

# Machine setting for CLM4.5.06 on Mac OSx

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Yuan, Fengming

## 1. The prerequisites (versions may be different):

- (1) gcc-4.8 full package
- (2) mpich-3.0.3 built with gcc-4.8
- (3) netcdf-4.1.3 built with gcc-4.8, bundled with mpich-3.0.3
- (4) python 2.7, with library of numpy, Scientific, nco support
- (5) perl

## 2. modification/addition of machine

The building/runs will use the case configuration of “-mach=userdefined”, which included in /scripts/cesm\_utils/Machines/, but will establish the required environmental settings under /clm4-pf-tools/userdefined\_machines, as following:

(1) env\_mach\_specific.Darwin\_gnu (here, ‘Darwin’ is the OS, and ‘gnu’ is the compiler, both of which are generally defined in ‘userdefined’ machine – same naming followed for other two setting files)

```
#!/bin/csh -f
```

```
# -----
```

```
# USERDEFINED
```

```
# Edit this file to add module load or other paths needed for the build
```

```
# and run on the system. Can also include general env settings for machine.
```

```
# Some samples are below
```

```
# -----
```

```
setenv GCC_PATH /usr/local
```

```
setenv PATH ${GCC_PATH}/bin:${PATH}
```

```
setenv LD_LIBRARY_PATH ${GCC_PATH}/lib
```

```
setenv DYLD_LIBRARY_PATH ${GCC_PATH}/lib
```

```
alias gmake make
```

```
alias gcc-4.8 gcc
```

```
alias g++-4.8 g++
```

```
alias gfortran-4.8 gfortran
```

```
#--- set env variables for Macros if needed
```

```
setenv NETCDF_PATH /usr/local/netcdf-4.1.3-gcc48
```

```
setenv MPICH_PATH /usr/local/mpich-3.0.3-gcc48
```

```
setenv PATH ${MPICH_PATH}/bin:${PATH}
```

```
setenv LAPACK_LIBDIR /usr/lib
```

NOTE: this file is a copy of 'env\_mach\_specific.userdefined' from the model Machines file, but here we add those specific PATHS and LIBRARIES paths

## **(2) mkbatch.Darwin\_gnu**

**This file is a copy of 'mkbatch.userdefined' from the model Machines file, but only need a modifying the following line:**

**Line 78: remove the "#" so that the model can be launched**

```
mpirun -n ${maxtasks} \${EXEROOT}/cesm.exe >&! cesm.log.\$LID
```

## **(3) Macros.Darwin\_gnu**

```
#
```

```
# Makefile Macros generated from /Users/f9y/mygit/clm4-cf/scripts/ccsm_utils/Machines/config_compilers.xml using
```

```
# COMPILER=gnu
```

```
# OS=Darwin
```

```
# MACH=userdefined
```

```
#
```

```
CPPDEFS+= -DFORTRANUNDERScore -DNO_R16 -DgFORTRAN -DSYSDARWIN -DDarwin -DCPRGNU
```

```
CXX_LINKER:=FORTRAN
```

```
FC_AUTO_R8:= -fdefault-real-8
```

FFLAGS:= -O -fconvert=big-endian -ffree-line-length-none -ffixed-line-length-none

FFLAGS\_NOOPT:= -O0

FIXEDFLAGS:= -ffixed-form

FREEFLAGS:= -ffree-form

**LAPACK\_LIBDIR:= \$(LAPACK\_LIBDIR)**

MPICC:= mpicc

MPICXX:= mpicxx

MPIFC:= mpif90

SCC:= gcc

SCXX:= g++

SFC:= gfortran

SUPPORTS\_CXX:=TRUE

ifeq (\$(DEBUG), TRUE)

    FFLAGS += -g -Wall

endif

ifeq (\$(compile\_threaded), true)

    LDFLAGS += -fopenmp

    CFLAGS += -fopenmp

    FFLAGS += -fopenmp

endif

ifeq (\$(MODEL), cism)

```
CMAKE_OPTS += -D CISM_GNU=ON
endif

ifeq ($(MODEL), driver)
    LDFLAGS += -all_load
    LDFLAGS += -L$(NETCDF_PATH)/lib -lnetcdff
endif
```

**NOTE: this file is modified from the automatically generated 'Macros' file in case creation. The modifications are highlighted in red and bold font.**

# Machine settings for CLM4.5.06 on ORNL-OIC Yuan, Fengming

1. The prerequisites (versions may be different on your machine):

**(1) pgi 2011**

**(2) openmpi with pgi**

**(3) netcdf-4.0 built with pgi/openmpi**

**(4) python 2.7, with library of numpy, Scientific, nco support**

**(5) perl**

## **2. modification/addition of machine**

**The building/runs will use the case configuration of "-**

**mach=userdefined", which included in**

**/scripts/cesm\_utils/Machines/, but will establish the required environmental settings under /clm4-pf-tools/userdefined\_machines, as following:**

**(1) env\_mach\_specific.LINUX\_pgi (here, 'LINUX' is the OS, and 'pgi' is the compiler, both of which are generally defined in 'userdefined' machine – same naming followed for other two setting files)**

```
#!/bin/csh -f
```

```
# -----
```

```
# USERDEFINED
```

```
# Edit this file to add module load or other paths needed for the build  
# and run on the system. Can also include general env settings for  
# machine.
```

```
# Some samples are below
```

```
# -----
```

```
if (-e /opt/modules/default/init/csh) then
```

```
    source /opt/modules/default/init/csh
```

```
    module unload mpi/openmpi-1.4.3-gcc4
```

```
else
```

```
    echo "ERROR: Failed to initialize modules"
```

```

    exit -1
endif

# invoking modules sets $MPICH_DIR and $NETCDF_DIR
setenv PATH ${PATH}:/home/zdr/nco-4.0.0/bin:/home/zdr/opt/ncl_ncarg-
6.0.0/bin
setenv LD_LIBRARY_PATH /usr/lib64:/home/zdr/netcdf-
4.0/lib:/home/zdr/opt/lib:${LD_LIBRARY_PATH}

setenv NCARG_ROOT /home/zdr/opt/ncl_ncarg-6.0.0
setenv NETCDF_ROOT /home/zdr/netcdf-4.0
setenv NETCDF_PATH /home/zdr/netcdf-4.0
setenv LIB_NETCDF ${NETCDF_PATH}/lib
setenv INC_NETCDF ${NETCDF_PATH}/include

module load PGI/2011-64bit
module load mpi/openmpi-1.4.3-pgi
setenv LAPACK_LIBDIR /opt/pgi/linux86-64/2011/lib

#-----
# Runtime environment variables
#-----

limit coredumpsize unlimited
limit stacksize unlimited

```

**NOTE: this file is a copy of**

**'env\_mach\_specific.userdefined' from the model**

**Machines file, but here we add those specific**

**PATHS and LIBRARIES paths**

(TIPS: the netcdf configuration and building must be consistent with the pgi and openmpi, otherwise the model build/compilation/run will fail.

ON ORNL-OIC, the only available NETCDF was built by DMR. There are a few versions on his directory. CLM building/runs with the version (/home/zdr/netcdf-4.0) was successfully tested ONLY with PGI/2011-64bit. I tried those 4.1.3 version under /home/zdr/opt, either with PGI/2011-64bit or PGI/2012-64bit, in which the model running failed due to error 'undefined netcdf90\_open\_' when reading datm data).

## **(2) mkbatch.LINUX\_pgi**

**This file is a copy of 'mkbatch.userdefined' from the model Machines file.**

**Unlike mac os, there is NO need to modify the following line, but OK if do so:**

**Line 79: remove the "" so that the model can be launched**

`mpirun -n ${maxtasks} \${EXEROOT}/cesm.exe >&! cesm.log.\${LID}`

(This is because these modifications are carried out in python scripts 'runCLM.py')

## **(3) Macros.LINUX\_pgi**

#

# Makefile Macros generated from /home/f9y/cesm/clm4-pf/scripts/ccsm\_utils/Machines/config\_compilers.xml using

# COMPILER=pgi

# OS=Linux

# MACH=userdefined

#

CPPDEFS+= -DFORTRANUNDERSCORE -DNO\_SHR\_VMATH -DNO\_R16 -  
DLinux -DCPRPGI

SLIBS+=# USERDEFINED \$(shell \$(NETCDF\_PATH)/bin/nc-config --flibs)

CFLAGS:= -gopt -Mlist -time -O -Mvect=nosse

CONFIG\_ARGS:=

CXX\_LINKER:= CXX

ESMF\_LIBDIR:=

FC\_AUTO\_R8:= -r8

FFLAGS:= -i4 -gopt -Mlist -time -Mextend -byteswapio -Mflushz -Kieee

FIXEDFLAGS:= -Mfixed

FREEFLAGS:= -Mfree

LDFLAGS:= -time -Wl,--allow-multiple-definition

MPICC:= mpicc

MPICXX:= mpicxx

MPIFC:= mpif90

MPI\_LIB\_NAME:=

MPI\_PATH:=

**NETCDF\_PATH:= \$(NETCDF\_PATH)**

PNETCDF\_PATH:=

**LAPACK\_LIBDIR:= \$(LAPACK\_LIBDIR)**

SCC:= pgcc

SCXX:= pgc++

**SFC:= pgf90**



SUPPORTS\_CXX:=FALSE

```
ifeq ($(DEBUG), TRUE)
  FFLAGS += -g -Ktrap=fp -Mbounds -Kieee
endif
```

```
ifeq ($(compile_threaded), true)
  LDFLAGS += -mp
  CFLAGS += -mp
  FFLAGS += -mp
endif
```

```
ifeq ($(MODEL), dwav)
  FFLAGS += -Mnovect
endif
```

```
ifeq ($(MODEL), dlnd)
  FFLAGS += -Mnovect
endif
```

```
ifeq ($(MODEL), drof)
  FFLAGS += -Mnovect
endif
```

```
ifeq ($(MODEL), cam)
  FFLAGS += -O -Mvect=nosse
endif
```

```
ifeq ($(MODEL), dice)
  FFLAGS += -Mnovect
endif
```

```
ifeq ($(MODEL), cice)
  FFLAGS += -O -Mvect=nosse
endif
```

```
ifeq ($(MODEL), moby)
    FFLAGS += -O -Mvect=nosse
endif
```

```
ifeq ($(MODEL), rtm)
    FFLAGS += -O -Mvect=nosse
endif
```

```
ifeq ($(MODEL), pop2)
    FFLAGS += -O -Mvect=nosse
endif
```

```
ifeq ($(MODEL), docn)
    FFLAGS += -Mnovect
endif
```

```
ifeq ($(MODEL), clm)
    FFLAGS += -O -Mvect=nosse
endif
```

```
ifeq ($(MODEL), datm)
    FFLAGS += -Mnovect
endif
```

**NOTE: this file is modified from the automatically generated 'Macros' file in case creation. The modifications are highlighted in red and bold font.**

# runCLM.py setup and test on Mac OS X10.8/ONRL-OIC

Yuan, Fengming

## **.(1) PTCLM tools and files**

Author: Dan Ricciuto, ORNL

There are two python scripts:

**runCLM.py** – the main script to: create/configure a case; setup/build the case; and run the case.

**makepointdata.py** – a script to extract point grid/fraction and surface data from global half degree datasets.

(Dan's scripts also include a point meteorological data extraction, but not yet tested here)

## **(2) Input data**

- /atm/datm7/CLM1PT\_data/1x1pt\_??? (this is the primary climate driver data. Basically you need to prepare by your own. The ??? is the name of point used throughout the setup procedure. And ??? must be defined in  
/scripts/PTCLM\_files/PTCLM\_sitedata/xxx\_pftdata.txt,  
xxx\_sitedata.txt, xxx\_soildata.txt)
- /atm/datm7/domain.clm/domain.lnd.1x1pt\_???\_navy.nc (this is generated by /scripts/makepointdata.py)
- other /atm data is automatically updated, if connected to CESM's site by SVN when build the case
- /lnd/clm2/surfddata/surfddata.1x1pt\_???.nc, (or  
surfddata\_dynpft.1x1pt\_???.nc for I20TRCLMCN45), also generated by makepointdata.py
- /ugrid/0.5x0.5data: the following global datasets are required for makepointdata.py to produce the point data:  
domain.360x720\_ORCHIDEE0to360.100409.nc  
surfddata\_360x720cru\_simyr1850\_c130415.nc  
surfddata.pftdyn\_0.5x0.5\_simyr1850-2010.nc

## **(3) Test run: site US-Brw in AmeriFlux**

compset I1850CLM45CN and I20TRCLM45CN

### **Step 1: ad\_spinup**

```
./runCLM.py --site=US-Brw --sitegroup=AmeriFlux
--caseroot=/Users/f9y/mygit/clm4-pf/cases
--runroot=/Users/f9y/clm4_5_simulations
--ccsm_input=/Users/f9y/clm4_5_inputdata
--cesmdir=/Users/f9y/mygit/clm4-pf
--compset=I1850CLM45CN --coldstart --vertsoilc --CH4 --
no_fire --ad_spinup --nyears_ad_spinup 10
--machine=userdefined --osname=Darwin --
compiler=gnu --debug --mpilib=mpi-serial
( --machine=userdefined --osname=LINUX --compiler=pgi
--debug --mpilib=mpi-serial )
--ugriddir=ugrid/0.5x0.5data
--rmold --clean_config --clean_build
```

NOTE – this script will

- (1) clean-create/setup a case in \$caseroot/US-Brw\_I1850CLM45CN\_ad\_spinup; (**black/bold** – Mac OSX; **red/bold** - OIC)
- (2) the model setting: CLM4.5, with CN, CLM4me, vertical-resolved C without Century bgc, and no fire.
- (3) clean-build the case in \$runroot/US-Brw\_I1850CLM45CN\_ad\_spinup; with 'Debug' option is ON
- (4) run the case in \$runroot/US-Brw\_I1850CLM45CN\_ad\_spinup/run, for 10 years (default 600+1 years)

FYI, clm45 no more needs to run 'exit-spinup'; if no need to make the point data, replace '--ugriddir=ugrid/0.5x0.5data' with '--nopointdata' (checking the runCLM.py with --help)

### **Step 2: I1850CLM45cn (i.e. spinup)**

```
./runCLM.py --site=US-Brw --sitegroup=AmeriFlux
--caseroot=/Users/f9y/mygit/clm4-pf/cases
--runroot=/Users/f9y/clm4_5_simulations
```

```

--ccsm_input=/Users/f9y/clm4_5_inputdata
--cesmdir=/Users/f9y/mygit/clm4-pf
--compset=I1850CLM45CN --vertsoilc --CH4 --no_fire --
finidat_year 11 --run_n 10
--machine=userdefined --osname=Darwin --
compiler=gnu --debug --mpilib=mpi-serial
( --machine=userdefined --osname=LINUX --compiler=pgi
--debug --mpilib=mpi-serial )
--ugridir=ugrid/0.5x0.5data
--rmold --clean_config --clean_build

```

NOTE – this script will

- clean-create/setup a case in \$caseroot/US-Brw\_I1850CLM45CN;
- clean-build the case in \$runroot/US-Brw\_I1850CLM45CN;
- copy all restart files from \$runroot/US-Brw\_I1850CLM45CN\_ad\_spinup/run to this case's run root (see below); note the 'finidat\_year 11' is from the last run year of the ad\_spinup run.
- run the case in \$runroot/US-Brw\_I1850CLM45CN/run, for 10 years (default 600 years)

### ***Step 3: transit***

```

./runCLM.py --site=US-Brw --sitegroup=AmeriFlux
--caseroot=/Users/f9y/mygit/clm4-pf/cases
--runroot=/Users/f9y/clm4_5_simulations
--ccsm_input=/Users/f9y/clm4_5_inputdata
--cesmdir=/Users/f9y/mygit/clm4-pf
--compset=I20TRCLM45CN --vertsoilc --CH4 --no_fire --
finidat_year 11 --run_n 10
--machine=userdefined --osname=Darwin --
compiler=gnu --debug --mpilib=mpi-serial
( --machine=userdefined --osname=LINUX --compiler=pgi
--debug --mpilib=mpi-serial )
--ugridir=ugrid/0.5x0.5data
--rmold --clean_config --clean_build

```

NOTE – this script will do similar run as I1850CLM45CN (spinup), i.e.,

- a. clean-create/setup a case in \$caseroot/US-Brw\_I20TRCLM45CN, including preparation of surface data;
- b. clean-build the case in \$runroot/US-Brw\_I20TRCLM45CN;
- c. copy all restart files from \$runroot/US-Brw\_I1850CLM45CN/run to this case's run root (see below); note the 'finidat\_year 11' is from the last run year of the ad\_spinup run.
- d. run the case in \$runroot/US-Brw\_I1850CLM45CN/run, for 10 years (default from 1850 – 2006 (the last year in the metdata))

***Historical CO2 into 'transit' run –***

(TO be updated soon)