The Community Land Model practical session

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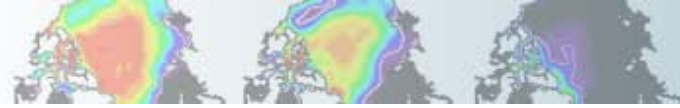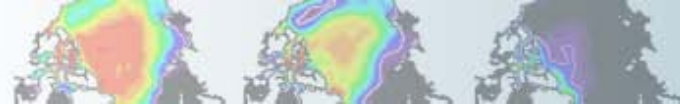
Terrestrial Sciences Section

CGD/NESL/NCAR

A1. REVIEW: Basic clm4 usage

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

If you have not memorized the
4 steps req'd to start any CESM simulation,
let's do that now!

A2. REVIEW: Basic clm4 usage

COMPSETS are shortcuts designed for specific cases… treat them as **starting points for all cases**
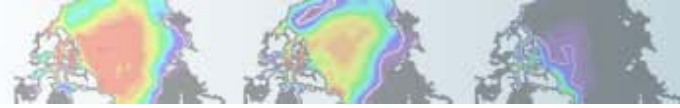
"I" compsets run the clm/datm and no ice/ocean models

Name	Short Name	Description of COMPSET
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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In this exercise you will try the I4804 compset

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 => how to customize a case

Goal: Create a case **w/ a different compset** to see how **settings change automatically** & therefore how **you may also change settings manually** for a case not supported by an existing compset
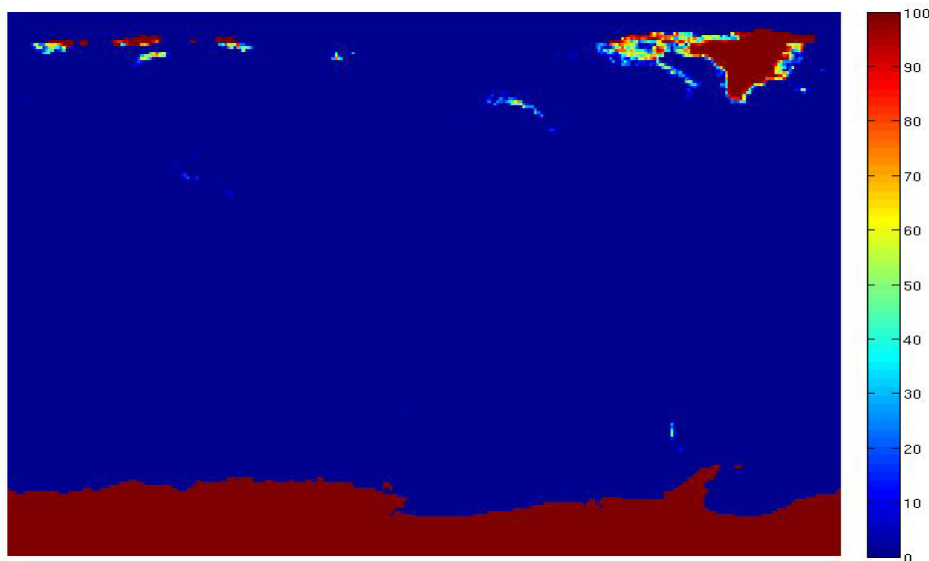
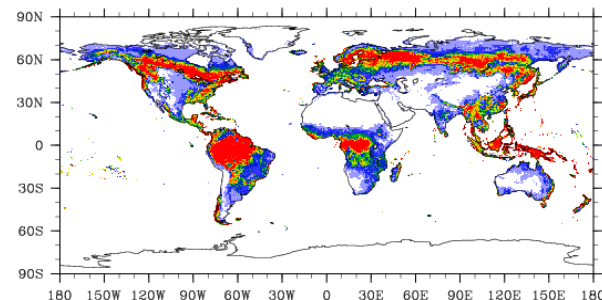Note: In this exercise you will try the I20TRCN compset

C. Understanding and modifying input data

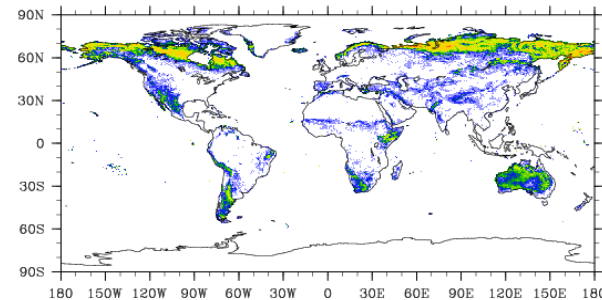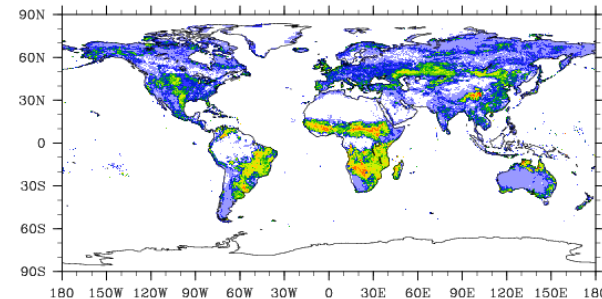Goal: Learn what inputs the clm needs and what they look like
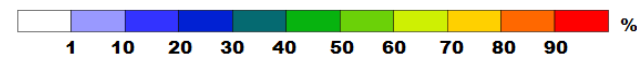
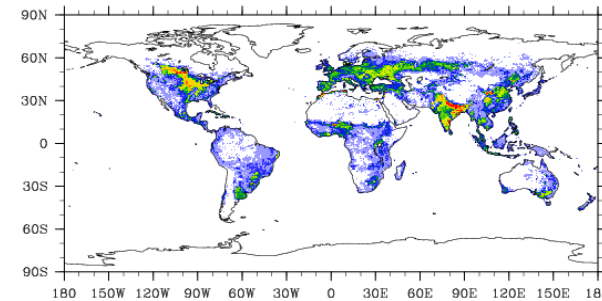% glacier

(a) Current Day (2000) Tree PFTs
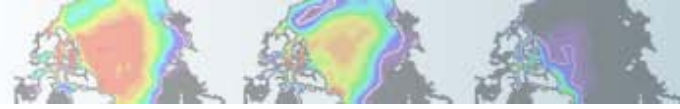

(c) Current Day (2000) Shrub PFTs

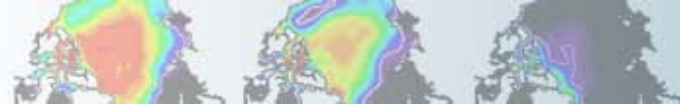(e) Current Day (2000) Grass PFTs

(g) Current Day (2000) Crop PFT

D. Some slides by Keith Lindsay followed by discussion

<u>Goal</u>: Ask questions pertaining to your interests

REMEMBER:

The CLM4 User's Guide is the best place to start!

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 yourACCTnumber < I1948-2004.bluefire.run   …OR
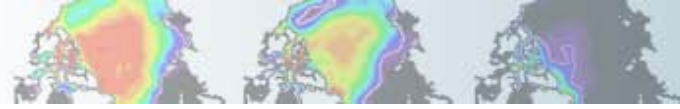
                                 # add the line   #BSUB -U yourACCTnumber near the top of I1948-2004.bluefire.run

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.
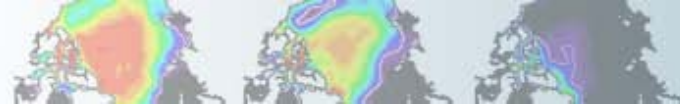Discussion leads to Exercise (C) where you will focus on clm's input data.

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, ncdump/ncgen, etc. to modify the pft-physiology file
   E.g. modify and save the following ncl script to filename.ncl and type ncl filename.ncl:
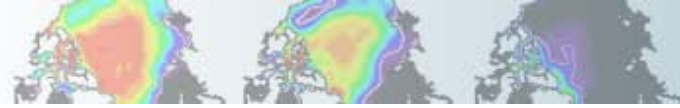
```
begin
 a = addfile("/$casedir/pft-physiology-file.nc","w")          # modify path and filename as needed
 arr = a->varname                                             # variable name in pft-physiology file; assuming variable is one-dimensional
 arr(1) = 0.2d                                                # 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?
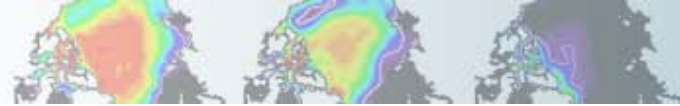
4) Look at datm.buildnml.csh for the list of input files to be read by the datm
   Go to the directories containing these files and view the data with ncview   …Discuss
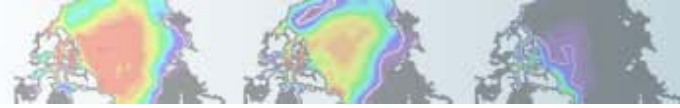
Coupled model BGC exercise

- 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.
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.
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
```