Proposed changes to CABLE + some bug fixes worth knowing

Bernard Pak

CSIRO OAF

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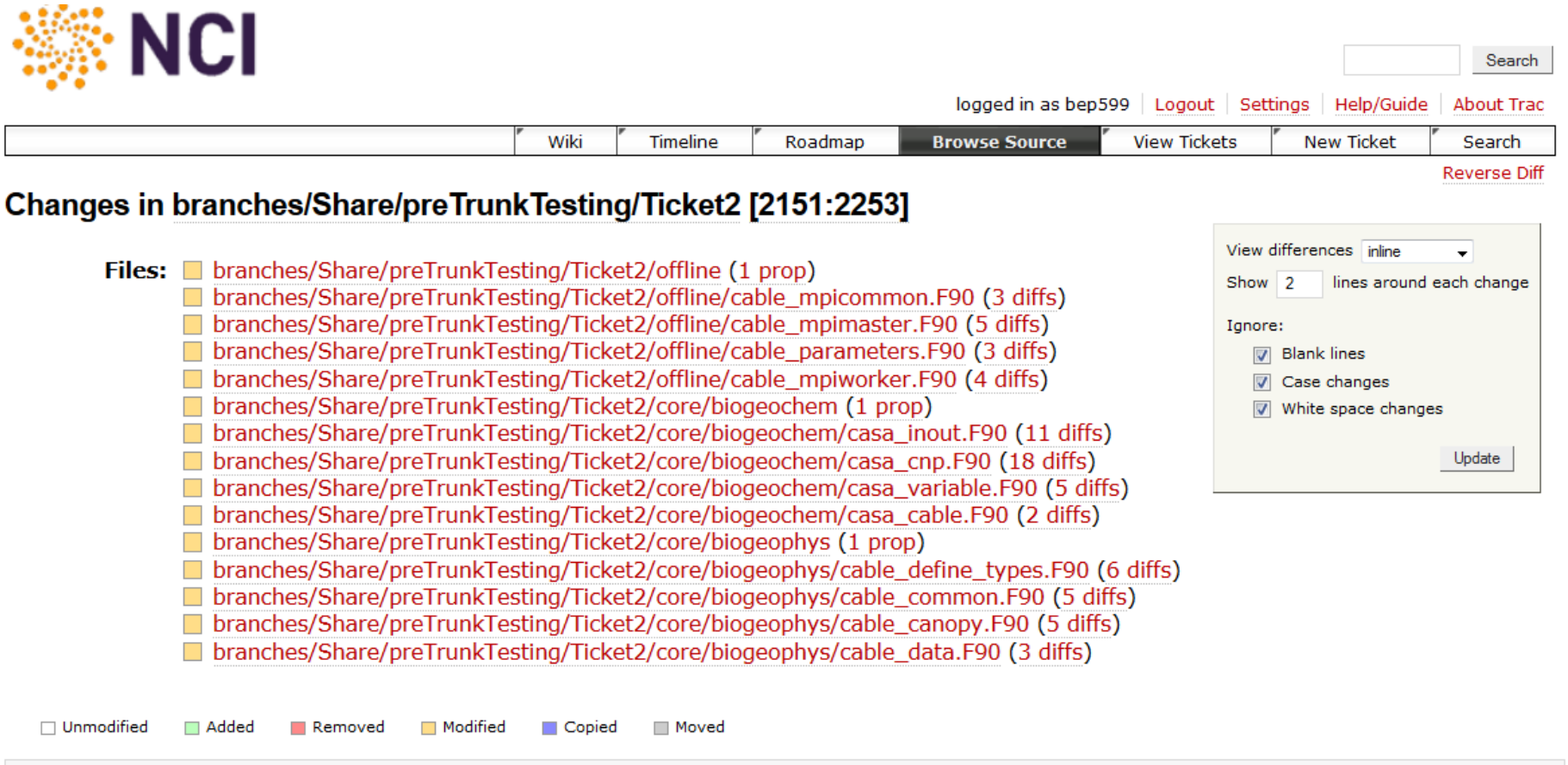
Ticket 2 – pull out parameters to be read in from input text file



Part 1 – vegetation parameters used in the canopy module

New variables	*Original parameters in cable_data.F90*
• veg%a1gs(:)	a1c3, a1c4 (for C3 and C4 plants)
• veg%d0gs(:)	d0c3, d0c4
• veg%alpha(:)	alpha3, alpha4
• veg%convex(:)	convx3, convx4
• veg%cfrd(:)	cfrd3, cfrd4
• veg%gswmin(:)	gsw03, gsw04
• veg%conkc0(:)	conkc0
• veg%conko0(:)	conko0
• veg%ekc(:)	ekc
• veg%eko(:)	eko

Veg types are distinct in each patch in the CSIRO classification(beware if using IGBP)

```
xleuning(i,1) = ( fwsoil(i) / ( csx(i,1) - co2cp3 ) ) &
    * ( ( 1.0 - veg%frac4(i) ) * C%A1C3 / ( 1.0 + dsx(i) &
    / C%d0c3 ) + veg%frac4(i) * C%A1C4 / (1.0+dsx(i) &
    / C%d0c4) )
```

Without C3-vs-C4 fractions, equations become simply:

```
xleuning(i,1) = ( fwsoil(i) / ( csx(i,1) - co2cp3 ) ) &
    * ( veg%a1gs(i) / ( 1.0 + dsx(i)/veg%d0gs(i)))
```

Files affected

- CABLE/core/biogeophys/cable_define_types.F90
- CABLE/core/biogeophys/cable_common.F90
- CABLE/core/biogeophys/cable_canopy.F90
- CABLE/core/biogeophys/cable_data.F90
- CABLE/offline/cable_parameters.F90
- CABLE/offline/cable_mpicommon.F90
- CABLE/offline/cable_mpimaster.F90
- CABLE/offline/cable_mpiworker.F90
- CABLE-AUX/core/biogeophys/def_veg_params.txt

Part 2 – remove 13 hardwired parameters in the CASA-CNP code

Same variable names but now under the derived type casabiome

casabiome%xnpmax(:)
casabiome%xkoptlitter(:)
casabiome%prodptase(:)
casabiome%maxfinelitter(:)
casabiome%nintercept(:)
casabiome%xkplab(:)
casabiome%xkpocc(:)
casabiome%q10soil(:)
casabiome%xkoptsoil(:)
casabiome%costnpup(:)
casabiome%maxcwd(:)
casabiome%nslope(:)
casabiome%xkpsorb(:)

Data statements removed from code

- data xnpmax/1.510856726,1.27916225,1.591076159,1.186066584,1.358075681,&
- 1.45621905,1.45621905,1.4[illegible]10382326, &
- 1.45621905,1.3659[illegible],1.210382326,1.0,1.399652677,1.0,1.[illegible]

However, beware that there are still data statements for

- Psorder, Pweasoil,
- fracpLab, fracPsorb,
- fracPocc, fracPorg,
- Xpsoil50

They are situated (duplicated) in two subroutines:
analyticpool and casa_poolout

Files affected

- CABLE/core/biogeochem/casa_inout.F90
- CABLE/core/biogeochem/casa_variable.F90
- CABLE/core/biogeochem/casa_cnp.F90
- CABLE/core/biogeochem/casa_cable.F90
- CABLE/offline/cable_mpicommon.F90
- CABLE/offline/cable_mpimaster.F90
- CABLE/offline/cable_mpiworker.F90
- CABLE-AUX/core/biogeochem/pftlookup_csiro.csv

Requires feedback from YOU

- Time frame for implementation – early 2015?
- Will the implementation affect your current work?
- Suggestion for more related changes?

Bug fixes related to online/offline ACCESS comparison

- Ticket 62 – affect offline runs only. The splitting of albedo bands was done twice, resulting in lower albedo.
- Ticket 66 – affect offline runs only. Variable soil%pwb_min was not initialized.
- Ticket 70 – affect both offline and online runs, especially for data assimilation. Variable ssnow%owetfac should be carried in the restart file (offline) and the startdump (online).

Bug fixes (cont.) – Ticket 71

- Ticket 71 – affect offline runs only, especially for data assimilation. Variables ssnow%wb and ssnow%wbice were reinitialized within the core code (cable_soilsnow.F90) when ktau_gl=1 plus a mix of online/offline switches.
- Quick fix is to put in suitable switch for each case.
- Full fix should have all initializations moved out of core code to the online interface and the offline driver respectively.

Bug fixes (cont.) – Ticket 68

- Ticket 68 – affect online runs only. All grids in online runs are set to soil type #2 for convenience, except permanent ice points have soil type #9.
- When not using CASA-CNP, this is OK as ACCESS has spatially-explicit soil parameters (therefore do not need soil type).
- However, the introduction of CASA-CNP codes in online code used soil types to determine soil textures. The offline code has already used spatially-explicit soil textures from UM anciliary.
- Bug fix – use the same UM anciliary to obtain soil textures for online runs

Lessons learned

- The bugs found above indicated a lack of oversight for all platforms of CABLE – some changes to the code were completed for the online platform only while others for the offline only.
- We need a test suite badly to run checks after each change to make sure it runs on all platforms
  - 1) Offline single site (how many sites?)
  - 2) Offline global serial (how many or which met forcing?)
  - 3) Offline global mpi (how many or which met forcing?)
  - 4) Online (ACCESS) – atmosphere only (with/without C-cycle?)
  - 5) Online (ACCESS) – coupled (with/without C-cycle?)
- For each platform mentioned, there should be runs using icycle from 0 to 3 (or 1 to 3?) – Anyone still using the old carbon module?
- A comparison of offline global runs using ACCESS forcing to the online ACCESS run would highlight the discrepancies immediately for bugs like those mentioned above.