CABLE deficiencies

- Are others seeing these problems and in what ways do they manifest?
- What tests are done to define the problem?
- Has anyone thought about a solution for any of these issues?
- Is this something we can take action on now? If yes, who?

CABLE technical deficiencies

CABLE needs to be re-designed from the top down:

- More modular
- Self contained modules
- Following the data flow
- Following the science

Why ?

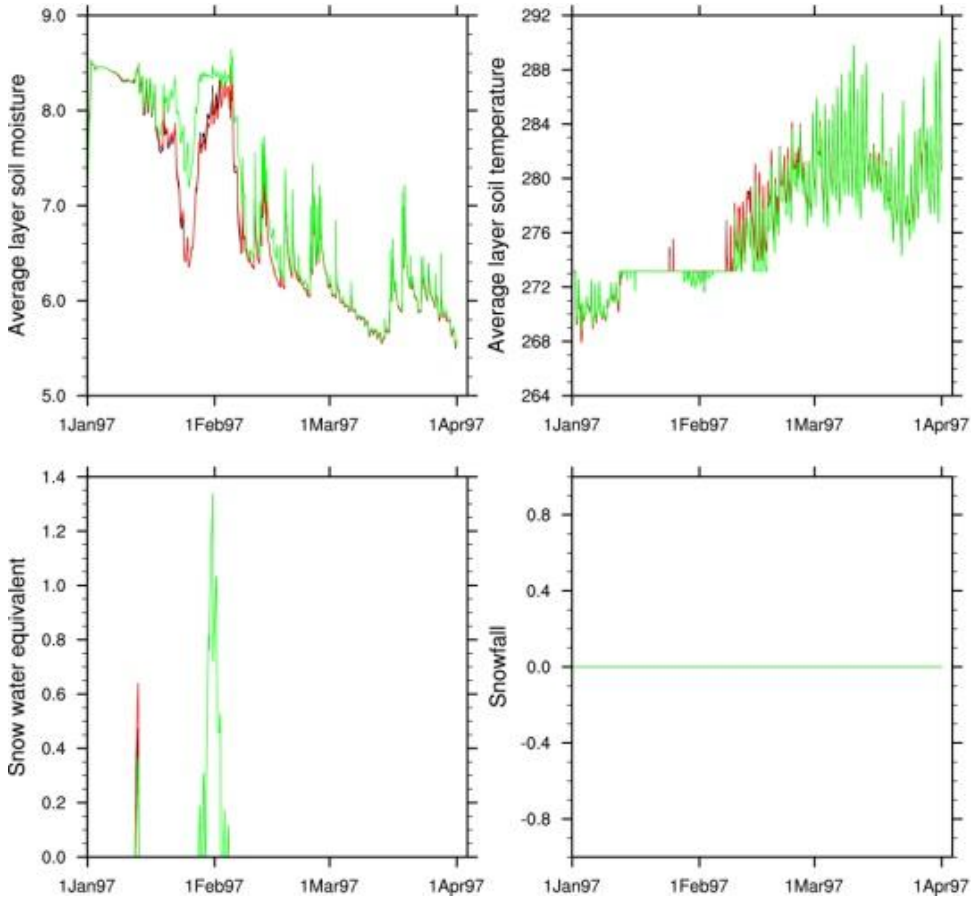
- Interoperability (JULES)
- Readability
- Flexibility (further development, performance, specific requirements)

Jhan Srbinovsky, CSIRO O&A

CABLE Initialisation

Lauren Stevens, CSIRO O&A

- Ref: Ticket #71
- What flags and counters do we use and when ?
  - ktau (e.g. soil_snow)
  - ktau_gl (e.g. amip vs. coupled)
  - first_call/first_cable_call
- What/When do things need to
- come from:
  - the restart file ?
  - the parameter files ?
  - the netCDF files ?
- Examples:
  - offline CABLE-JULES (see figure)
  - online (UM) CABLE-SLI



Science issues: water

Evaporation problem

CABLE has excessive evaporation:

- ACCESS and CCAM are not badly affected
- WRF is affected (-10°C bias in winter max. temperatures, monthly mean)

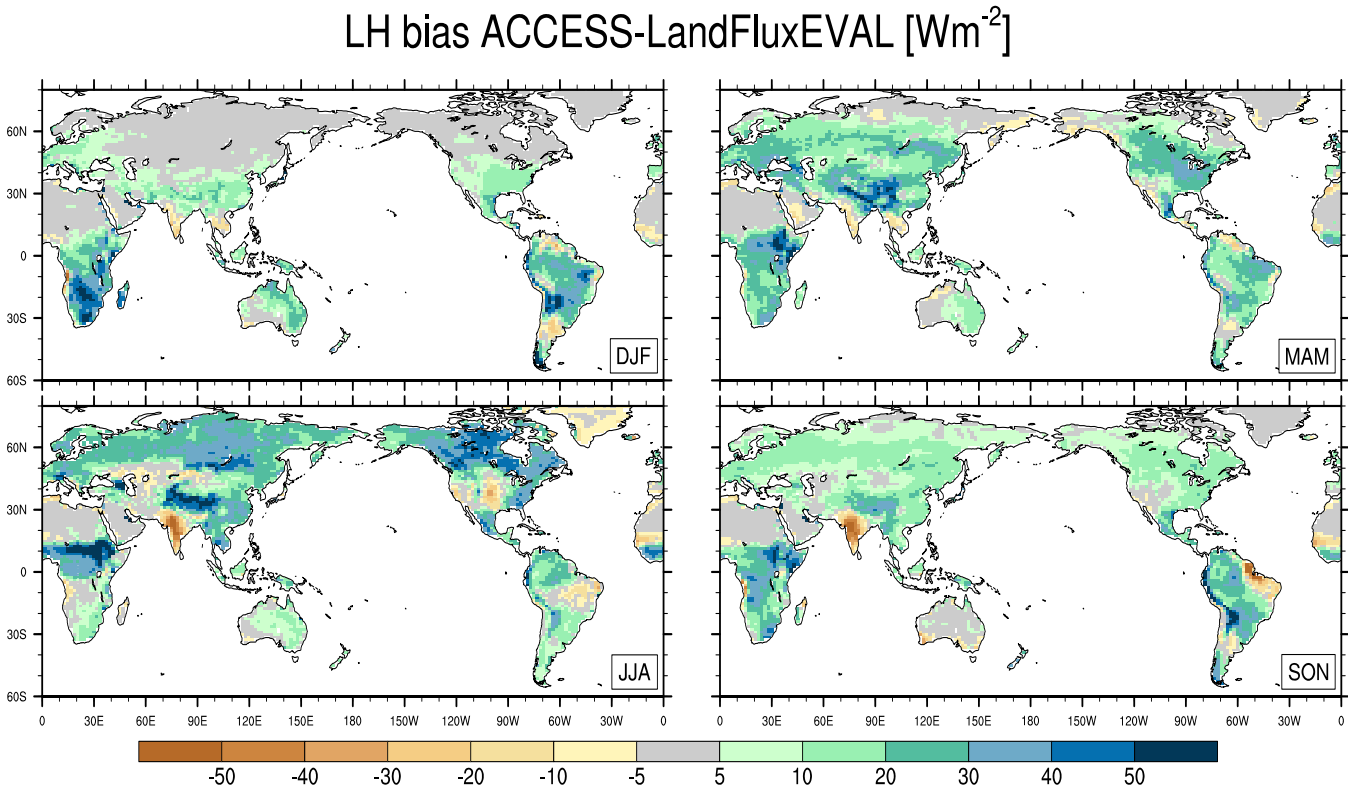
Solved by using the new hydrology from Mark Decker.

→ Should we investigate further? How?
→ Could it affect ACCESS and CCAM in other ways?

Claire Carouge, UNSW

CABLE2.0 in ACCESS: Bias in Latent Heat Flux

- Excessive Latent Heat flux in most regions, particularly regions with high vegetation



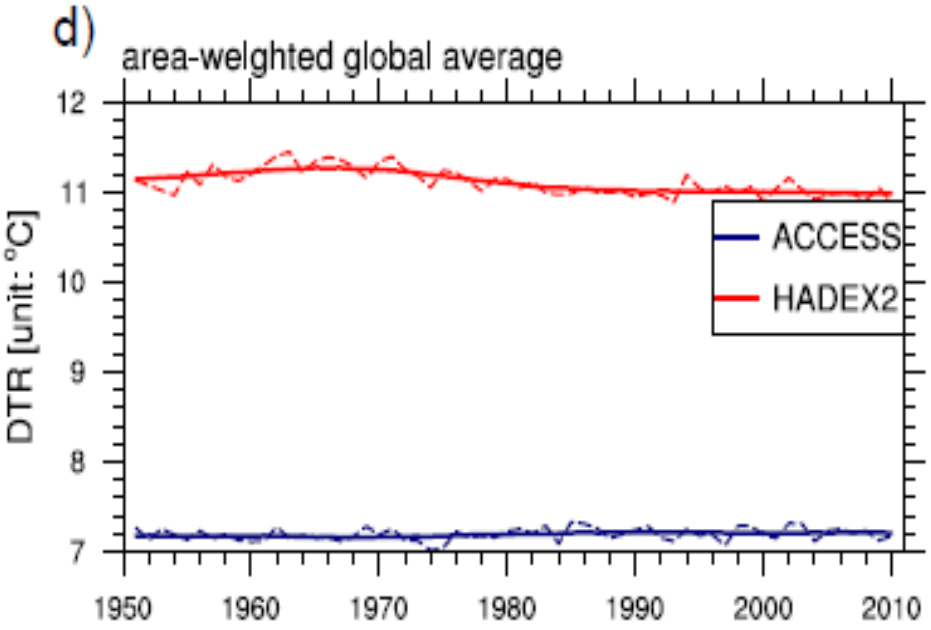
Ruth Lorenz, UNSW

Correction of transpiration for over-extraction can result in higher WUE than calculated in the coupled stomatal conductance/photosynthesis equations.

```
IF (ecx(i) > 0.0 .AND. canopy%fwet(i) < 1.0) Then
        evapfb(i) = ( 1.0 - canopy%fwet(i)) * REAL( ecx(i) ) *dels      &
                / air%rlam(i)

        DO kk = 1,ms

          ssnow%evapfbl(i,kk) = MIN( evapfb(i) * veg%froot(i,kk),      &
                        MAX( 0.0, REAL( ssnow%wb(i,kk) ) -     &
                        1.1 * soil%swilt(i) ) *              &
                        soil%zse(kk) * 1000.0 )

        ENDDO

        canopy%fevc(i) = SUM(ssnow%evapfbl(i,:))*air%rlam(i)/dels

        ecx(i) = canopy%fevc(i) / (1.0-canopy%fwet(i))

ENDIF
```

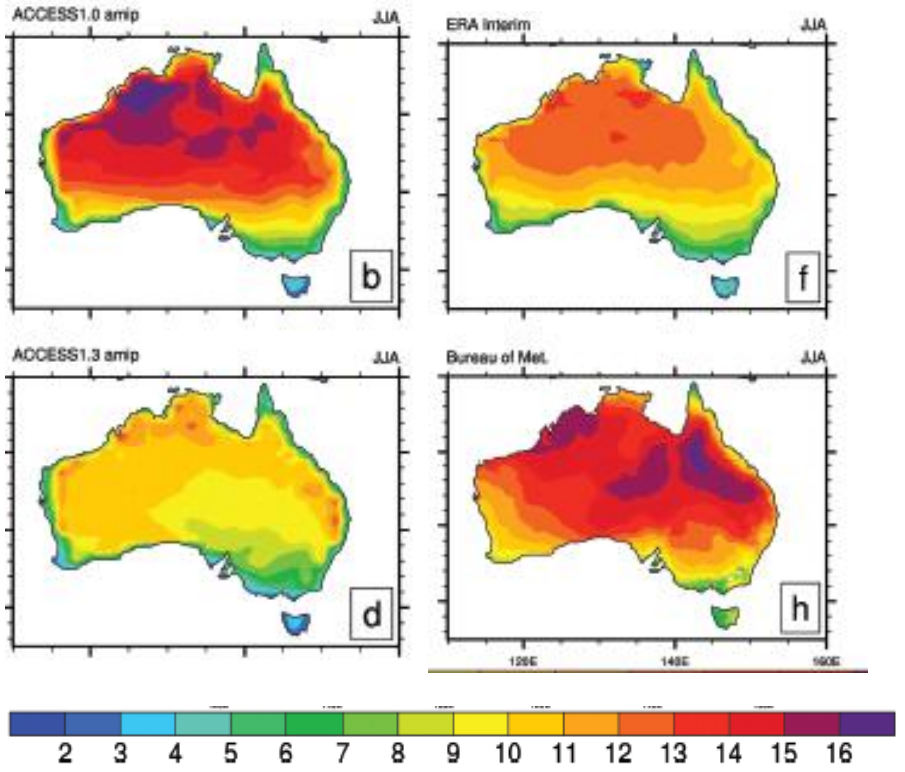
Vanessa Haverd, CSIRO O&A

Diurnal temperature range – too small



From Lorenz et al, GMD, 2014

June-August



From Kowalczyk et al, AMOJ, 2013

CABLE for Regional Climate Modelling with ACCESS and CCAM

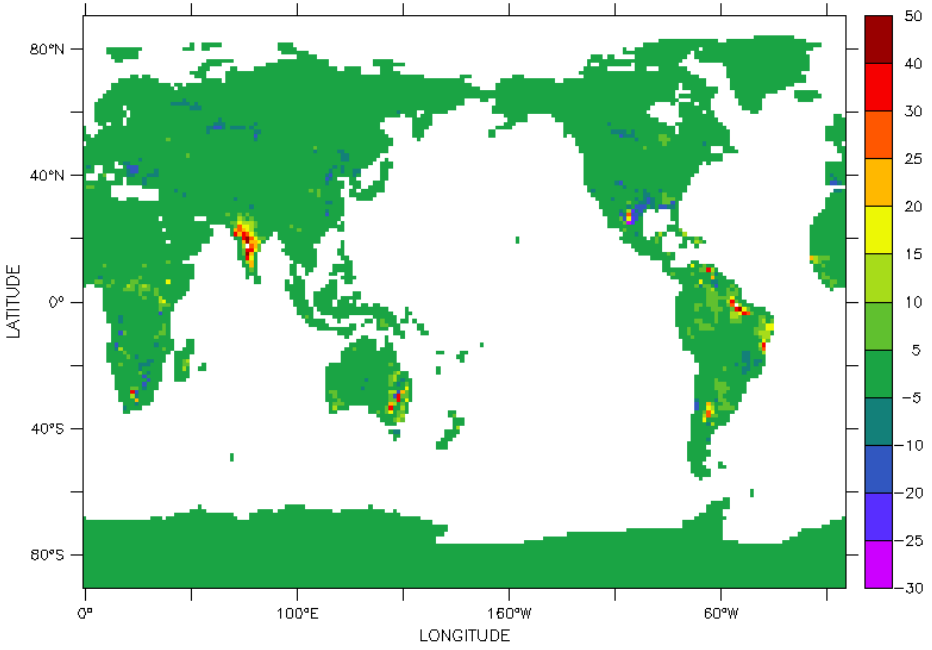
- Some ambiguity with input data and prognostic variables (e.g., soil albedo, snow)
- Speed of cable_canopy.F90 creates load balance issues with higher processor counts (i.e., 1000's). Are 20 iterations necessary?
- Possible issue for stable conditions. Why is zetpos=1 and not 10?
- Very keen to see advances in CABLE hydrology, runoff, etc

Carbon related deficiencies

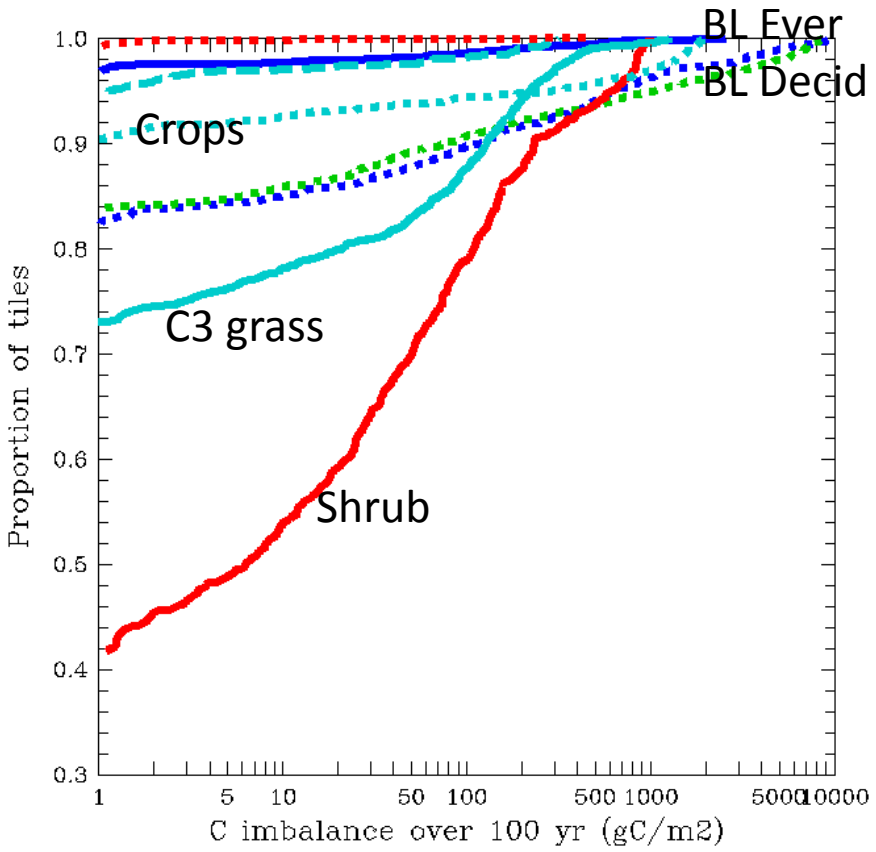
- Excessive P limitation
- Errors in leaf phenology
- Grassy crops
- C4 photosynthesis
- Vegetation biomass too high, soil carbon too low
- Negative litter nitrogen pool

Ying-Ping Wang, CSIRO O&A

CASA-CNP: carbon conservation



NEE (gC/m2/y) averaged over year 601-700
from ACCESS-ESM1, pre-industrial control



NB: log scale

Global: 0.097 PgC/y
Global ignoring tiles with poor C balance: 0.007 PgC/y