

# Common Land Model

## Activity 2: Testing Single Columns

ParFlow Short Course

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Jennifer Jefferson

Note: Demo is for operation of PF-CLM from a local version installed on a Mac.

# Why would you want to test CLM with single columns?

- Computationally cheaper than whole domain simulation
- Can quickly run simulation on laptop
- Isolate variable
- Obtain information about variable not output (by default) from CLM
- Isolate period of time or scenario
- Compare effect of change
- Clarify computation or conceptual understanding

# Activity 2

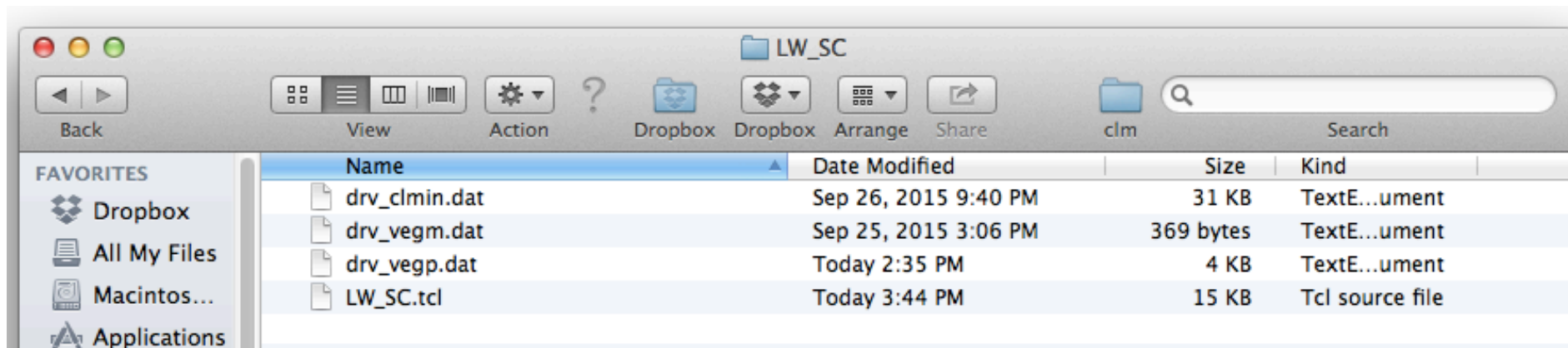
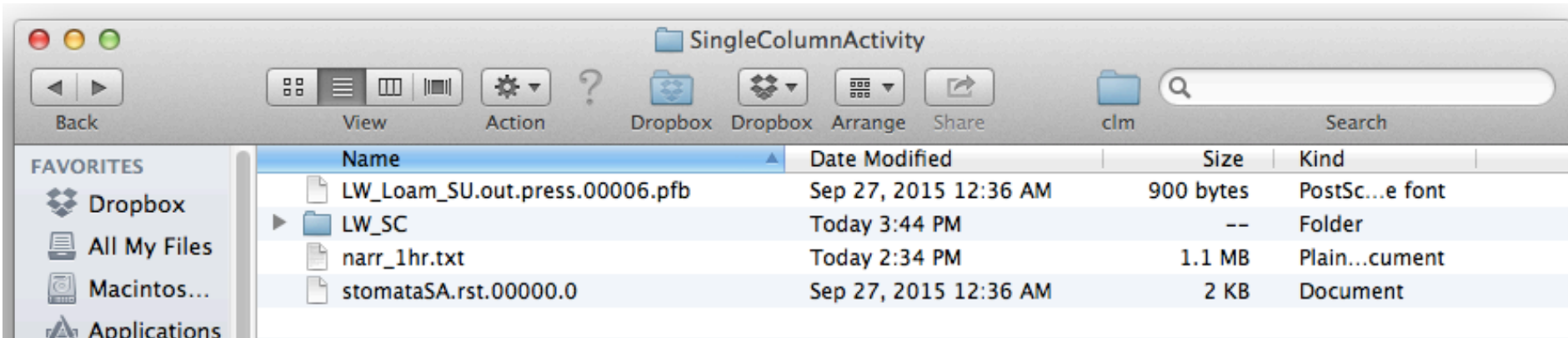
(demo portion)

**Goal:** Output and plot 2 variables from CLM

**Variables of interest:**

1. **clm%btran** – vegetation water stress (for transpiration)
  2. **taf** – canopy air temperature
- Both variables are located in `clm_leaftem.F90`
  - Neither variable is written out of the model

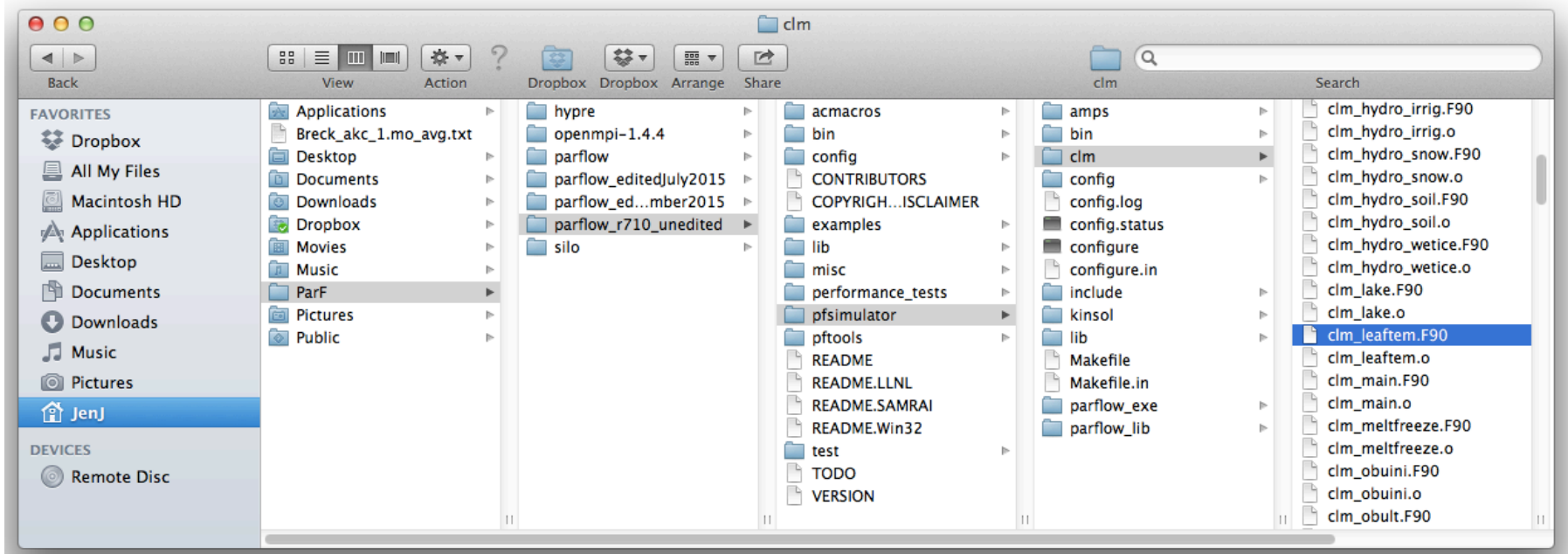
# Step 1: Obtain (or locate) files in a folder called “SingleColumnActivity”



Put folder somewhere on your computer, but leave files in this arrangement.

## Step 2: Add print statement to clm\_leaftem.F90

- Navigate to clm\_leaftem.F90



- Open the file and at the bottom of clm\_leaftem.F90 **add** (will print to ...out.txt):

```
! Update dew accumulation (kg/m2)
```

```
clm%h2ocan = max(dble(0.),clm%h2ocan + (clm%qflx_tran_veg-clm%qflx_evap_veg)*clm%dttime)
```

```
print*, '111', clm%btran, taf
```

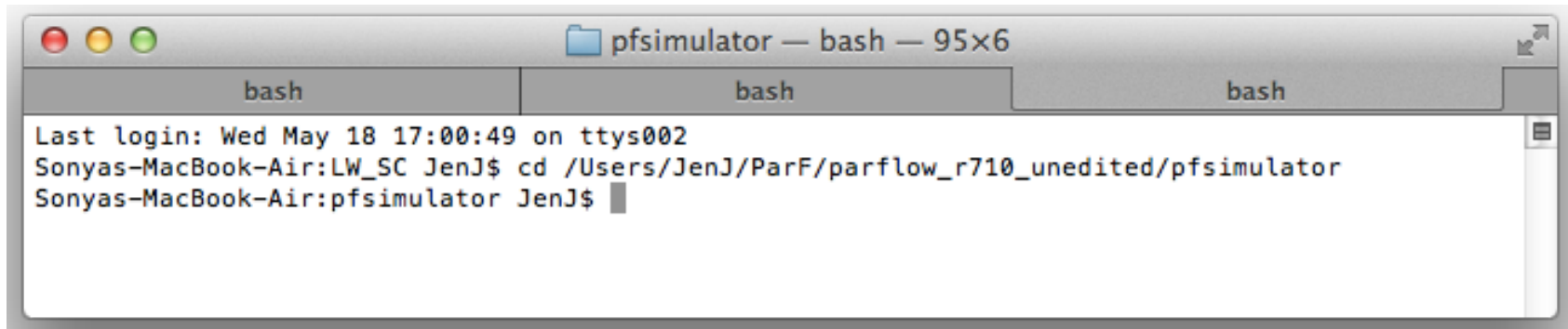
```
end subroutine clm_leaftem
```

# Tips

- Be thoughtful about placement of print statement
  - Not in a loop
  - Before final value is computed
- Select variables strategically so that you can make offline calculations
  - To duplicate output
  - Think ahead, if possible

## Step 3: Recompile PF-CLM

- Open the terminal window
- Navigate to pfsimulator folder  
`cd ...`

A screenshot of a macOS terminal window. The title bar shows a folder icon, the text 'pfsimulator — bash — 95x6', and standard window control buttons. The terminal has three tabs, each labeled 'bash'. The first tab is active and displays the following text: 'Last login: Wed May 18 17:00:49 on ttys002', 'Sonyas-MacBook-Air:LW\_SC JenJ\$ cd /Users/JenJ/ParF/parflow\_r710\_unedited/pfsimulator', and 'Sonyas-MacBook-Air:pfsimulator JenJ\$' with a cursor at the end.

```
Last login: Wed May 18 17:00:49 on ttys002
Sonyas-MacBook-Air:LW_SC JenJ$ cd /Users/JenJ/ParF/parflow_r710_unedited/pfsimulator
Sonyas-MacBook-Air:pfsimulator JenJ$
```

- Recompile code by typing  
`make install`

## Step 4: Run tcl script

- Open a new tab in the terminal window (command+t)
- Navigate to the “SingleColumnActivity – LW\_SC” folder  
`cd ...`
- Run tcl script  
`tclsh LW_SC.tcl`

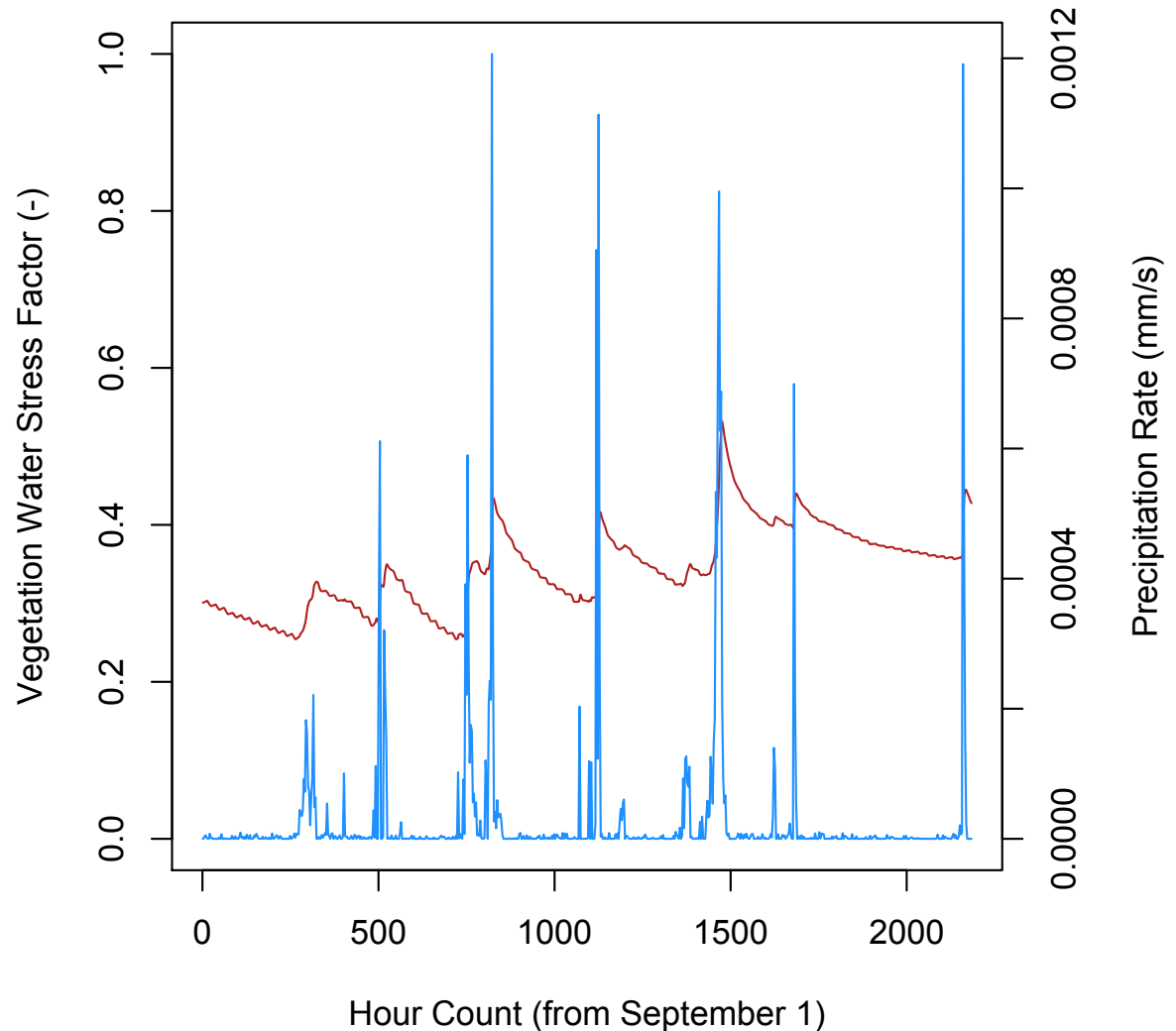


# Step 5: Post-process data

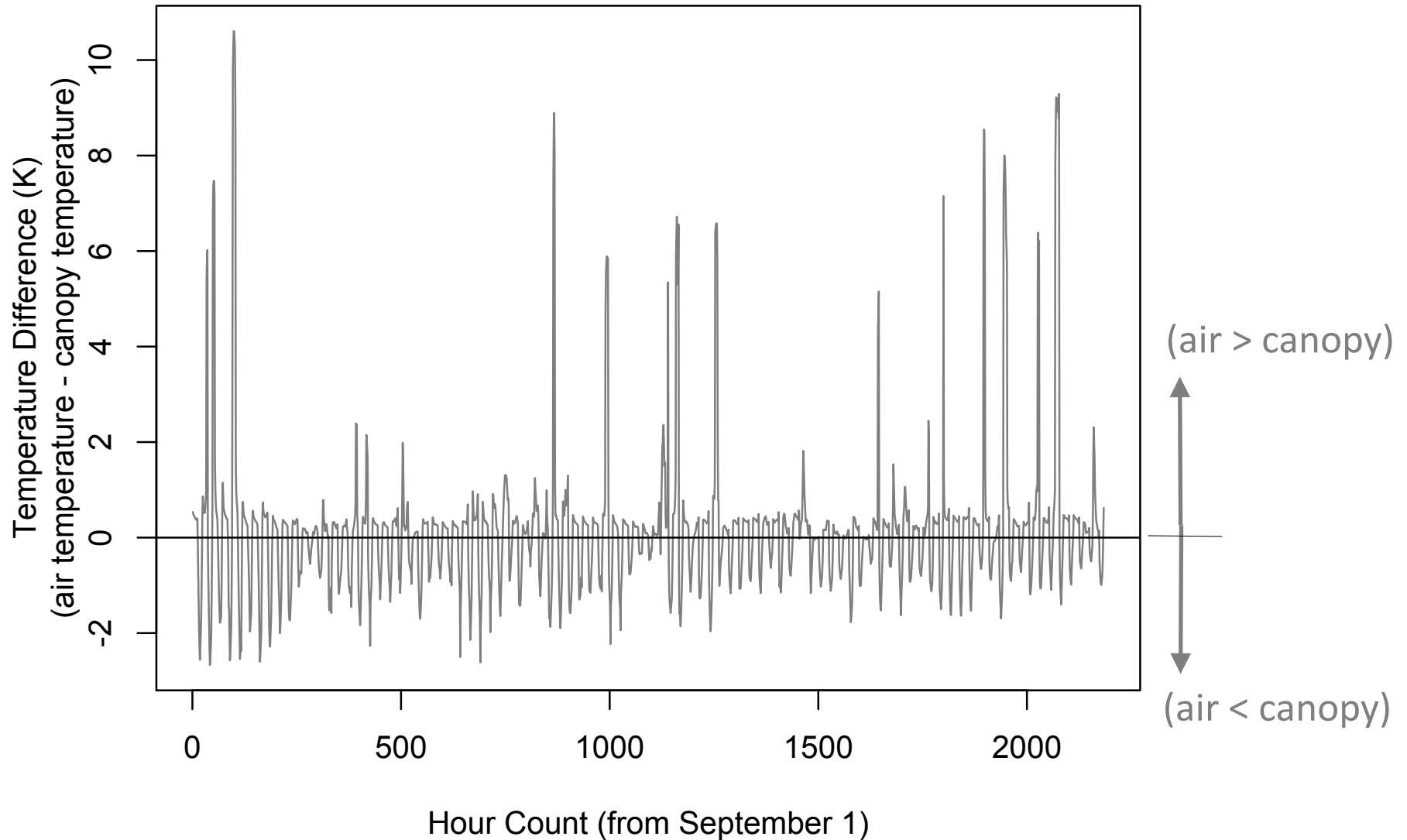
(I used R to load, compare and plot data)

(more moisture, does not  
limit photosynthesis as much)

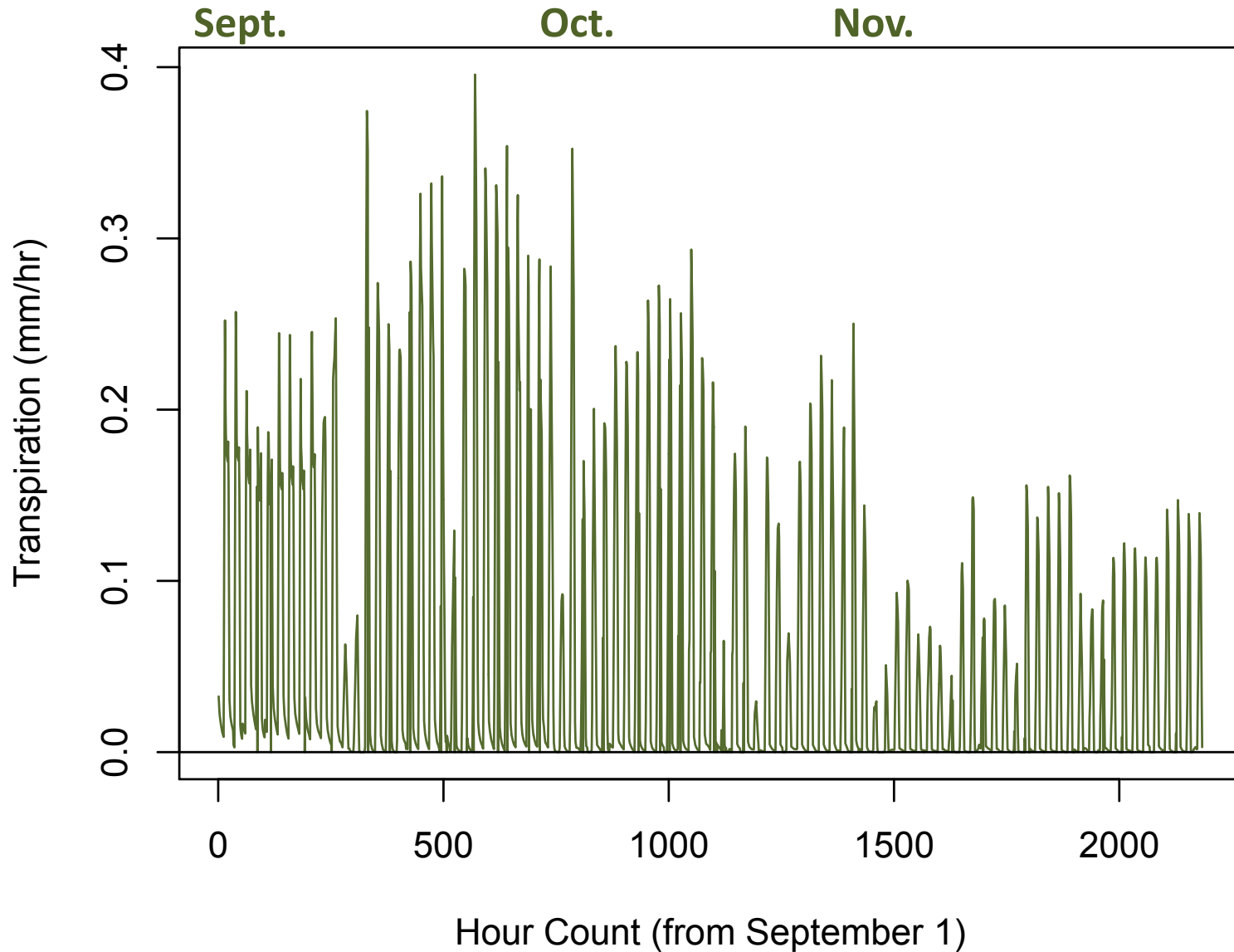
(less moisture, limits  
photosynthesis more)



## Step 5: Post-process data



## Step 5: Post-process data



# Activity 2

(active portion)

**Goal:** Run a single column domain and plot variable from single file output

Example single column setup is provided:

1. .tcl script
2. (3) CLM files
3. 1D forcing file
  - Little Washita, OK
  - File begins on September 1, 1998 at 0 GMT  
(7pm CT August 31, 1998)
4. Pressure file
5. Restart file

# (Some) Decisions to Make

## 1. How many time steps to simulate?

```
set stopt 2184.0

pfset TimingInfo.BaseUnit      1.0
pfset TimingInfo.StartCount    0
pfset TimingInfo.StartTime     0.0
pfset TimingInfo.StopTime      $stopt
pfset TimingInfo.DumpInterval  1.0
pfset TimeStep.Type             Constant
pfset TimeStep.Value           1.0
```

## 2. Restart or not?

```
#pfset ICPressure.Type          HydroStaticPatch
#pfset ICPressure.GeomNames      domain
#pfset Geom.domain.ICPressure.Value -1.0
#pfset Geom.domain.ICPressure.RefGeom domain
#pfset Geom.domain.ICPressure.RefPatch z-upper

pfset ICPressure.Type          PFBFile
pfset ICPressure.GeomNames      domain
pfset Geom.domain.ICPressure.FileName "LW_Loam_SU.out.press.00006.pfb"
pfdist "LW_Loam_SU.out.press.00006.pfb"
```

## 1. What CLM variable to plot?

- See end of introduction slides for list and order