuration
- #48 notes addition of switch, no ticket to describe code change?

2. Roughness for bare soil

- Soil roughness length changed from Z0=1.e-6 to z0=A*min(1.,LAI) + 1.e-4. This allows soil roughness to vary from 1.e-4 for deserts to 1.e0-3 for areas with vegetation cover.
- Coding complete and in trunk
- Switch: cable_user%l_new_roughness_soil
- Testing has been done with ACCESS1.3.
- Confirm result with ACCESS-CM2, then recommend this switch defaults to true rather than false
- #30, #48

3. FWSOIL parameterisation

- CABLE provides 3 options for calculating soil water uptake efficiency, 'standard', 'non-linear extrapolation', 'Lau and Ktaul' (based on Lau and Katul 2000). ACCESS1.4 uses 'standard'. Lau and Katul version performed better (especially combined with hydraulic redistribution for offline site tests, Li et al, JGR, 2012)
- Coding: complete and in trunk
- Switch: cable_user%FWSOIL_SWITCH
- Testing: Need to confirm what offline testing has been done. No ACCESS tests to date.

4. Hydraulic redistribution

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https://trac.nci.org.au/trac/cable/wiki

Thank you

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