The Community Land Model practical session

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A. REVIEW: Basic clm4 usage

Goal: Run the CLM4SP on bluefire at T31 horizontal resolution and cycle the prescribed atm data from 1948 to 2004

If you have not memorized the **four steps required to start any cesm simulation**, let's do that now!

A. REVIEW: Basic clm4 usage (cont'd)

Compsets are shortcuts designed for specific cases… treat them as starting points for all cases

"I" compsets run the clm/datm and no ice/ocean models

Name	Short Name	Description
I_2000	I	CLM4SP, where SP = satellite phenology
I_1850	I1850	CLM4SP, single yr w/ corresp. pfts, CO_2 , $aerosol_{dep}$
I_1948-2004	I4804	CLM4SP, yr range w/ corresp. datm data only
I_1850-2000	I20TR	CLM4SP, yr range w/ corresp. transient data
I_2000_CN	ICN	CLM4CN, where CN = carbon-nitrogen model
I_1850_CN	I1850CN	CLM4CN, same comment as for the SP case + N_{dep}
I_1948-2004_CN	I4804CN	CLM4CN, same comment as for the SP case
I_1850-2000_CN	I20TRCN	CLM4CN, same comment as for the SP case

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Auto-resubmit a run: RESUBMIT to > 0 in env_run.xml before run ends

Manual resubmit: CONTINUE_RUN to TRUE in env_run.xml before run begins

B. Differences between compsets => customizing a case

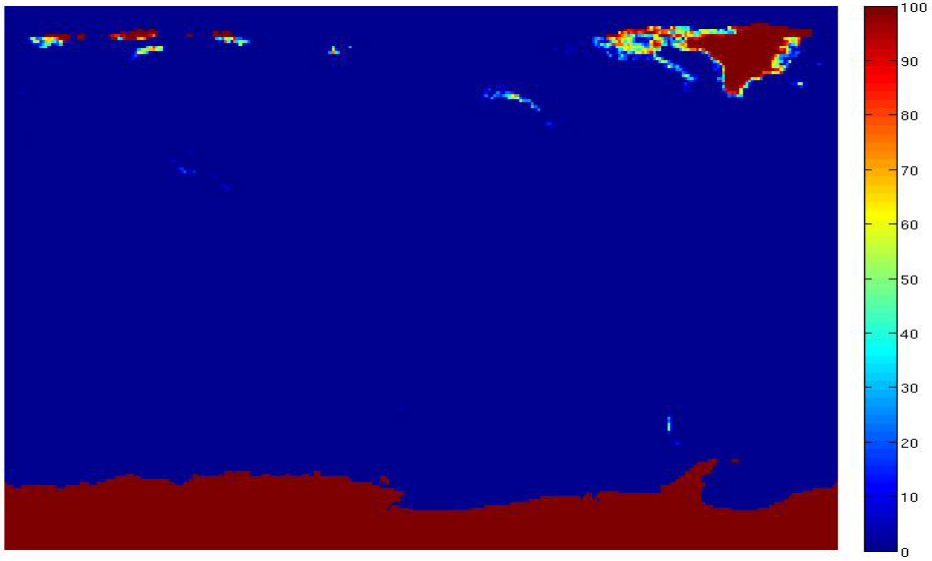
Goal: Create a case **with a different compset** and see how **settings change automatically** for you. Use this information to understand how **you may also change settings manually** for the purposes of a case not explicitly supported by an existing compset.

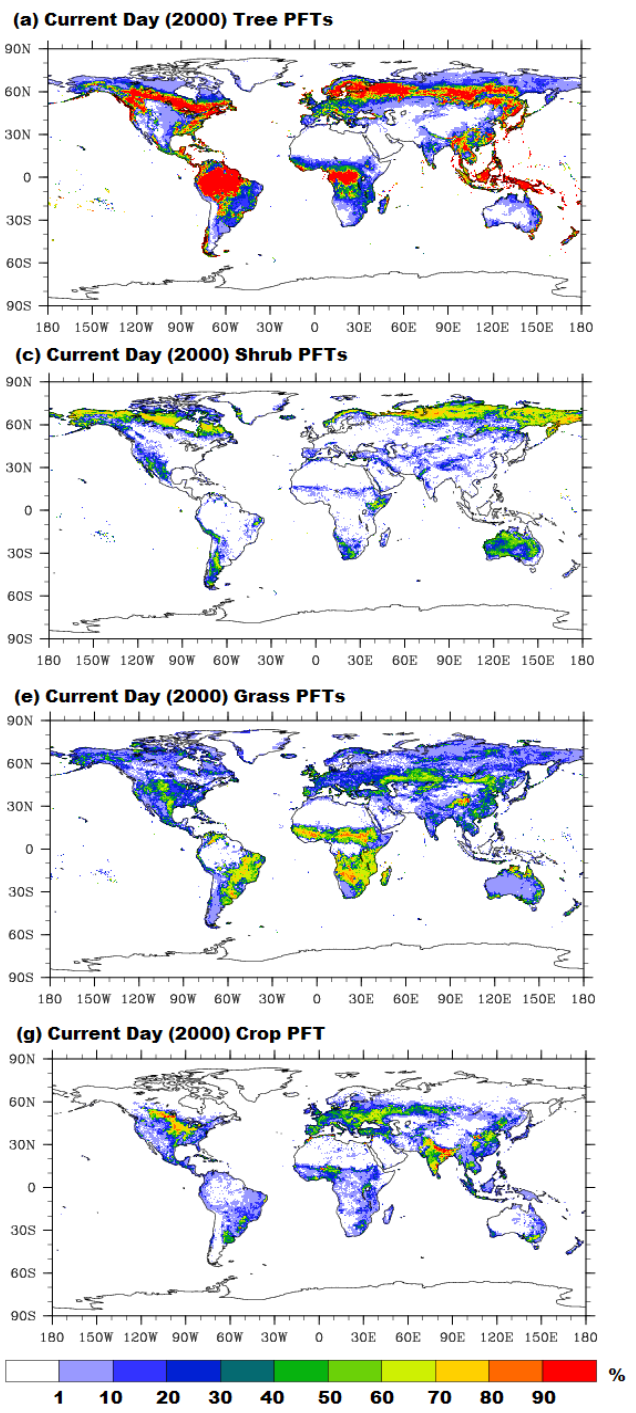
Note: In this exercise you will try the I20TRCN compset

C. Understanding and modifying input data

Goal: Learn what inputs the clm needs and what they look like

% glacier





D. Some slides by Keith Lindsay followed by discussion

Goal: Ask questions pertaining to your interests

- Spinning up the CLM?
- Transient or single-point simulations?
- Other…
- **CLM4 user's guide always best place to start!**

Spinning up the CLM

Option 1: Spin up carbon/nitrogen (CN) from scratch for 650+ years

Step 1: B-case with high frequency compset; run for 30 years

Step 2: I-case with "**-ad_spinup on**" in CLM_CONFIG_OPTS; run 600 years; finidat=' '

Step 3: I-case with "**-exit_spinup on**" in CLM_CONFIG_OPTS; 1 yr; finidat from step 2

Step 4: I-case with neither of the above options; run for >50 years; finidat from step 3

Comments:

Look for long-term average NEE near zero for successful spin-up

Initial file from step 4 may serve to start a CNDV (dynamic veg.) run

Spinning up the CLM

Option 2: Run without the nitrogen Carbon_only for a < 500-year spin-up

Step 1: B-case with high frequency compset and run for 30 years

Step 2: I-case with **suplnitro='ALL'**; start with **finidat=' '**

Comments:

-Again, look for NEE near zero

-Current implementation results in over-productive veg. from unlimited nitrogen

Option 3: Use spun up data from some existing run with similar climate

-If running on diff. grid or diff. continental outline, run interpinic first

*Option 4: Run B-case **without CN** for a < 100-year spin-up (same as CCSM3)*

Exercise (A) detailed steps

1) Create the case…
cd scripts
./create_newcase -case <your path>/I1948-2004 -compset I4804 -mach bluefire -res T31_gx3v7
./create_newcase -help # for documentation
./create_newcase -list # for available options

2) Configure the case…
cd <your path>/I1948-2004
You need not change env_conf.xml for this case to work but now would be the time to make such changes (we will discuss later)
./configure -case # configure -help …for documentation

3) Add hist_nhtfrq and set to -24 (i.e., 24 hrs) in the clm namelist to get daily avg output instead of monthly (default)…
$EDITOR Buildconf/clm.buildnml.csh

4) Build the case and compile the code…
./I1948-2004.bluefire.build

5) Submit the run…
You need not change env_run.xml for this case to work but now would be the time to make such changes (we will discuss later)
I1948-2004.bluefire.submit # modify this file with… bsub -U 37591059#4 < I1948-2004.bluefire.run …OR
add the line #BSUB -U 37591059#4 near the top of I1948-2004.bluefire.run
bjobs # to see the $jobID and whether the job is pending or running
bkill $jobID # if necessary;
run executes in /ptmp/$USER/I1948-2004
output moves to /ptmp/$USER/archive/I1948-2004 when run ends

Exercise (B) detailed steps

1) Create the case…
cd scripts
./create_newcase -case <your path>/I1850-2000CN -compset I20TRCN -mach bluefire -res f19_g16

2) Note differences between this case and the case created in (A)
cd <your path>
diff I1850-2000CN I1948-2004

3) Configure the case as you learned in (A) step 2

4) Now compare the /Buildconf directories
diff I1850-2000CN/Buildconf I1948-2004/Buildconf

5) Discuss the differences in the context of changing settings manually for cases not supported by existing compsets.
Discussion leads to Exercise (C) where you will focus on clm's input data.

6) Before proceeding to (C), change hist_nhtfrq to -24 in the clm namelist, then build and run this case as you learned in (A) steps 3, 4, and 5.
Look at the history files generated by this run versus the run in (A). Do you notice differences? Discuss output fields.

…Proceed to (C) while waiting for the run to complete.

Exercise (C) detailed steps

1) Look at clm.buildnml.csh for the list of input files to be read by the clm
   Go to the directories containing these files and view the data with ncview
   grep DIN_LOC_ROOT * | more # in the case directory in order to find which directory you're trying to go to
   Discuss

2) Create a case like the one in (A) but with a different case name
   Make a copy of the pft-physiology file in the case directory and modify a parameter in the pft-physiology file

   ncdump pft-physiology-file.nc | more # to see the contents; a leaf reflectance (e.g., rholvis) may be a good parameter to change
   chmod u+w pft-physiology-file.nc # if you need to change file permission from read-only to read-write

   Use nco, ncl, matlab, idl, fortran, etc. to modify the pft-physiology file
   E.g. modify and save the following ncl script to filename.ncl and type ncl filename.ncl:

```
begin
 a = addfile("/$casedir/pft-physiology-file.nc","w")     # modify path and filename as needed
 arr = a->varname                                        # of variable in pft-physiology file; assuming variable is one-dimensional
 arr(1) = 0.2d                                           # NCL is 0-based, so this modifies the 2nd entry to 0.2 in double precision
 a->varname = arr                                        # writes variable back to file with new value(s)
end
```

3) Configure, change clm namelist to point to new pft-physiology file and to write daily output, then build and run
   Compare history output against that generated in (A). Do you see differences?

4) Look at datm.buildnml.csh for the list of input files to be read by the datm
   Go to the directories containing these files and view the data with ncview …Discuss

Coupled model BGC exercise

- In BGC slide titled “Example usage”

Namelist from exercise A

```
co2_ppmv = 367.0
co2_type = 'constant'
create_crop_landunit = .false.
dtime = 1800
fatmgrid = '$DIN_LOC_ROOT/lnd/clm2/griddata/griddata_48x96_060829.nc'
fatmlndfrc = '$DIN_LOC_ROOT/lnd/clm2/griddata/fracdata_48x96_gx3v7_c090915.nc'
finidat = '$DIN_LOC_ROOT/lnd/clm2/initdata/clmi.BCN_0051-01-01_48x96_gx3v7_simyr2000_c110509.nc'
fpftcon = '$DIN_LOC_ROOT/lnd/clm2/pftdata/pft-physiology.c110425.nc'
frivinp_rtm = '$DIN_LOC_ROOT/lnd/clm2/rtmdata/rdirc_0.5x0.5_simyr2000_c101124.nc'
fsnowaging = '$DIN_LOC_ROOT/lnd/clm2/snicardata/snicar_drdt_bst_fit_60_c070416.nc'
fsnowoptics = '$DIN_LOC_ROOT/lnd/clm2/snicardata/snicar_optics_5bnd_c090915.nc'
fsurdat = '$DIN_LOC_ROOT/lnd/clm2/surfdata/surfdata_48x96_simyr2000_c100505.nc'
ice_runoff = .false.
outnc_large_files = .true.
rtm_nsteps = 6
urban_hac = 'ON_WASTEHEAT'
urban_traffic = .false.
hist_nhtfrq = -24
```

Namelist from exercise B

```
 co2_ppmv = 367.0
 co2_type = 'constant'
 create_crop_landunit = .false.
 dtime = 1800
 fatmgrid = '$DIN_LOC_ROOT/lnd/clm2/griddata/griddata_1.9x2.5_060404.nc'
 fatmlndfrc = '$DIN_LOC_ROOT/lnd/clm2/griddata/fracdata_1.9x2.5_gx1v6_c090206.nc'
 finidat = 'I1850CN_f19_g16_c100503.clm2.r.0001-01-01-00000.nc'
 fpftcon = '$DIN_LOC_ROOT/lnd/clm2/pftdata/pft-physiology.c110425.nc'
 fpftdyn = '$DIN_LOC_ROOT/lnd/clm2/surfdata/surfdata.pftdyn_1.9x2.5_simyr1850-2005_c091108.nc'
 frivinp_rtm = '$DIN_LOC_ROOT/lnd/clm2/rtmdata/rdirc_0.5x0.5_simyr2000_c101124.nc'
 fsnowaging = '$DIN_LOC_ROOT/lnd/clm2/snicardata/snicar_drdt_bst_fit_60_c070416.nc'
 fsnowoptics = '$DIN_LOC_ROOT/lnd/clm2/snicardata/snicar_optics_5bnd_c090915.nc'
 fsurdat = '$DIN_LOC_ROOT/lnd/clm2/surfdata/surfdata_1.9x2.5_simyr1850_c091108.nc'
 ice_runoff = .true.
 outnc_large_files = .true.
 rtm_nsteps = 6
 urban_hac = 'ON_WASTEHEAT'
 urban_traffic = .false.
 hist_nhtfrq = -24
/
&ndepdyn_nml
 model_year_align_ndep = 1850
 ndepmapalgo = 'bilinear'
 stream_fldfilename_ndep = '$DIN_LOC_ROOT/lnd/clm2/ndepdata/fndep_clm_hist_simyr1849-
2006_1.9x2.5_c100428.nc'
 stream_year_first_ndep = 1850
 stream_year_last_ndep = 2005
```