

# Namelist and Code Modifications

**Part 1: Namelist Modifications**

**Part 2: Code Modifications**

**Part 3: Exercises and Quiz**

Cecile Hannay, CAM Science Liaison  
Atmospheric Modeling and Predictability Section  
Climate and Global Dynamics Division

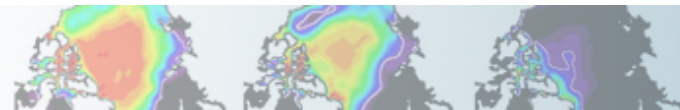


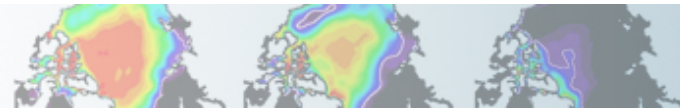
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**“I can only show you the door.  
You're the one that has to walk through it”**

*(The Matrix, 1999)*





# Part 1: Namelist Modifications

**In this section, we will:**

- review the “CESM flow” and how to make namelist changes,
- see where to find documentation for namelist variables
- as an illustration, we will customize the output history files to get high frequency output



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# Review: The 4 commands to run CESM

Set of commands to build and run the model on "cheyenne"

```
# Set location of pre-compile code (for a faster build)
# if you use tcsh shell
setenv CESM_BLD_TEMPLATE /glade/p/cesm/tutorial/templates/cesm2.1.1_b1850/bld
# if you use bash shell
export CESM_BLD_TEMPLATE=/glade/p/cesm/tutorial/templates/cesm2.1.1_b1850/bld

# go into scripts directory into the source code download
cd /glade/p/cesm/tutorial/cesm2.1.1_tutorial/cime/scripts

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qcmd -- ./case.build

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# Review: The 4 commands to run CESM

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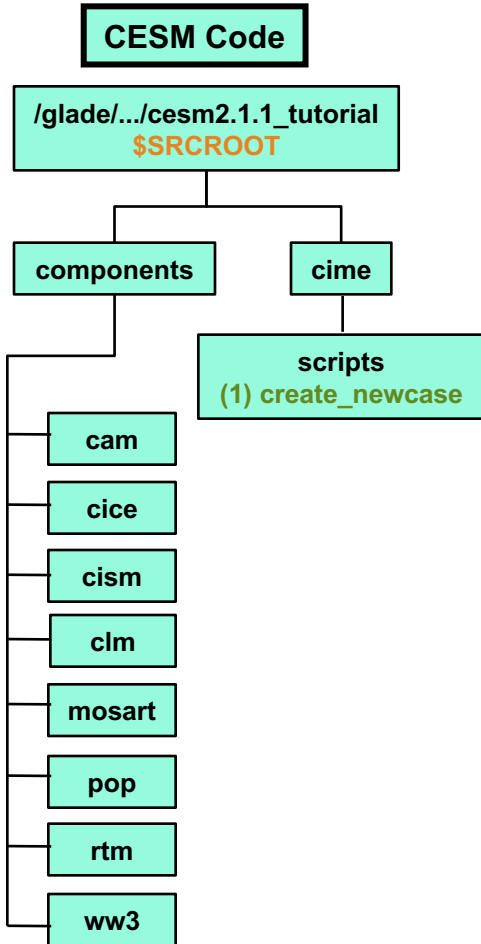
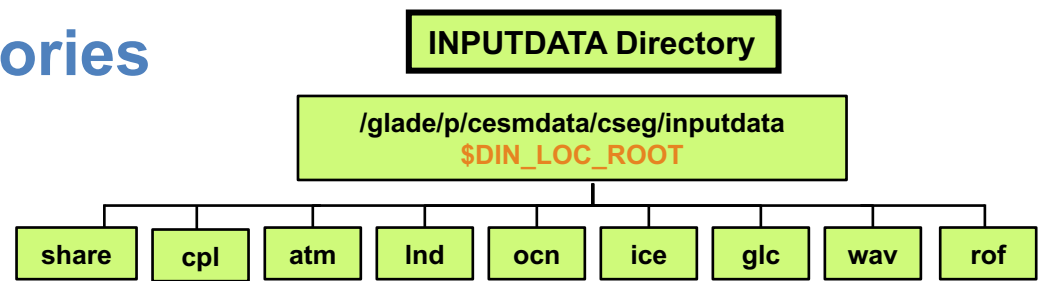
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# Overview of CESM directories before create\_newcase



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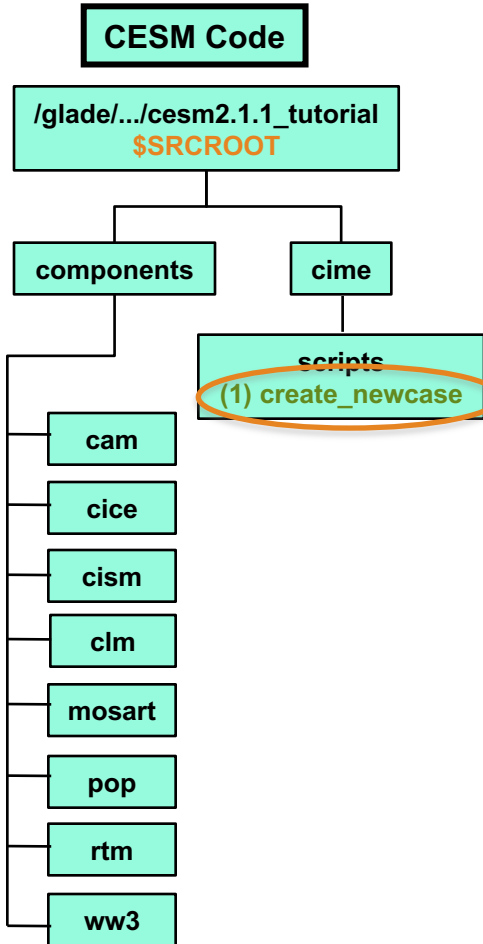
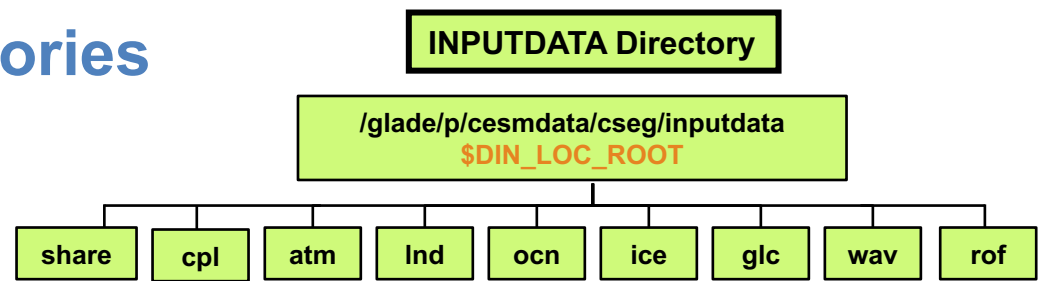
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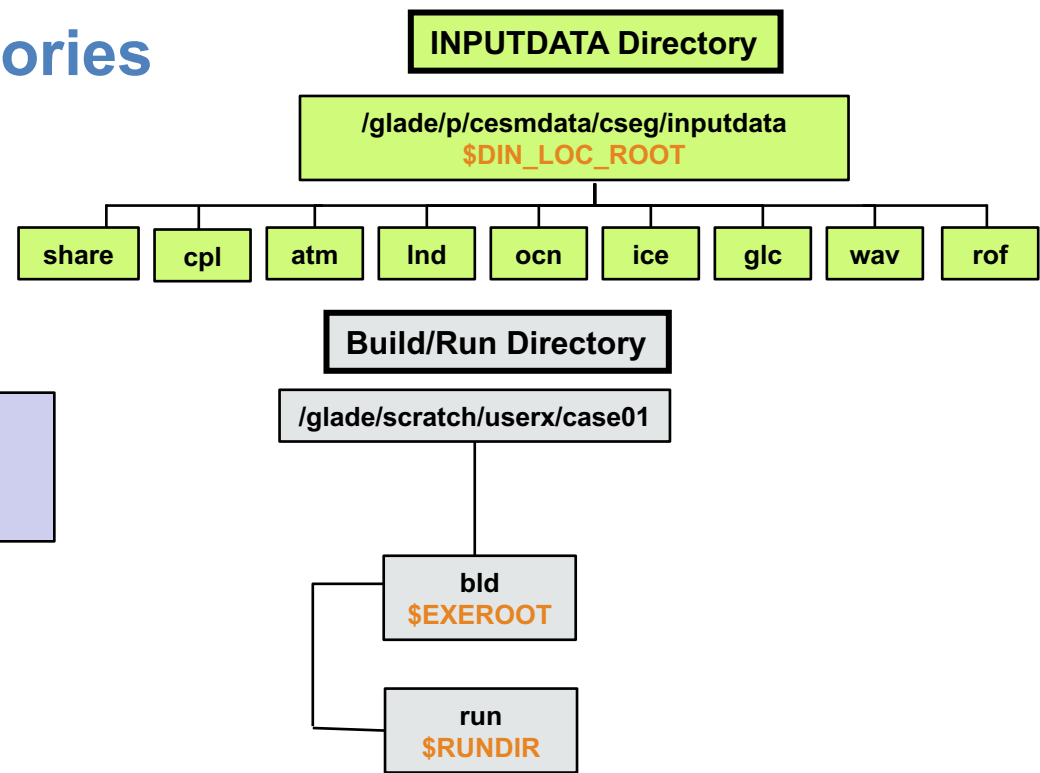
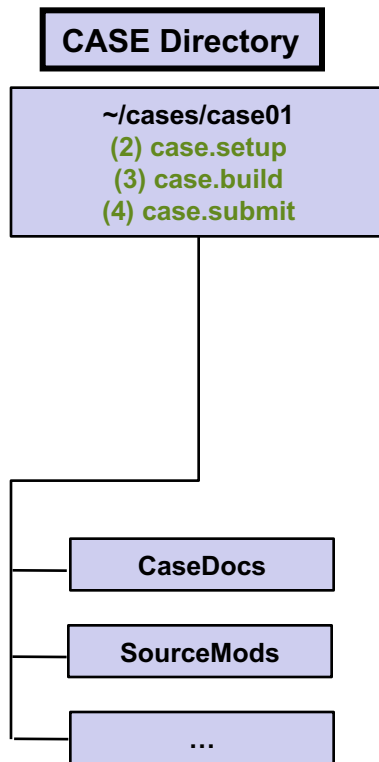
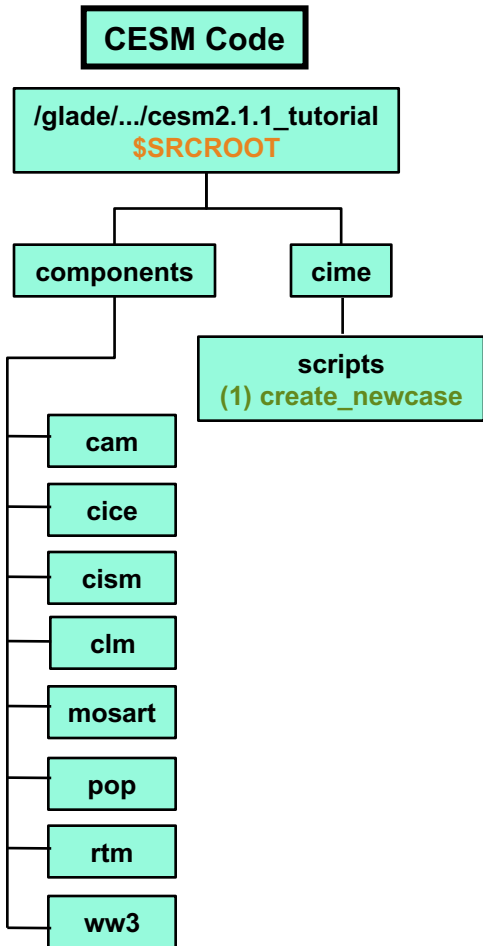
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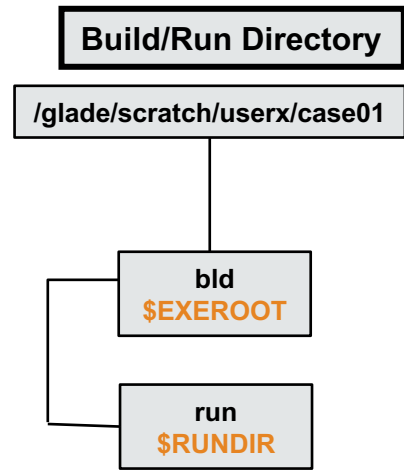
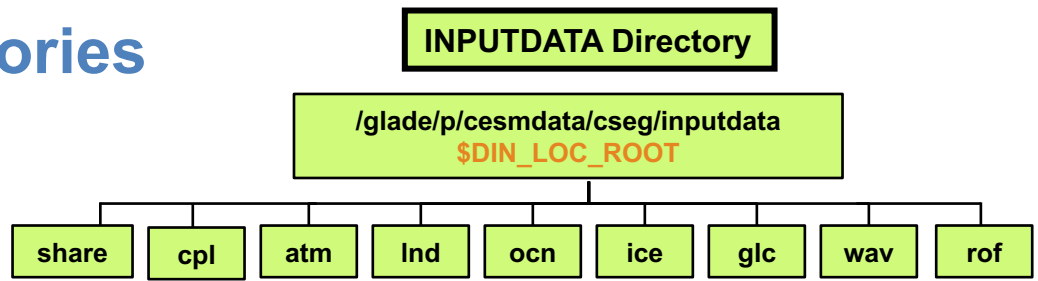
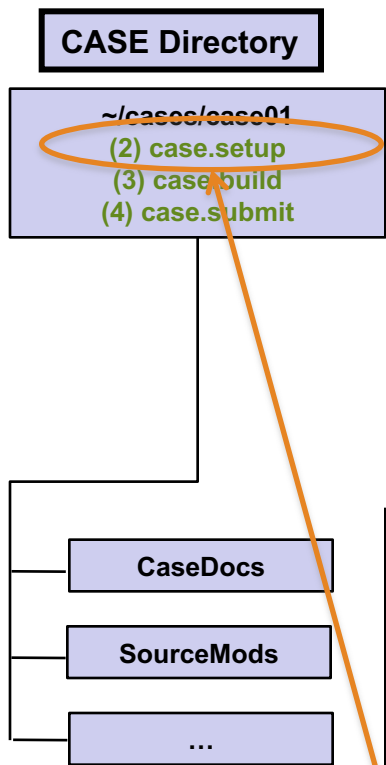
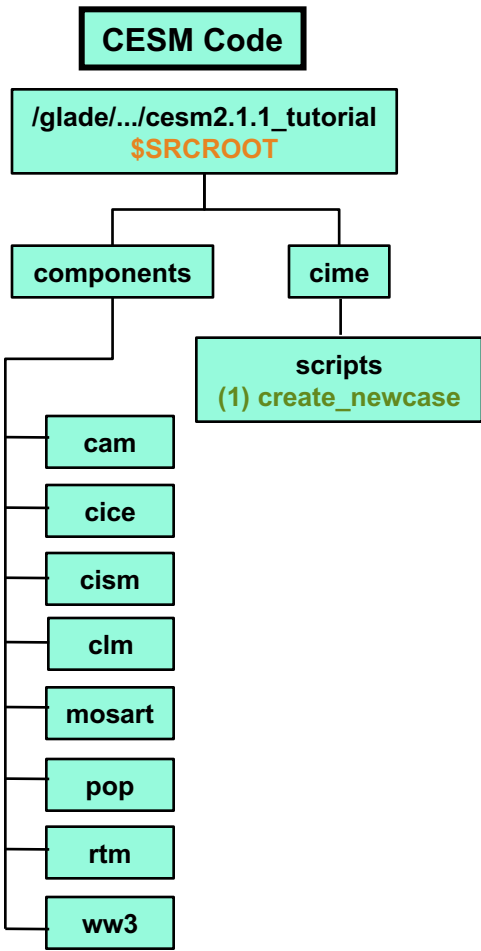
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# Overview of CESM directories + 4 CESM commands



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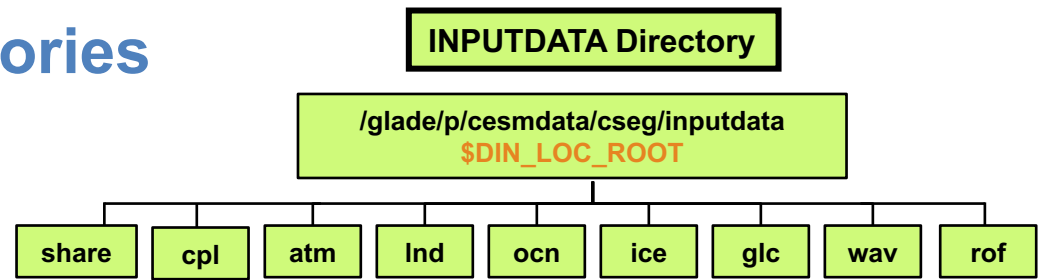
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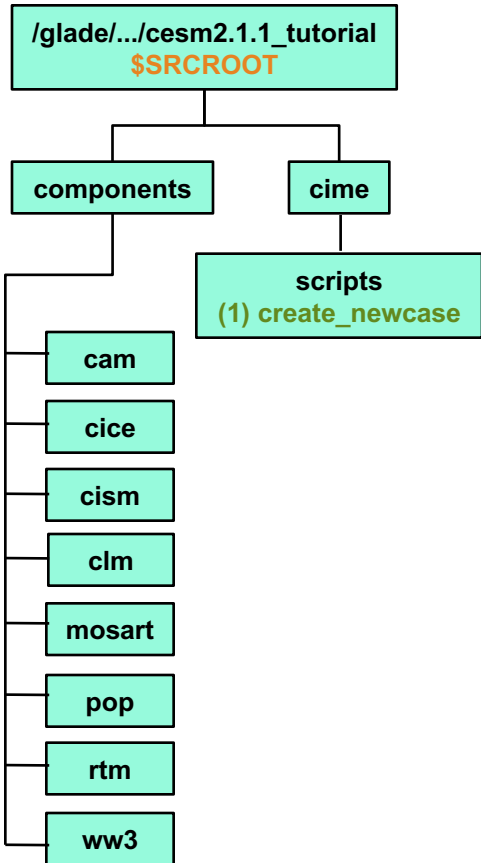
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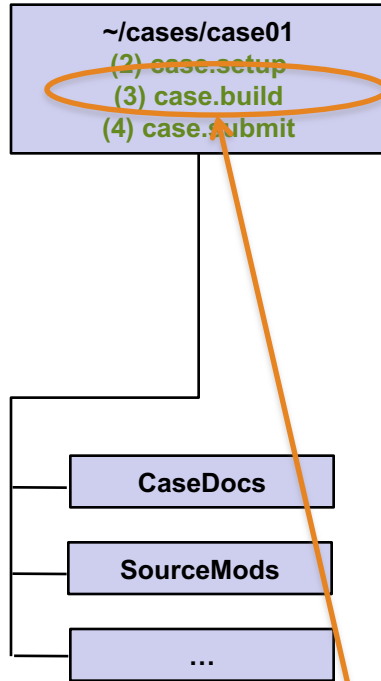
# Overview of CESM directories + 4 CESM commands



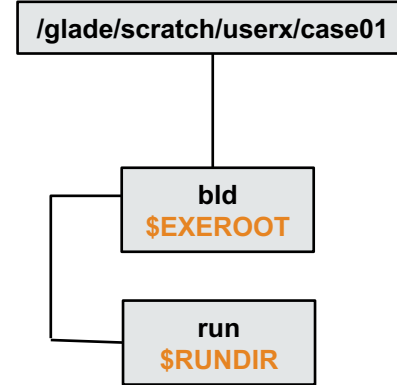
**CESM Code**



**CASE Directory**



**Build/Run Directory**



```

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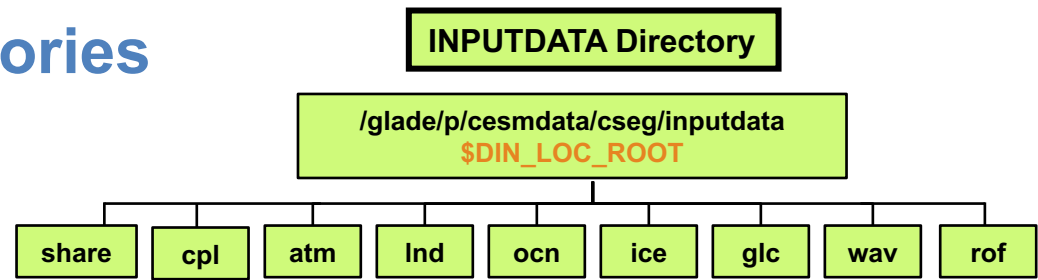
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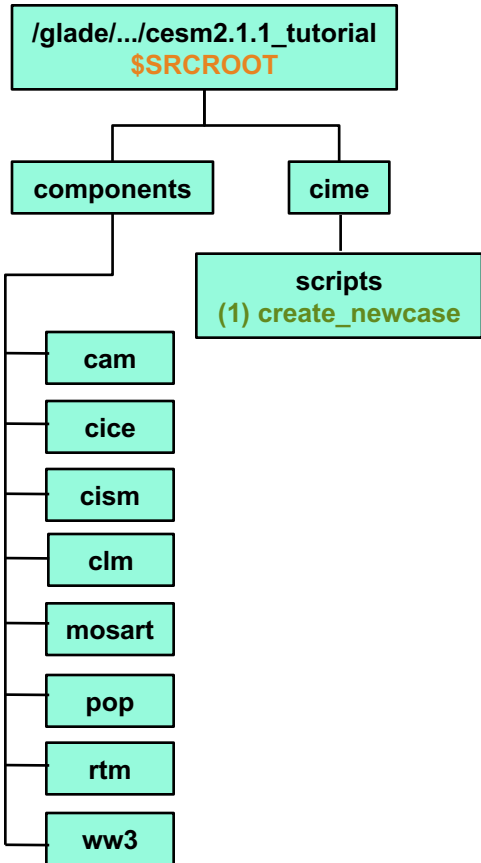
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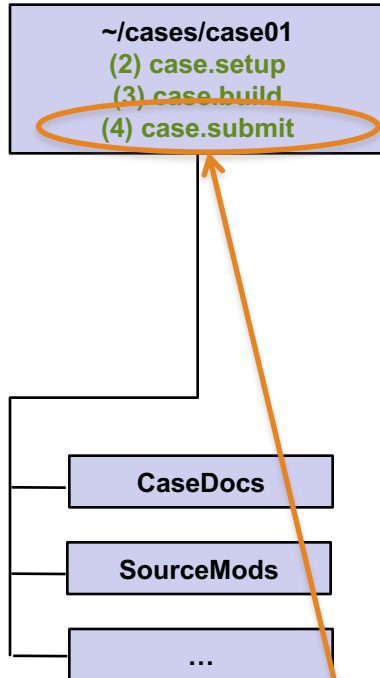
# Overview of CESM directories + 4 CESM commands



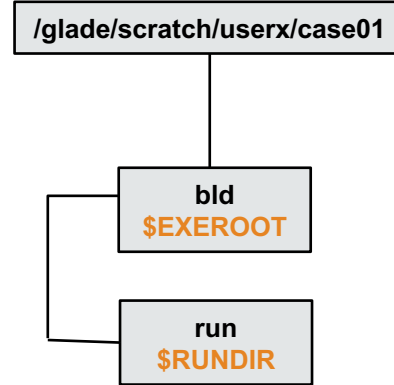
**CESM Code**



**CASE Directory**



**Build/Run Directory**



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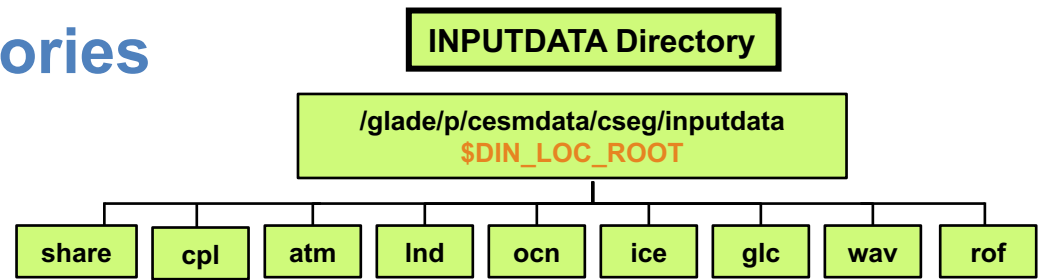
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```

# Overview of CESM directories + 4 CESM commands



**Build/Run Directory**

```

    /glade/scratch/userx/case01
  
```

```

    bld
    $EXERROOT
  
```

```

    run
    $RUNDIR
  
```

**CASE Directory**

```

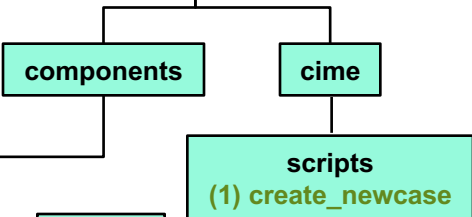
    ~/cases/case01
    (2) case.setup
    (3) case.build
    (4) case.submit
  
```

- CaseDocs
- SourceMods
- ...

**CESM Code**

```

    /glade/.../cesm2.1.1_tutorial
    $SRCROOT
  
```



```

# go into scripts directory into the source code download
cd /glade/p/cesm/tutorial/cesm2.1.1_tutorial/cime/scripts

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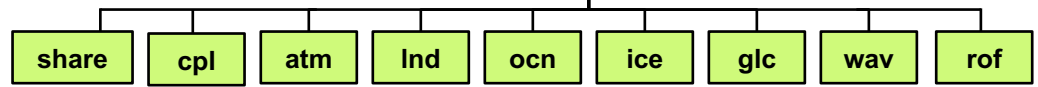
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```

**This is when you can modify the namelists**

# Overview of CESM directories + 4 CESM commands

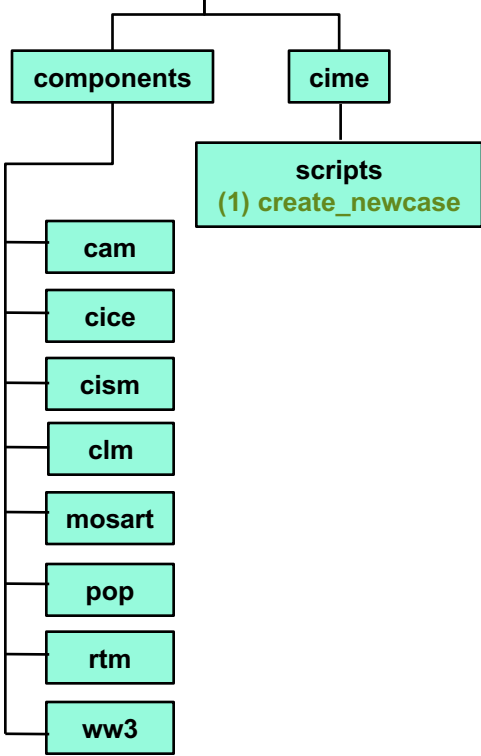
## INPUTDATA Directory

/glade/p/cesmdata/cseg/inputdata  
\$DIN\_LOC\_ROOT



## CESM Code

/glade/.../cesm2.1.1\_tutorial  
\$SRCROOT



## CASE Directory

```

~/cases/case01
(2) case.setup
(3) case.build
(4) case.submit
user_nl_cam
user_nl_cice
user_nl_cism
user_nl_clm
user_nl_cpl
user_nl_mosart
user_nl_pop
user_nl_ww
  
```

case.setup creates namelist modification files user\_nl\_XXX this is where you modify your namelists



## Build/Run Directory

/glade/scratch/userx/case01

bld  
\$EXEROOT

The build script creates namelists in the run directory

```

run
$RUNDIR
atm_in
cism_in
drv_fds_in
drv_in
ice_in
lnd_in
mosart_in
pop_in
wav_in
  
```

This is used by the model at runtime

(should not be edited)



```

CaseDocs
atm_in
cism_in
drv_fds_in
drv_in
ice_in
lnd_in
mosart_in
pop_in
wav_in
  
```

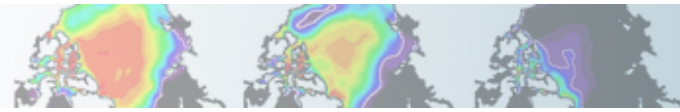
CaseDocs contains copy of the namelists for reference only

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SourceMods

...



# Part 1: Namelist Modifications

In this section, we will:

- review the “CESM flow” and how to make namelist changes,
- **see where to find documentation for namelist variables**
- as an illustration, we will customize the output history files to get high frequency output



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# Where to find info about namelists ?

<http://www.cesm.ucar.edu/models/cesm2>

The screenshot shows the CESM2 website homepage. At the top, there is a navigation bar with 'CESM Models / CESM Supported Releases / CESM2'. Below this is a large banner image of Earth from space with the text 'Current Release' and 'The current CESM supported release is CESM 2.11'. There are three buttons: 'Learn more', 'View Experiments', and 'Download current release'. The main content area is divided into several sections: 'About CESM2', 'Scientific Validation', 'Quick Start', 'CIME Documentation', 'Configurations and Grids', 'Supported Machines & Performance Data', 'Prognostic Components', and 'External Library Documentation'. A 'CESM2 QUICKLINKS' sidebar is on the right. Two orange arrows originate from a text box on the right: one points to the 'Prognostic Components' section, and the other points to the 'Component Configuration Settings' link in the 'Configurations and Grids' section.

**CESM2 QUICKLINKS**  
Quick Start Guide  
Downloading The Code  
Scientifically Validated Configurations  
> Prognostic Components  
CESM Software Engineering

**RELATED INFORMATION**  
Data Management & Distribution Plan  
Development Project Policies & Terms of Use  
DiscussCESM Forums Bulletin Board  
Publication / Acknowledgment Information  
CESM2 Copyright  
CESM Support Policy  
CESM2 Included Packages Copyright

**CESM PROJECT**  
The CESM project is supported primarily by the National Science Foundation (NSF). Administration of the CESM is maintained by the Climate and Global Dynamics Laboratory (CGD) at the National Center for Atmospheric Research (NCAR).  
CESM is a fully-coupled, community, global climate model that provides state-of-the-art computer simulations of the Earth's past, present, and future climate states.

**About CESM2**  
CESM is a fully-coupled, community, global climate model that provides state-of-the-art computer simulations of the Earth's past, present, and future climate states.  
• What's New in CESM2  
• CESM Naming Conventions  
• CESM2 Known Issues \*  
\* Includes known issues associated with the CESM2 CIMP6 code base and output datasets.

**Scientific Validation**  
Scientific validation consists of a multi-decadal model run of the given component set at the target resolution, followed by scientific review of the model output diagnostics.  
• CESM2 Scientifically Validated Configurations \*  
• CESM1 Experiment Diagnostics  
\* This page now contains links to datasets on ESGF, CDG, glade and NCAR HPSS as well as diagnostic plots and caseroad details.

**Quick Start**  
See the selected links below to help you quickly get started with CESM2  
• Getting Help  
• CESM2 Use Cases  
• CESM2 Quick Start Guide  
• Download the CESM2 Code

**CIME Documentation**  
Common infrastructure for Modeling the Earth contains the coupling infrastructure, support scripts, data models and utility libraries needed to create a single-executable coupled Earth System Model.  
\* CIME does not contain any prognostics components and is available in a stand-alone package that can be compiled and tested with just its data components.  
• CIME User Guide

**Prognostic Components**  
Each model component page contains descriptions and documentation for active or prognostic models.  
• Atmosphere  
• Land  
• Land Ice  
• Land Ice  
• Ocean  
• River Runoff  
• Sea Ice  
• Wave

**Configurations and Grids**  
Component configurations include settings required for CIME enabled models; both prognostic and data model components. These settings include:  
• Grid Resolutions  
• Component Sets  
• Component Configuration Settings

**Supported Machines & Performance Data**  
• Supported Machines and Compilers  
• Timing, Performance and Load Balancing Data  
• Running on a Medium-Sized Linux Cluster  
• Verify a Machine Port

**External Library Documentation**  
• Parallel I/O Library (PIO)  
• Model Coupling Toolkit (MCT)  
• Earth System Modeling Framework (ESMF)  
• External Python Based Tools \*  
\* Support for these tools is currently limited to NCAR machines only

In "Prognostic Components" or in "Components Configuration Settings", you can find information about namelist variables in:  
"Component Fortran Namelist settings"

# Where to find info about namelists ?

<http://www.cesm.ucar.edu/models/cesm2>

**CESM2**

**Current Release**  
The current CESM supported release is CESM 2.11

[Learn more](#) | [View Experiments](#) | [Download current](#)

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**Configurations and Grids**

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- Grid Resolutions
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**Component Configuration Settings**

CESM2 Version -  
Model Version: 2.11  
HTML created on: 2019-06-09

Please select a setting from the model options below

**Atmosphere Models**

**Active / Prognostic Atmosphere - CAM**

- CAM Namelist Definitions
- CAM CASEROOT Variable Definitions

**Climatological Data Atmosphere - DATM** (includes Aquaplanet)

- DATM Namelist Definitions
- DATM CASEROOT Variable Definitions

**Land Models**

**Active / Prognostic Land - CLM**

- CLM5.0 Namelist Definitions
- CLM5.0 CASEROOT Variable Definitions
- CLM4.0 Namelist Definitions
- CLM4.0 CASEROOT Variable Definitions (See CLM4.0 documentation)

**Climatological Data Land - DLND**

- DLND Namelist Definitions
- DLND CASEROOT Variable Definitions

**River Models**

**Active / Prognostic River Runoff Model - MOSART**

- MOSART Namelist Definitions
- MOSART CASEROOT Variable Definitions

**Active / Prognostic River Runoff Model - RTM**

- RTM Namelist Definitions
- RTM CASEROOT Variable Definitions

**Climatological Data River - DROF**

- DROF Namelist Definitions
- DROF CASEROOT Variable Definitions

**Ocean Models**

**Active / Prognostic Ocean - POP2**

- POP2 Namelist Definitions
- MARBL Namelist Definitions
- POP2 / MARBL CASEROOT Variable Definitions

**Climatological Data Ocean - DOCN**

- DOCN Namelist Definitions
- DOCN CASEROOT Variable Definitions

**Sea Ice Models**

**Active / Prognostic Sea Ice - CICE**

- CICE Namelist Definitions
- CICE CASEROOT Variable Definitions

**Climatological Data Sea Ice - DICE**

- DICE Namelist Definitions
- DICE CASEROOT Variable Definitions

**Wave Models**

**Active / Prognostic Wave - WW3**

- WW3 Namelist Definitions
- WW3 CASEROOT Variable Definitions

**Climatological Data Wave - DWAV**

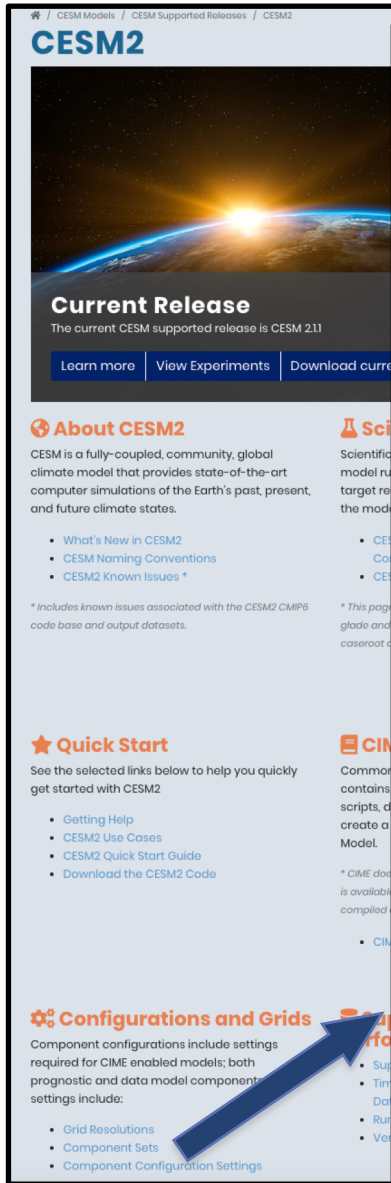
- DWAV Namelist Definitions
- DWAV CASEROOT Variable Definitions

**Namelist definitions for every component**



# Where to find info about namelists ?

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**Quick Start**

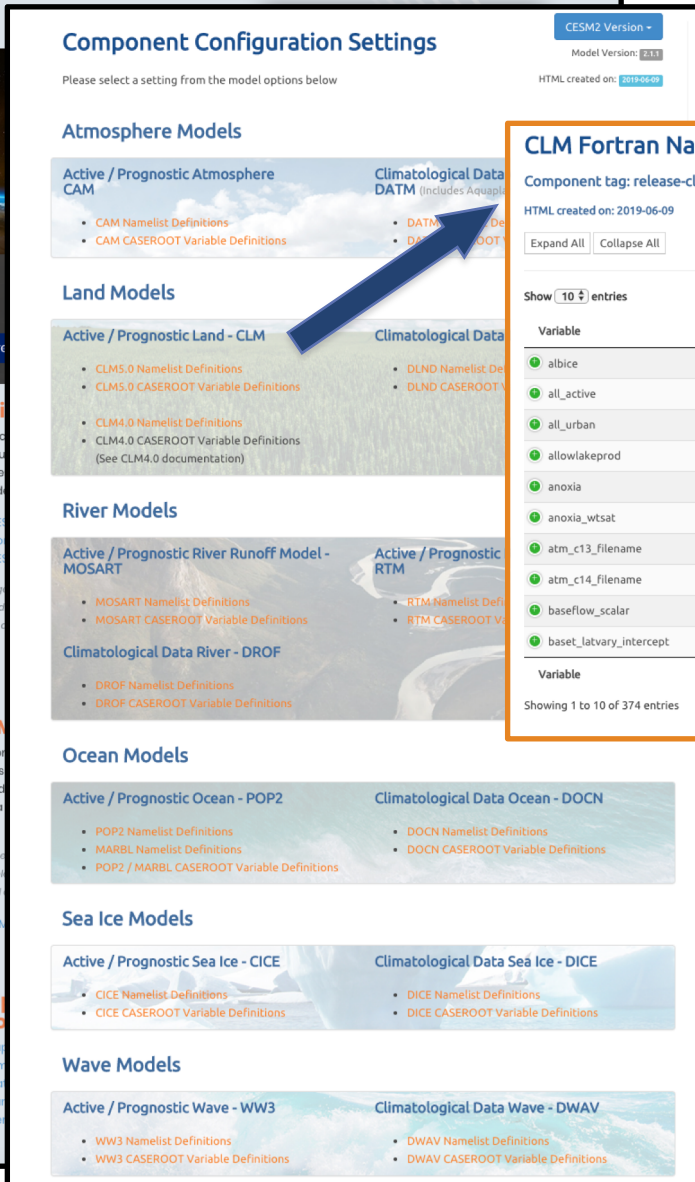
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- Component Sets
- Component Configuration Settings



**Component Configuration Settings**

Please select a setting from the model options below

CESM2 Version -  
Model Version: 2.11  
HTML created on: 2019-06-09

**Atmosphere Models**

Active / Prognostic Atmosphere CAM | Climatological Data DATM (Includes Aquap)

- CAM Namelist Definitions
- CAM CASEROOT Variable Definitions
- DATM Namelist Definitions
- DATM CASEROOT Variable Definitions

**Land Models**

Active / Prognostic Land - CLM | Climatological Data DLND (Includes Aquap)

- CLM5.0 Namelist Definitions
- CLM5.0 CASEROOT Variable Definitions
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- CLM4.0 CASEROOT Variable Definitions (See CLM4.0 documentation)
- DLND Namelist Definitions
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**River Models**

Active / Prognostic River Runoff Model - MOSART | Active / Prognostic River Runoff Model - RTM

- MOSART Namelist Definitions
- MOSART CASEROOT Variable Definitions
- RTM Namelist Definitions
- RTM CASEROOT Variable Definitions

**Climatological Data River - DROF**

- DROF Namelist Definitions
- DROF CASEROOT Variable Definitions

**Ocean Models**

Active / Prognostic Ocean - POP2 | Climatological Data Ocean - DOCN

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**Sea Ice Models**

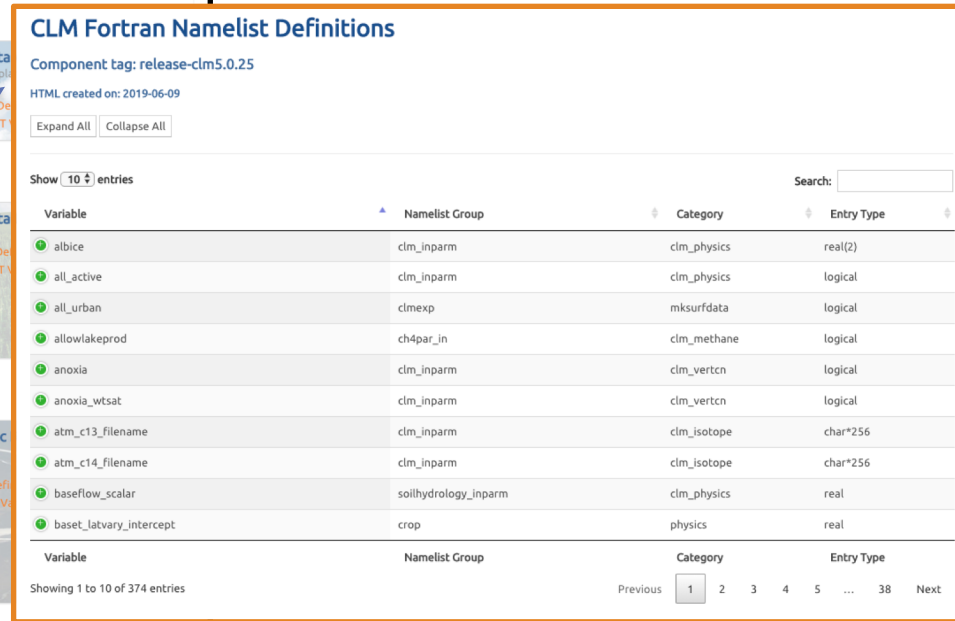
Active / Prognostic Sea Ice - CICE | Climatological Data Sea Ice - DICE

- CICE Namelist Definitions
- CICE CASEROOT Variable Definitions
- DICE Namelist Definitions
- DICE CASEROOT Variable Definitions

**Wave Models**

Active / Prognostic Wave - WW3 | Climatological Data Wave - DWAV

- WW3 Namelist Definitions
- WW3 CASEROOT Variable Definitions
- DWAV Namelist Definitions
- DWAV CASEROOT Variable Definitions



**CLM Fortran Namelist Definitions**

Component tag: release-clm5.0.25

HTML created on: 2019-06-09

[Expand All](#) | [Collapse All](#)

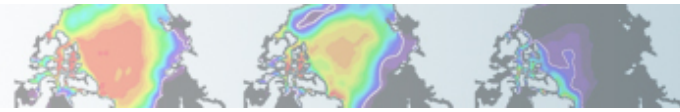
Show  entries

Search:

Variable	Namelist Group	Category	Entry Type
albice	clm_inparm	clm_physics	real(2)
all_active	clm_inparm	clm_physics	logical
all_urban	clmexp	mksurldata	logical
allowlakeprod	ch4par_in	clm_methane	logical
anoxia	clm_inparm	clm_vertcn	logical
anoxia_wtsat	clm_inparm	clm_vertcn	logical
atm_c13_filename	clm_inparm	clm_isotope	char*256
atm_c14_filename	clm_inparm	clm_isotope	char*256
baseflow_scalar	soilhydrology_inparm	clm_physics	real
basel_latvary_intercept	crop	physics	real

Showing 1 to 10 of 374 entries

Previous  2 3 4 5 ... 38 Next



# Part 1: Namelist Modifications

In this section, we will:

- review the “CESM flow” and how to make namelist changes,
- see where to find documentation for namelist variables
- as an illustration, we will customize the output history files to get high frequency output



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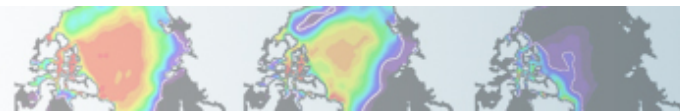
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Science

# Let's change the output frequency in CAM\*\*

By default, CESM outputs **monthly average** history files but you can output at other frequency.

For instance: to change the output frequency of a CAM history file from **monthly average** to **daily average**, we use the namelist variable: ***nhtfrq=-24***

***\*\* In this tutorial, examples will be coming from the atmospheric model. Concepts are transferable to other model components.***



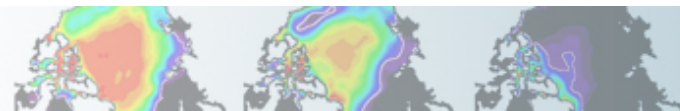
# Customizing CAM history files

In this section, we will cover:

- how to change the **output frequency**
- how to output **extra variables**
- how to output **extra history files**
- how to control the **number of time samples** written to a history file

This can be achieved with 3 namelist variables:

- ***nhtfrq***: sets the output frequency
- ***fincl***: add variables to the history file
- ***mfilt***: maximum number of time samples written to a history file



# Customizing CAM history files: *nhtfrq*

The **default** history file from CAM is a **monthly average**.

We can change the output frequency with the namelist variable *nhtfrq*

If *nhtfrq*=0, the file will be a **monthly average**

If *nhtfrq*>0, frequency is input as number of **timesteps**.

If *nhtfrq*<0, frequency is input as number of **hours**.

For instance to change the history file from **monthly average** to **daily average**, we set the namelist variable:

*nhtfrq* = -24

# Customizing CAM history files: mfilt

To control the **number of time samples** in the history file, we can use the variable *mfilt*

For instance, to specify that we want 10 time samples on each history file, we set the namelist variable:

*mfilt = 10*

For instance, if we output daily data for a 1 year run:

*nhfrq = -24*

*mfilt = 365*

=> *1 history file with 365 time samples*

*nhfrq = -24*

*mfilt = 1*

=> *365 history files with 1 time sample*

**NB: we cannot change *mfilt* for monthly frequency.**

**For monthly frequency, we always have: *mfilt = 1***

# Customizing CAM history files: fincl

You can output up to 10 history files: “h0”, “h1”, ..., “h9”.

The file “h0” contains the default variables (in the code: “call add\_default”). This includes the variables necessary for the *AMWG package*.

For the files “h1” to “h9”, the user has to specify the variables to output.

To control the list of fields in the history files *h0* *h1* ... *h9*  
we can use the namelist variables *fincl1* *fincl2* ... *fincl10*

For instance, the line:

```
fincl1 = 'PRECT'
```

is used to add the field '*PRECT*' to the file “h0”

# Customizing CAM history files: fincl

Using a ":" following a field gives the **averaging flag** for the output field.

Valid flags are:

**A ==> Average**

**B ==> GMT 00:00:00 average**

**I ==> Instantaneous**

**M ==> Minimum**

**X ==> Maximum**

**L ==> Local-time**

**S ==> Standard deviation**

For instance, the line:

***fincl1 = 'PREC:M'***

is used to add the minimum of 'PREC' to the file "h0"



# Example of customizing history files

For instance, what happens if we set:

```
fincl2 = 'T:I','Q:I','U:I','V:I'
```

```
nhtfrq = 0, -3
```

```
mfilt = 1, 8
```

In addition to the monthly history file “h0”,  
we output the file “h1” with **instantaneous values of T, Q, U, V**  
we output these variables every **3 hour**  
We have **8 time samples** in each h1 file (we create a new file every  
day)

***NB: If you plan to run the AMWG diagnostic package, it is recommended to leave the “h0” file untouched and to add extra history files***

# Outputting high frequency data in other components

Here is a few variables to control output frequency of **land**, **ice** and **ocean**

## CLM

**hist\_nhtfrq**: output frequency of the history file

**hist\_mfilt**: number of samples on each history file

**hist\_fincl**: adding variables and auxiliary history files

## Example

**user\_nl\_clm** to output 4 extra history files with daily, six-hourly, hourly, and every time-step values of TG and TV (leaving the primary history files as monthly):

*hist\_fincl2 = 'TG', 'TV'*

*hist\_fincl3 = 'TG', 'TV'*

*hist\_fincl4 = 'TG', 'TV'*

*hist\_fincl5 = 'TG', 'TV'*

*hist\_nhtfrq = 0, -24, -6, -1, 1*

[http://www.cesm.ucar.edu/models/cesm2/settings/current/clm5\\_0\\_nml.html](http://www.cesm.ucar.edu/models/cesm2/settings/current/clm5_0_nml.html)

# Outputting high frequency data in other components

## CICE

**histfreq:** Frequency of output written to history files ('1', 'm', 'd', 'y', ...)

**histfreq\_n:** Frequency history data is written to history files

**hist\_avg:** if false => instantaneous values  
if true => time-averages

## Example

**user\_nl\_cice** to output an extra history file with daily values (leaving the primary history file as monthly):

*histfreq = 'm','d','x','x','x'*

*histfreq\_n = 1,1,1,1,1*

See: [http://www.cesm.ucar.edu/models/cesm2/settings/current/cice\\_nml.html](http://www.cesm.ucar.edu/models/cesm2/settings/current/cice_nml.html)

# Outputting high frequency data in other components

## POP2

**tavg\_freq** = frequency at which the model fields are written

**tavg\_freq\_opt** = units of time for 'tavg\_freq' ('nmonth', 'nhour', 'once', ...)

**tavg\_file\_freq** = frequency at which the model files are written

**tavg\_file\_freq\_opt** = units of time for 'tavg\_file\_freq' ('nmonth', 'nhour', ...)

[http://www.cesm.ucar.edu/models/cesm2/namelist/pop2\\_nml.html](http://www.cesm.ucar.edu/models/cesm2/namelist/pop2_nml.html)

For instance, to output a timeseries of daily averages bundled into a monthly file:

**tavg\_freq\_opt** = 'nday'

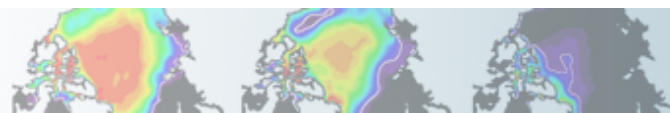
**tavg\_freq** = 1

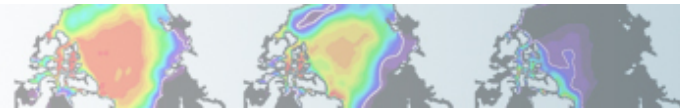
**tavg\_file\_freq\_opt** = 'nmonth'

**tavg\_file\_freq** = 1



Changing tavg\_nml variables is non standard  
Do not modify these variables directly in user\_nl\_pop2  
Use the workaround explained in user\_nl\_pop2





## Part 2: Code Modification

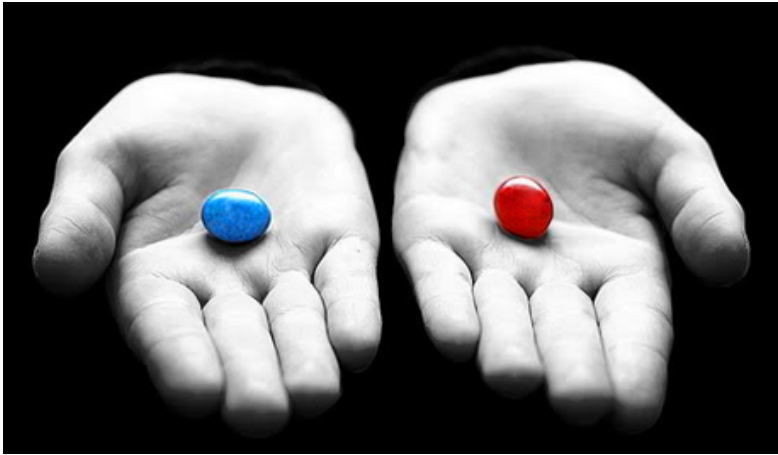
**In this section, we will learn how to do simple code modifications such adding a new variable**



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# Your choice: The Red Pill or the Blue Pill



*The Matrix (1999):* Neo, the main character is offered the choice between a red pill and a blue pill.

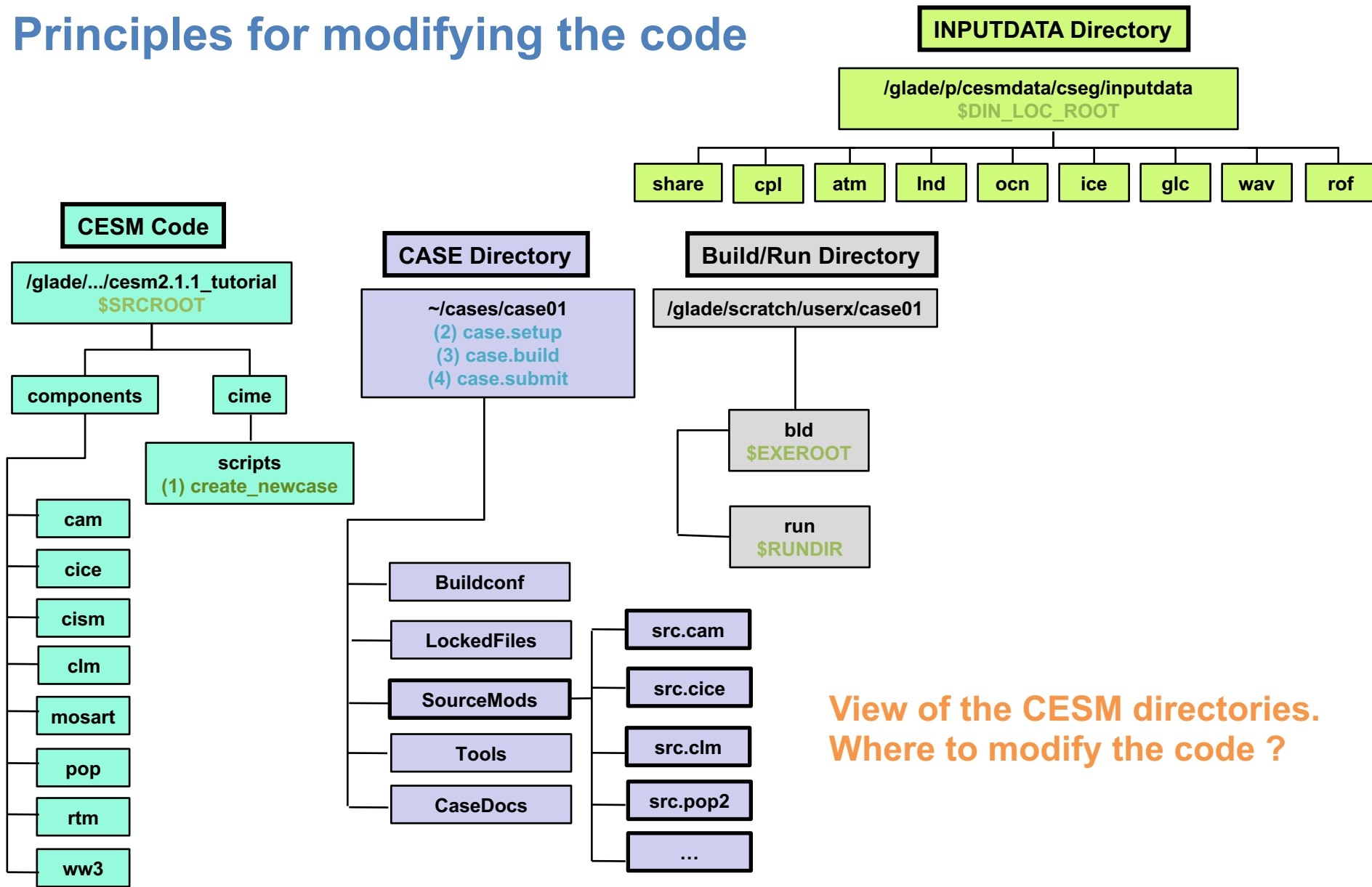
-The **blue pill** would allow him to remain in the Matrix (a fictional computer-generated world)

-The **red pill** would lead to his "escape" from the Matrix into the real world and embracing the sometimes painful truth of reality.



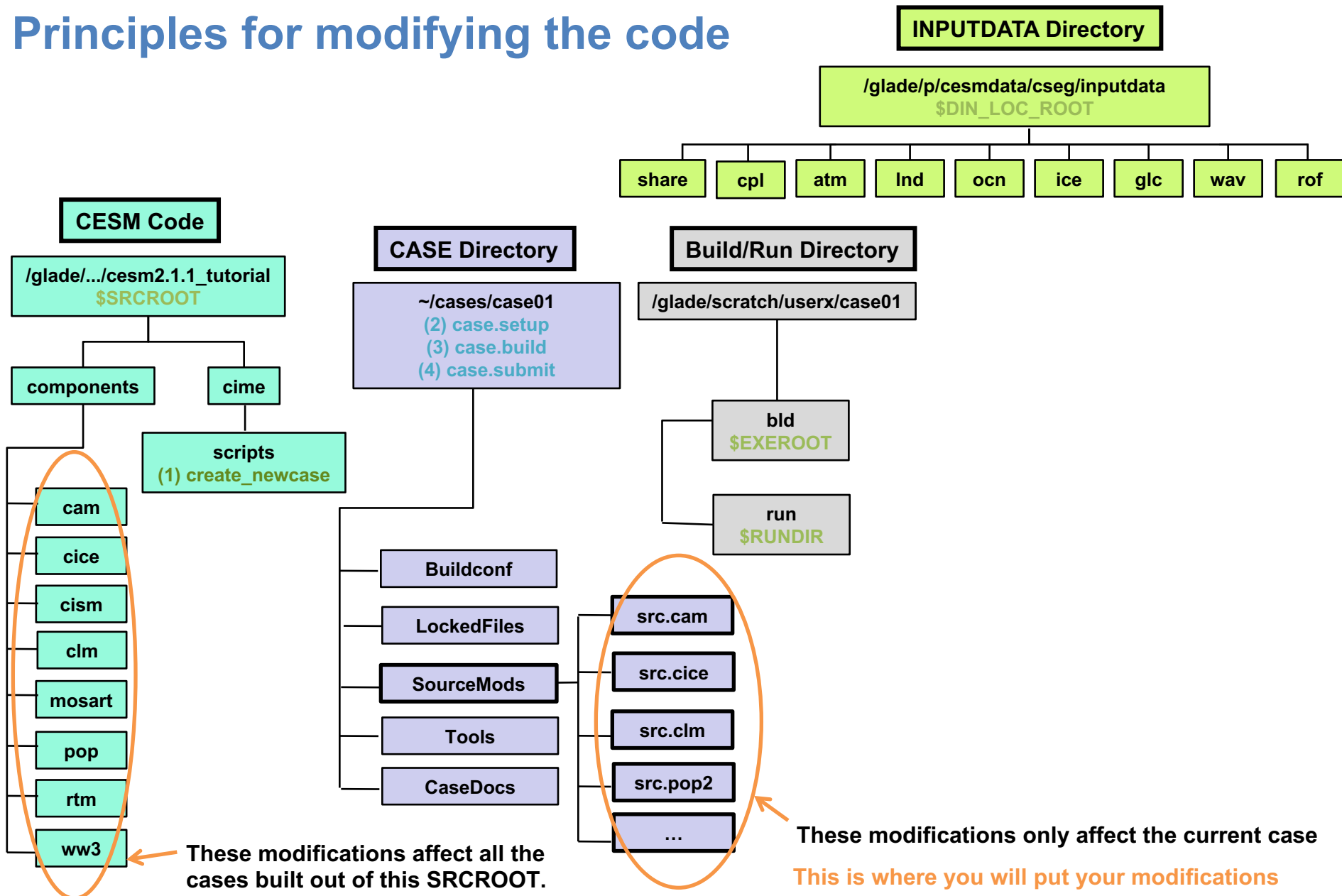
Courtesy: Andrew Gettelman

# Principles for modifying the code



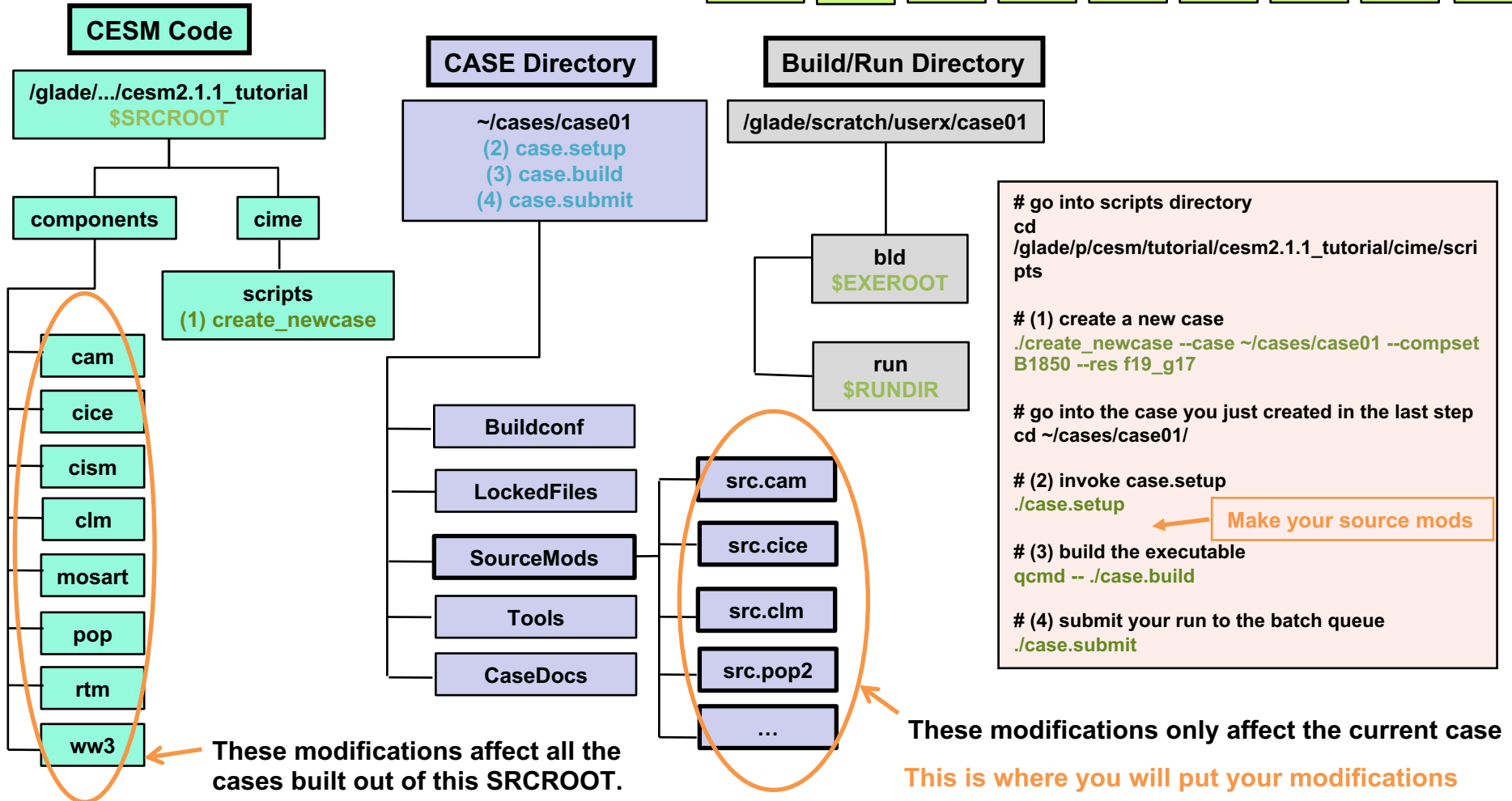
View of the CESM directories.  
Where to modify the code ?

# Principles for modifying the code





# Principles for modifying the code



# Modifying a subroutine

## Steps to modify the code:

- Find the subroutine you want to modify
- Copy this subroutine in SourceMods
- Make your mods
- Compile and run the model

# Output an extra variable

- One common thing you may want to do is to **add code to output a new variable**
- For instance, CAM has a field to output the temperature at 500 mbar (T500) but not at 750mb. Let's add a field to output the temperature at 750 mbar (T750)

This can be done by a succession of calls:

*call addfld ('T750', ...)*

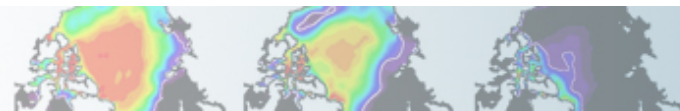
→ Add a field to master field list

*call add\_default ('T750',...)*

→ Add this field to "h0" by default (optional)

*call outfld('T750', ... )*

→ Collect values for this field and write to history file



# Syntax: addfld

**addfld = Add a field to master field list**

Field name

Units

Number of vertical levels:  
single level :1  
multi-level: pver or pverp

Averaging flag:  
A = average  
I = instantaneous

**subroutine addfld (fname, units, numlev, avgflag, &  
long\_name, decomp\_type, [Optional arguments])**

Field full name

Decomposition type  
(phys\_decomp or  
dyn\_decomp)

There are several optional arguments (not covered  
here. See documentation for more information about  
optional arguments)

**Example:**

*call addfld ('T500', 'K', 1, 'A', 'Temperature at 500 mbar pressure  
surface', phys\_decomp)*

# Syntax: add\_default

**add\_default = Add a field to the list of default fields on history file**

Field name

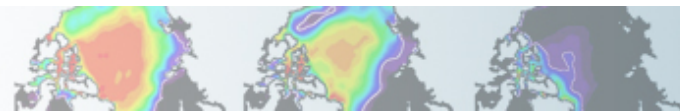
Averaging flag:  
A = average (default)  
I = instantaneous

```
subroutine add_default (name, tindex, flag)
```

history tape index

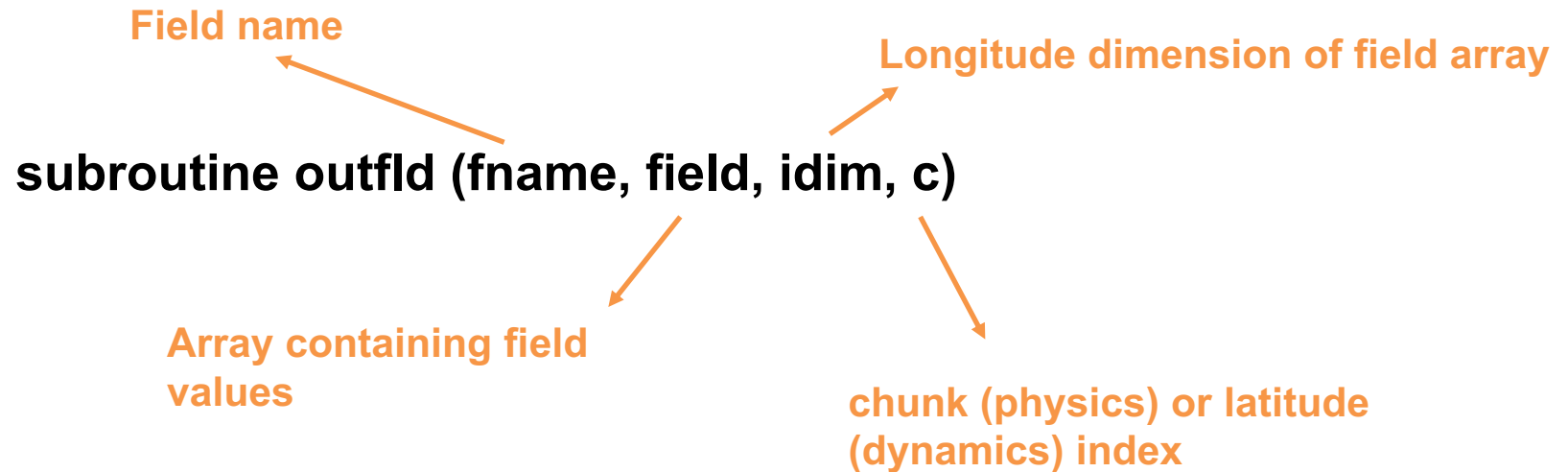
**Example:**

*call add\_default ('T500', 1, '')*



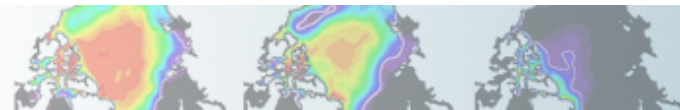
# Syntax: outfld

**outfld = accumulate (or take min, max, etc. as appropriate) input field into its history buffer for appropriate tapes**



**Example:**

*call outfld('T500', cld, pcols, lchnk)*



# Where to find help ?

<http://www.cesm.ucar.edu/models/cesm2>

## CESM Models | CESM2



### About CESM2

CESM is a fully-coupled, community, global climate model that provides state-of-the-art computer simulations of the Earth's past, present, and future climate states.

- [What's New in CESM2](#)
- [CESM Naming Conventions](#)
- [Supported Release Tags and Notes](#)

### Scientific Validation

Scientific validation consists of a multi-decadal model run of the given component set at the target resolution, followed by scientific review of the model output diagnostics.

- [CESM2 Scientifically Validated Configurations](#)
- [Experiment Diagnostics](#)
- [Experiment Output Datasets](#) \* [↗](#)

\* Please see [CESM2 Scientifically Validated Configurations](#) for data download details.

### CESM Project

CESM is a fully-coupled, community, global climate model that provides state-of-the-art computer simulations of the Earth's past, present, and future climate states.

CESM is sponsored by the National Science Foundation (NSF) and the U.S. Department of Energy (DOE). Administration of the CESM is maintained by the Climate and Global Dynamics Laboratory (CGD) at the National Center for Atmospheric Research (NCAR).

### CESM2 Quicklinks

- Quick Start Guide
- Downloading The Code
- Scientifically Validated Configurations
- [Prognostic Components](#)

### Related Information

- [Data Management & Distribution Plan](#)
- [Development Project Policies & Terms of Use](#)
- [DiscussCESM Forums Bulletin Board](#)
- [CESM2 Copyright](#)
- [CESM Support Policy](#)
- [CESM2 Included Packages Copyright](#)

CESM webpage is a gold mine for **model documentation**

### ★ Quick Start

See the selected links below to help you quickly get started with CESM2

- [Getting Help](#)
- [CESM2 Use Cases](#)
- [CESM2 Quick Start Guide](#)
- [Download the CESM2 Code](#)

### 📄 CIME Documentation

Common Infrastructure for Modeling the Earth contains the coupling infrastructure, support scripts, data models and utility libraries needed to create a single-executable coupled Earth System Model.

\* CIME does not contain any prognostics components and is available in a stand-alone package that can be compiled and tested with just its data components.

- [CIME User Guide](#) [↗](#)

### ≡ Prognostic Components

Each model component page contains descriptions and documentation for active or prognostic models.

- [Atmosphere](#)
- [Land](#)
- [Land Ice](#)
- [Ocean](#)
- [River Runoff](#)
- [Sea Ice](#)
- [Wave](#)

### ⚙️ Configurations and Grids

Component configurations include settings required for CIME enabled models; both prognostic and data model components. These settings include:

### 🖨️ Supported Machines & Performance Data

- [Supported Machines and Compilers](#)
- [Performance and Load Balancing Data](#)
- [Running on a Medium-Sized Linux Cluster](#)
- [Verify a Machine Port](#)

### 📖 External Library Documentation

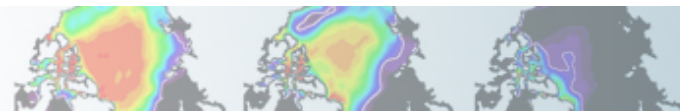
- [Parallel I/O Library \(PIO\)](#)
- [Model Coupling Toolkit \(MCT\)](#)
- [Earth System Modeling Framework \(ESMF\)](#)
- [External Python Based Tools \\*](#)

If you cannot find an answer in the model documentation, post your question on the **CESM Bulletin Board**

# Exercise Overview



- **Exercise 1: Namelist modification**  
**Customize your history output**
- **Exercise 2: Namelist + Code modification**  
**Add a new output field to the code**
- **Exercise 3: Change a tuning parameter**





# Exercise Overview



Find the exercises on the CESM tutorial webpage:

<http://www.cesm.ucar.edu/events/tutorials/2019/files/Practical4-exercise-hannay.pdf>

Location of these  
afternoon exercises

Exercise

Hints

And ... solutions

## Exercise 2: Add an output field

Create a case called "b1850\_T750" using the `compset B1850` at `f19_g17` resolution.

- Add an output field for the temperature at 750 mbar.
- Output daily values of T750 and T500 in the "h1" history file.
- Set the `namelist` to output a single h1 for the run.
- Make a 1-month run.

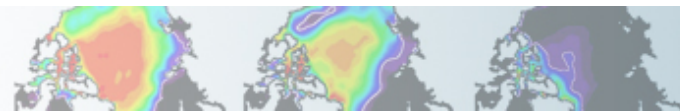
## Hints for exercise 2

Use T500 as a template for your changes.

Find the subroutine containing T500 using `grep -r T500 *`

When the run is completed, go to your archive directory:

- check the fields T750 and T500 are in the file h1
- create a file with the difference between T750-T500
- For instance, you can use `ncap2`  
`ncap2 -s 'T750_minus_T500=T750-T500' b1850_T750.cam.h1.0001-01-01-00000.nc T750-T500.nc`
- Look at the difference with `ncview`.



# Solutions to the exercises



At the request of previous year students, I am providing the solution.

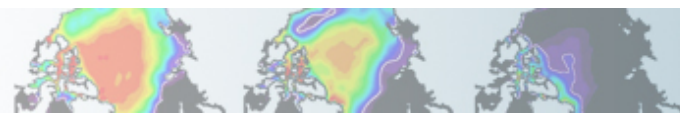
My own recommendation:

**DON'T LOOK AT THE SOLUTIONS DURING THE LAB !!!**

I believe:

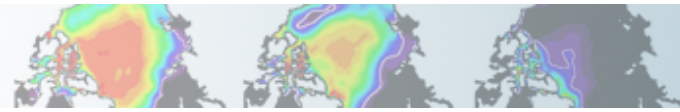
- You will only learn if you try the exercises by yourself.
- You will only learn if you do mistakes.
- Copy/paste will teach you little, indeed.
- Your best bet is to try, do mistakes, ask your neighbor, interact with each others, look at the documentation, try to understand what is wrong...

But this is my own opinion, and I am too old to believe I know the Truth.  
So do what is best for you. Go to the next page at your own risk 😊



**If you are sure you want to look at the solutions, click on the button...**





# Quizzes

**At the end of the practical, please go to the online course and take the quiz.**

**<http://www.cesm.ucar.edu/events/tutorials/2019/quizzes.html>**

**To answer the questions, you can use documentation, ask questions to others or to the helper. Indeed you are strongly encouraged to do all the above. This is the way you will use CESM in the future.**

**How are you graded ? You can take the quizzes as many times as you want, I only retain your highest score. But please try to understand your mistakes.**

**If you cannot complete the quiz by the end of the practical session, you have until August 16 to complete the quizzes. If you get a perfect score, you will get a certificate of awesomeness.**

**“Special prize” for those who get a perfect score before Friday morning!!!**



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# Where to find stuff ?

<http://www.cesm.ucar.edu/events/tutorials/2019/>

## Thursday, August 8

Lectures	
Topic: Ocean Modeling II Speaker: Peter Gent	<a href="#">Slides</a> <a href="#">Videos</a>
Topic: Ocean Biogeochemistry Speaker: Keith Lindsay	<a href="#">Slides</a> <a href="#">Videos</a>
Topic: Sea Ice Modeling Speaker: Alice DuVivier	<a href="#">Slides</a> <a href="#">Videos</a>

Meet a Scientist	
Topic: Sign up to meet one of our CESM Scientists	<a href="#">Scientist bios</a>

Specialized Talk	
Topic: Simpler Models Speaker: Isla Simpson	<a href="#">Slides</a> <a href="#">Videos</a>

Practical	
Topic: Namelist and Code Modifications Speaker: Cecile Hannay	<a href="#">Overview</a> <a href="#">Exercises</a> <a href="#">Videos</a>

Lab overview  
(these slides)

Exercises/Solutions

## Tutorial Details

- **Dates:** 05 - 09 August 2019
- **Location:** NCAR Mesa Lab, Boulder, CO [[More info](#)]
- **Registration:** Closed 08 March 2019

## Tutorial Links

- **Agenda:** View the agenda in pdf format
- **Announcement:** Information about the event and how to apply to the tutorial
- **Prerequisites:** Please complete the following activities to ensure you are prepared for the tutorial
- **Coursework:** View the sciences presentations and the labs exercises.
- **Quizzes:** Access your daily quiz.
- **Visitor Wireless:** How to access the UCAR Visitor Wireless

Quizzes

## 2019 CESM Tutorial: Daily Quizzes

### One-time registration/enrollment

To gain access to your daily quiz, you need to either use your existing account or create an account on the COMETMetEd website and then enroll in "CESMTut\_2019". This is a one-time painless process.

Directions for those without existing accounts on COMET/MetEd (meted.ucar.edu)

1. Go to <https://www.meted.ucar.edu>
2. Click "Sign Up" located to the left the "Sign In" button.
3. Provide all required information and then click "Create Account" at the bottom of the page.
4. Go to <https://courses.comet.ucar.edu/course/view.php?id=226>
5. Scroll to the bottom of the Enrollment options page. Enter the enrollment key "CESMTut\_2019" (without quotes), then click the "Enroll Me" button.
6. You should see the CESM Tutorial welcome message, and you will receive an email to confirm your enrollment.

Directions for those with existing accounts on COMET/MetEd (meted.ucar.edu)

1. Go to <https://courses.comet.ucar.edu/course/view.php?id=226>
2. Log on to the MetEd website.
3. Scroll to the bottom of the Enrollment options page. Enter the enrollment key "CESMTut\_2019" (without quotes), then click the "Enroll Me" button.
4. You should see the CESM Tutorial welcome message, and you will receive an email to confirm your enrollment.

### Daily quizzes

Once you have enrolled, follow the "Quiz Link" below to access your daily quiz.

**Quiz Link:** <https://courses.comet.ucar.edu/course/view.php?id=226>

Feel free to take the quiz anytime during the lab session or even after the lab session. For instance, you can take the quiz while you are waiting for the model to compile or your run to complete. However, please refrain from taking the quiz before your daily lab session. We might need to modify the quiz just before the lab session, and we would need to erase your attempts.

The goal of the quizzes is to challenge your knowledge and to create a learning experience. You can take the quiz as many times as you want. During the quiz: Feel to talk to your neighbor, to ask questions to your instructor, to look into the documentation.

Good luck ! And don't forget to have fun.

