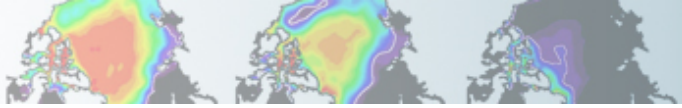

The Community Land Model
practical session

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Exercise A: Basic clm usage

Goal: Run the CLM4.5SP on yellowstone
at ~1° lat/lon resolution for 5 days
while cycling prescribed Qian atm data

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

Exercise A: Basic clm 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

Short Name	Description of 3 out of the many available COMPSETs
I	CLM4.0SP, Qian et al. atmosphere, 2000 pfts, CO_2 , $aerosol_{dep}$
I1850CLM45	CLM4.5SP, Qian et al. atmosphere, 1850 pfts, CO_2 , $aerosol_{dep}$
I20TRCRUCLM45BGC	CLM4.5BGC, CRU atm., 1850-2005 pfts, $aerosol_{dep}$+ N_{dep}

SP = Satellite Phenology; BGC = Biogeochemistry

In Exercise A you will try the I1850CLM45 compset

In Exercise B you will try the I20TRCRUCLM45BGC 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

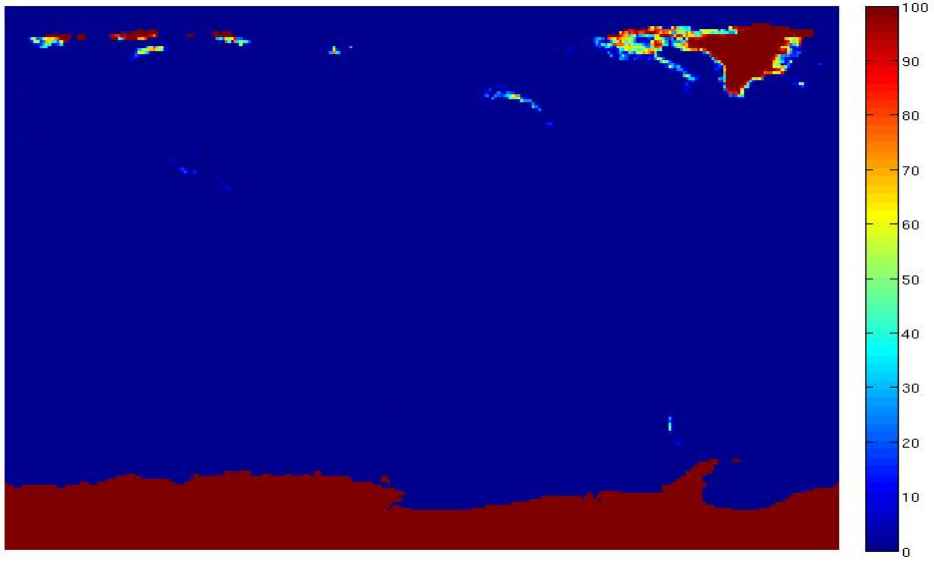
Goal: Create case **with a different compset;** see how **settings change automatically** & therefore how **you may also change settings manually** for a case not supported by an existing compset

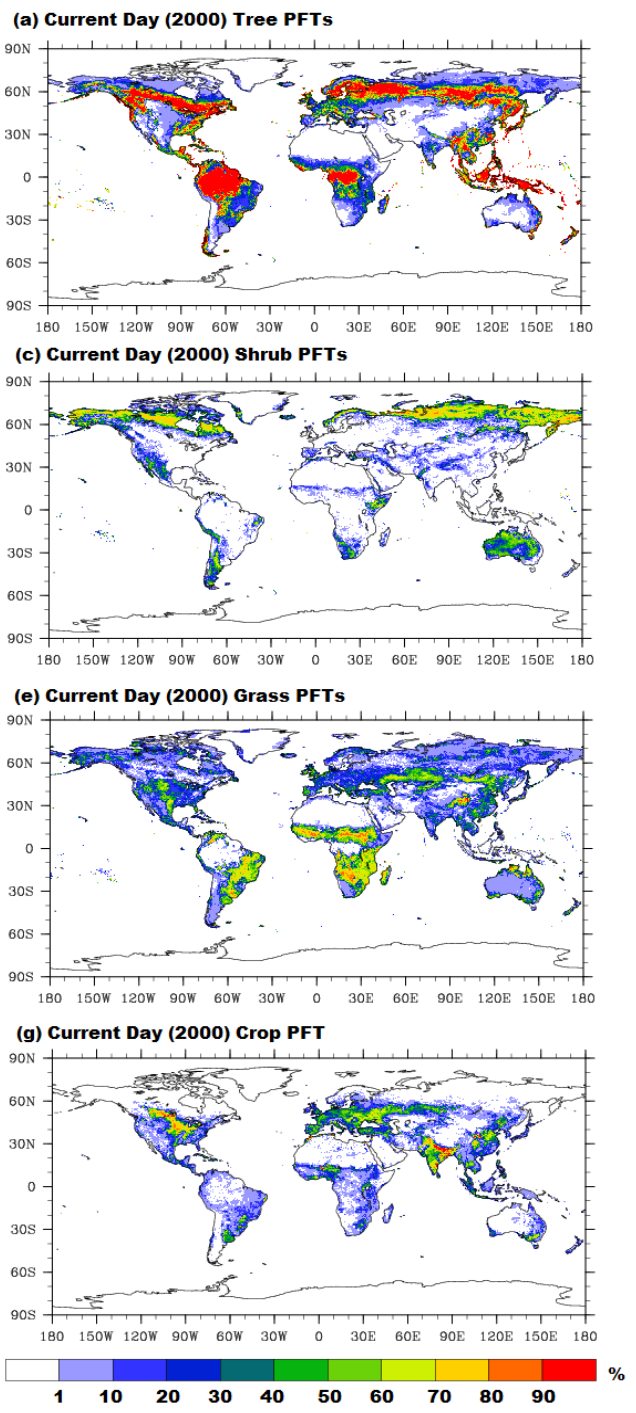
In Exercise B you will try the I20TRCRUCLM45BGC compset

C. Understand & modify CLM input data

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

% glacier





D. BGC slides by Keith Lindsay followed by discussion

Goal: Ask questions pertaining to your interests

REMEMBER:

Always look for answers in the CLM User's Guide FIRST!

Exercise A detailed steps

1) Create the case…

```
cd scripts
./create_newcase  -case <your path>/i.day5.a  -compset I1850CLM45  -mach yellowstone -res f09_g16
./create_newcase  -help                                              # for documentation
./create_newcase  -list   compsets (OR) grids (OR) machines          # for available options
```

2) Set up the case…

```
cd <your path>/i.day5.a
# You need not change env_build.xml for this case to work, but now would be the time to make such changes
./cesm_setup
```

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

```
$EDITOR user_nl_clm
```

4) Build the case and compile the code…

```
./i.day5.a.build
```

5) Submit the run and proceed to Exercise (B)…

```
# You need not change env_run.xml for this case to work but now would be the time to make such changes
i.day5.a.submit  # if nec. modify this file with: bsub -U yourACCTnumber < i.day5.a.run
                                  # OR…  add the line      #BSUB -U yourACCTnumber near the top of i.day5.a.run
bjobs            # to see the $jobID and whether the job is pending or running
bkill $jobID     # if necessary;
                 # run executes in /glade/scratch/$USER/i.day5.a
                 # output moves to /glade/scratch/$USER/archive/i.day5.a when run ends
                 # outside the context of this tutorial I might have named this case clm45sp_1degcesm1.2.0_1850qian
```

Exercise B detailed steps

1) Create the case…

cd scripts

./create_newcase -case <your path>/i.day5.b -compset I20TRCRUCLM45BGC -mach yellowstone -res f09_g16

outside the context of this tutorial I might have named this case clm45bgc_1degcesm1.2.0_histcru

2) Note differences between this case and the case created in (A)

cd <your path>

diff i.day5.b i.day5.a

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

4) Now compare the /CaseDoc directories

diff i.day5.b/CaseDocs i.day5.a/CaseDocs

5) Discuss the differences in the context of potentially changing settings manually for cases not supported by existing compsets.

Your discussion may include the topic of different input data for different cases. Exercise (C) focuses on clm's input data.

6) Before proceeding to (C), change hist_nhtfrq to -24 in the clm namelist and build and run this case as you learned in (A) steps 3, 4, and 5.

Look (e.g. with ncview) at history files generated by this run versus the run in (A). Do you notice differences? Discuss output fields.

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

Exercise C detailed steps

1) In /CaseDocs from Exercises A and/or B look at lnd_in (clm's namelist) for lists of input files to be read by the clm
   Go to the directories containing these input files and view the data with ncview, ncdump, or other appropriate method
   Discuss. Notice the pft-physiology file because you will use it in step 2.

2) Create a case like the one in Exercise A but with a different case name (could use ./create_newcase OR ./create_clone commands)
   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")   # in this line modify the path and the filename as needed
 arr = a->varname                                      # variable name in pft-physiology file; assuming variable is one-dimensional
 arr(1) = 0.8d                                         # NCL is 0-based, so this modifies the 2nd entry to 0.8 in double precision
 a->varname = arr                                      # writes variable back to file with new value(s)
end
```

3) Set up the case, change the clm namelist to point to the new pft-physiology file and to write daily output, then build and run
   Compare history output against that generated in (A). The ncdiff command may help you see differences between the two history files more easily: ncdiff <case2>.clm2.h0.0001-01-01-00000.nc <case1>.clm2.h0.0001-01-01-00000.nc <chooseAfilename>.nc
   Do you see differences? E.g. in the variable FSR?

4) In /CaseDocs look at files such as datm.streams.txt.*.Precip 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

…Keith Lindsay's ppt

Namelist (lnd_in) from Exercise A

```
&clm_inparm
 albice = 0.60,0.40
 co2_ppmv = 284.7
 co2_type = 'constant'
 create_crop_landunit = .false.
 dtime = 1800
 fatmlndfrc = '/glade/p/cesm/cseg//inputdata/share/domains/domain.lnd.fv0.9x1.25_gx1v6.090309.nc'
 finidat = '/glade/p/cesm/cseg//inputdata/lnd/clm2/initdata_map/clmi.I1850CRUCLM45SP.
0521-01-01.0.9x1.25_g1v6_simyr1850_c130506.nc'
 fpftcon = '/glade/p/cesm/cseg//inputdata/lnd/clm2/pftdata/pft-physiology.c130503.nc'
 fsnowaging = '/glade/p/cesm/cseg//inputdata/lnd/clm2/snicardata/snicar_drdt_bst_fit_60_c070416.nc'
 fsnowoptics = '/glade/p/cesm/cseg//inputdata/lnd/clm2/snicardata/snicar_optics_5bnd_c090915.nc'
 fsurdat = '/glade/p/cesm/cseg//inputdata/lnd/clm2/surfdata_map/surfdata_0.9x1.25_simyr1850_c130415.nc'
 hist_nhtfrq = -24
 maxpatch_glcmec = 0
 more_vertlayers = .false.
 nsegspc = 20
 urban_hac = 'ON'
 urban_traffic = .false.
/
&ndepdyn_nml
/
&popd_streams
/
&light_streams
/
&clm_hydrology1_inparm
/
&clm_soilhydrology_inparm
```

Namelist (lnd_in) from Exercise B

```
&clm_inparm
 albice = 0.60,0.40
 co2_ppmv = 367.0
 co2_type = 'constant'
 create_crop_landunit = .false.
 dtime = 1800
 fatmlndfrc = '/glade/p/cesm/cseg//inputdata/share/domains/domain.lnd.fv0.9x1.25_gx1v6.090309.nc'
 finidat = '/glade/p/cesm/cseg/inputdata/lnd/clm2/initdata_map/clmi.I1850CRUCLM45BGC.0241-01-01.0.9x1.25_g1v6_simyr1850_c130531.nc'
 fpftcon = '/glade/p/cesm/cseg//inputdata/lnd/clm2/pftdata/pft-physiology.c130503.nc'
 fpftdyn = '/glade/p/cesm/cseg//inputdata/lnd/clm2/surfdata_map/surfdata.pftdyn_0.9x1.25_rcp8.5_simyr1850-2100_c130415.nc'
 fsnowaging = '/glade/p/cesm/cseg//inputdata/lnd/clm2/snicardata/snicar_drdt_bst_fit_60_c070416.nc'
 fsnowoptics = '/glade/p/cesm/cseg//inputdata/lnd/clm2/snicardata/snicar_optics_5bnd_c090915.nc'
 fsurdat = '/glade/p/cesm/cseg//inputdata/lnd/clm2/surfdata_map/surfdata_0.9x1.25_simyr1850_c130415.nc'
 hist_nhtfrq = -24
 maxpatch_glcmec = 0
 more_vertlayers = .false.
 nsegspc = 20
 spinup_state = 0
 urban_hac = 'ON'
 urban_traffic = .false.
/
&ndepdyn_nml
 model_year_align_ndep = 1850
 ndepmapalgo = 'bilinear'
 stream_fldfilename_ndep = '/glade/p/cesm/cseg/inputdata/lnd/clm2/ndepdata/fndep_clm_hist_simyr1849-2006_1.9x2.5_c100428.nc'
 stream_year_first_ndep = 1850
 stream_year_last_ndep = 2005
/
&popd_streams
 model_year_align_popdens = 1850
 popdensmapalgo = 'bilinear'
 stream_fldfilename_popdens = '/glade/p/cesm/cseg/inputdata/lnd/clm2/firedata/clmforc.Li_2012_hdm_0.5x0.5_AVHRR_simyr1850-2010_c130401.nc'
 stream_year_first_popdens = 1850
 stream_year_last_popdens = 2010
/
&light_streams
 lightngmapalgo = 'bilinear'
 stream_fldfilename_lightng = '/glade/p/cesm/cseg/inputdata/atm/datm7/NASA_LIS/clmforc.Li_2012_climo1995-2011.T62.lnfm_c130327.nc'
 stream_year_first_lightng = 0001
 stream_year_last_lightng = 0001
/
&clm_hydrology1_inparm
/
&clm_soilhydrology_inparm
/
&ch4par_in fin_use_fsat = .true.
/
```