

# The Community Land Model (CLM)

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# Outline

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- CESM: workflow reminder
- Archiving results/long term and short term archive
- Create a clone
- Runtype: initial, branch, hybrid
- Exercises solutions



# Basic workflow to run CESM

The set of 4 commands you need to create and run a case

- **Create a New Case**

Go into the CESM script directory:

```
cd /path/to/source/cesm1_0/scripts
```

```
create_newcase -case ~/mycase.01 -res f19_g16 -compset B_1850 -mach mapache
```

CESM grid resolution

machine



- **Configure the Case**

Go into the case directory you just created (in the previous step):

```
cd ~/mycase.01/
```

```
configure -case
```

case name and path

CESM compset



- **Build the Executable**

```
mycase.01.mapache.build
```

- **Run the Model**

```
qsub mycase.01.mapache.run
```



# Some instructions for the lab

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1. We will use the CESM code located locally on mapache, no need to checkout or download any input data.

**CESM code:** `/usr/projects/cesm/cesm1_0_2`

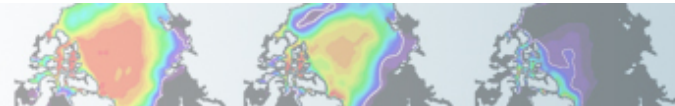
2. We will run at coarse resolution (T31\_T31 or T31\_g37).
3. Because of space issue on scratch1, the scripts are configured to put your run directories into: `/scratch2/$logname/CESM` (instead of `/scratch1/$logname/CESM` )
4. Exercises solutions are at the end of the tutorial. Try to use hints and documentation before looking at solutions.
5. Be curious (explore the CESM directories/files).
6. Have fun



# Archiving history files

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- Archiving is a phase of a CESM model run where the generated output data is moved from your directory to a local disk area (*short-term archiving*) and subsequently to a long-term storage system (*long-term archiving*).
- Clean up disk space and help manage user quotas (no impact on the production run).
- Short-term archive is performed by the script “*mycase.01.mapache.run*” (at the end of CESM run). Typically, the output files (not necessary to for restart) are moved to /scratch2/\$username/CESM/archive
- Long-term archive is performed by the script “*mycase.01.mapache.l\_archive*”. This script is created by the configure command (only if long-term archiving is available on the machine).



# Archiving history files

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The archiving is controlled by variables in `env_run.xml`.

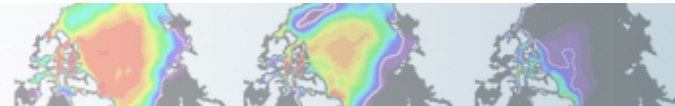
Some useful variables are:

***DOUT\_S***: If TRUE, short term archiving will be turned on  
(default = TRUE)

***DOUT\_S\_ROOT***: Root directory for short term archiving

***DOUT\_L\_MS***: If TRUE, perform long-term archiving on the output data  
(default = FALSE)

***DOUT\_L\_MSROOT***: Root directory on mass store system for long-term data archives.



# Create a clone

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The *create\_clone* utility creates an exact copy of a previously created case.

The *create\_clone* utility is very handy when the user wishes to run a slightly modified version of a previous experiment.

- Invoke *create\_clone* to create an exact copy of an old case by typing the following on the command line:

```
create_clone -clone <case to clone> -case <new case>
```

- Implement desired modifications before building and running .



# Exercise 7: clone and archiving

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Exercise 7: Clone the “case07” from the “case05”. Turn on the short-term archiving. Build and run. When the run is done, compare the rundir directory of case05 and case07.

Where are your history files in each case ?

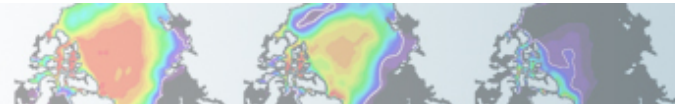
## Hints:

- If you haven't run case05, do it NOW !

- Edit env\_run.xml

to turn on short-term archiving

Set the variable DOUT\_S to TRUE  
using the xmlchange command





# CESM initialization types

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A CESM run can be initialized in one of three ways; *startup, branch, or hybrid*. The initialization type is set by the variable *RUN\_TYPE* in the file *env\_conf.xml*

**Startup** (default when *create\_newcase* is invoked)

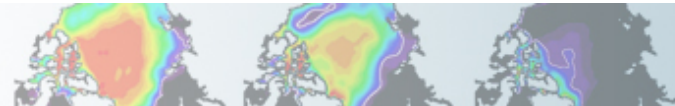
In a startup run, all components are initialized using baseline states.

**Branch**

In a branch run, all components are initialized using a consistent set of restart files from a previous run. Branch runs are typically used when sensitivity or parameter studies are required, or when settings for history file output streams need to be modified. In a branch: exact bit-for-bit restart in the same manner as a continuation

**Hybrid**

A hybrid run indicates that CESM will be initialized more like a startup, but will use initialization datasets from a previous case. This is somewhat analogous to a branch run with relaxed restart constraints. In an hybrid run, the model does not continue in a bit-for-bit fashion with respect to the reference case. The resulting climate, however, should be continuous



# CESM initialization types

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Useful variables in env\_conf.xml:

*RUN\_TYPE* : startup, hybrid, branch

*RUN\_REFCASE* : if branch/hybrid, case name you are starting from

*RUN\_REFDATE* : reference date for branch/hybrid date

A branch run is useful if you have an experiment which only slightly differs from your control, but you want to initialize with the spun-up basic state of your control.

Example: You are running a present day control and have completed 200 years of steady-state (i.e. unchanging) forcing. You want to run a 2xCO<sub>2</sub> experiment off the end of your control. You accomplish this by creating a new case, configuring your model to run as a BRANCH case



# CESM initialization types: restart files

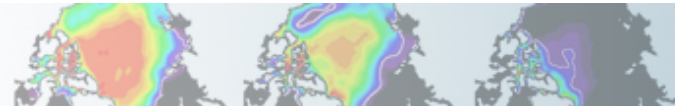
---

All models use restart files to perform this type of run.

To set up a branch/hybrid run, locate the restart directory for \$RUN\_REFCASE and \$RUN\_REFDATE from a previous run, then place those files in the \$RUNDIR directory.

You will find this file in the short-term archive directory:

`/scratch2/$USER/CESM/archive/case08/rest/0001-02-01-00000`



# Exercise 8-9: Initial and branch run

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Exercise 8: Create, configure, and build an out-of-the-box set of scripts called “case08” that runs an fully coupled 1850 control (B\_1850) at the resolution: T31\_g37. Run 1 month.

Exercise 9: Create a branch run called “case09” from the end of “case08”. Run a fully coupled 1850 control (B\_1850) at the resolution: T31\_g37. Double the CO2 value. Run 1 month

## Hints:

- Edit env\_conf.xml:

to set a branch run

*Change the variables RUN\_REFCASE and RUN\_REFDATE using the xmlchange command*

to change the CO2 value

*Change the variable CCSM\_CO2\_PPMV using the xmlchange command*



# Customizing your run script

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When you submit a job on mapache using: *case09.mapache.submit*, the #MSUB directives will read into the script *case09.mapache.run*

By default the #MSUB directive are:

*#MSUB -N case09*

*#MSUB -l nodes=2:ppn=8* (=> use 2 nodes with 8 processors each)

*#MSUB -l walltime=00:59:00* (=> set the wall clock time limit for this job)

*##MSUB -A S11\_CESM* (=> your account number; please modify after tutorial)

*#MSUB -o /users/hannay/case09/log.o* (=> your output log)

*#MSUB -e /users/hannay/case09/log.e* (=> your error log)

You can customize the MSUB directives as needed.



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# Exercise 7: Solutions

---

Exercise 7: Clone the “case07” from the “case05”. Turn on the short-term archiving. Build and run. When the run is done, compare the run directory of case05 and case07.

Where are your history files in each case ?

Solution:

1. Go to the scripts directory and create a new case in your home directory

```
cd /usr/projects/cesm/cesm1_0_2/scripts  
./create_clone -clone ~/case05 -case ~/case07
```

2. Configure the case

```
cd ~/case07  
./configure -case
```

3. Edit the variable DOUT\_S

```
./xmlchange -file env_run.xml -id DOUT_S -val TRUE
```

4. Build the model

```
./case07.mapache.build
```

5. Submit your job

```
./case07.mapache.submit
```

# Exercise 7: Solutions

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6. Where are history files ?

```
cd /scratch2/${USER}/CESM/archive/case07
```





# Exercise 8: Solutions

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Exercise 8: Create, configure, and build an out-of-the-box set of scripts called “case08” that runs a fully coupled 1850 control (B\_1850) at the resolution: T31\_g37. Run 1 month.

Solution:

1. Go to the scripts directory and create a new case in your home directory

```
cd /usr/projects/cesm/cesm1_0_2/scripts
```

```
./create_newcase -res T31_g37 -compset B_1850 -case ~/case08 -mach mapache
```

2. Configure the case

```
cd ~/case08
```

```
./configure -case
```

3. Build the model

```
./case08.mapache.build
```

4. Change the length of the run

```
./xmlchange -file env_run.xml -id STOP_N -val 1
```

```
./xmlchange -file env_run.xml -id STOP_OPTION -val nmonths
```

5. Submit your job

```
./case08.mapache.submit
```

# Exercise 9: Solutions

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Exercise 9: Create a branch run called “case09” from the end of “case08”. Run an fully coupled 1850 control (B\_1850) at the resolution: T31\_g37. Double the CO2 value. Run 1 month

Solution:

1. Go to the scripts directory and create a new case in your home directory

```
cd /usr/projects/cesm/cesm1_0_2/scripts
```

```
./create_newcase -res T31_g37 -compset B_1850 -case ~/case09 -mach mapache
```

2. Set the run as an branch run and change the value of CO2

```
./xmlchange -file env_conf.xml -id RUN_REFCASE -val case08
```

```
./xmlchange -file env_conf.xml -id RUN_REFDATE -val 0001-02-01
```

```
./xmlchange -file env_conf.xml -id CCSM_CO2_PPMV -val 569.4
```

3. Configure the case

```
cd ~/case09
```

```
./configure -case
```

4. Build the model

```
./case09.mapache.build
```

# Exercise 9: Solutions

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5. Change the length of the run

```
./xmlchange -file env_run.xml -id STOP_N -val 1  
./xmlchange -file env_run.xml -id STOP_OPTION -val nmonths
```

6. Locate your restart files. Copy the restart files into your run directory:

```
cd /scratch2/${USER}/CESM/archive/case08/rest/0001-02-01-00000/  
cp * /scratch2/${USER}/CESM/case09/run
```

7. Submit your job

```
cd ~/case09  
./case09.mapache.submit
```

