

DSM2 Learning Series: Planning Studies

Session 1: Hands-on Exercises

October 27, 2023



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DISCLAIMER

All DSM2 and CalSim simulations
in this training are

**EXAMPLES AND SHOULD ONLY BE
USED FOR TRAINING**

Reminders

1. Raise your hand (on Teams) when you complete each step
2. If you have a question, enter it into the Teams chat, even if you are in the room

DSM2 Learning Series: **Planning**

Skills Learned

- Session 1: DSM2 Planning study setup
- **Session 1 Hands-On Exercises:**
 - Pre-process CalSim output for DSM2
 - Plotting DSM2 input with Jupyter notebooks
 - Running DSM2 planning studies
- Session 2: Plotting DSM2 output with Jupyter notebooks



DSM2 Learning Series

Topics Not Covered

How to

- Run CalSim
- Change channel geometry
- Add/remove/change structures

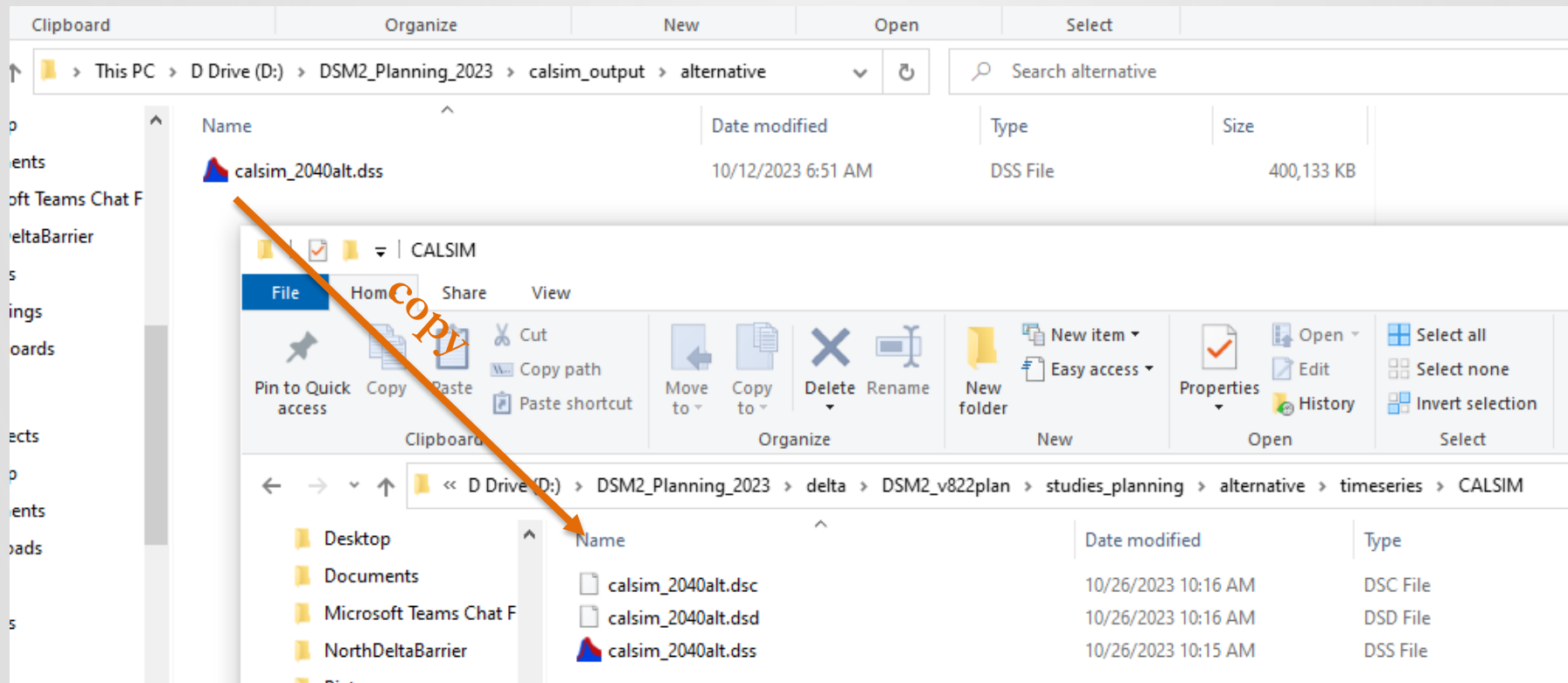
Setting up and running DSM2, plotting input

- For each scenario,
 - Create a copy of the CalSim output DSS file
 - Edit the pre-processor batch file
 - Run the pre-processor
 - Create input plots
 - Run the models
 - dsm2_batch.bat

Running the DSM2 Pre-processor

alternative scenario: copy CalSim output to DSM2 folder

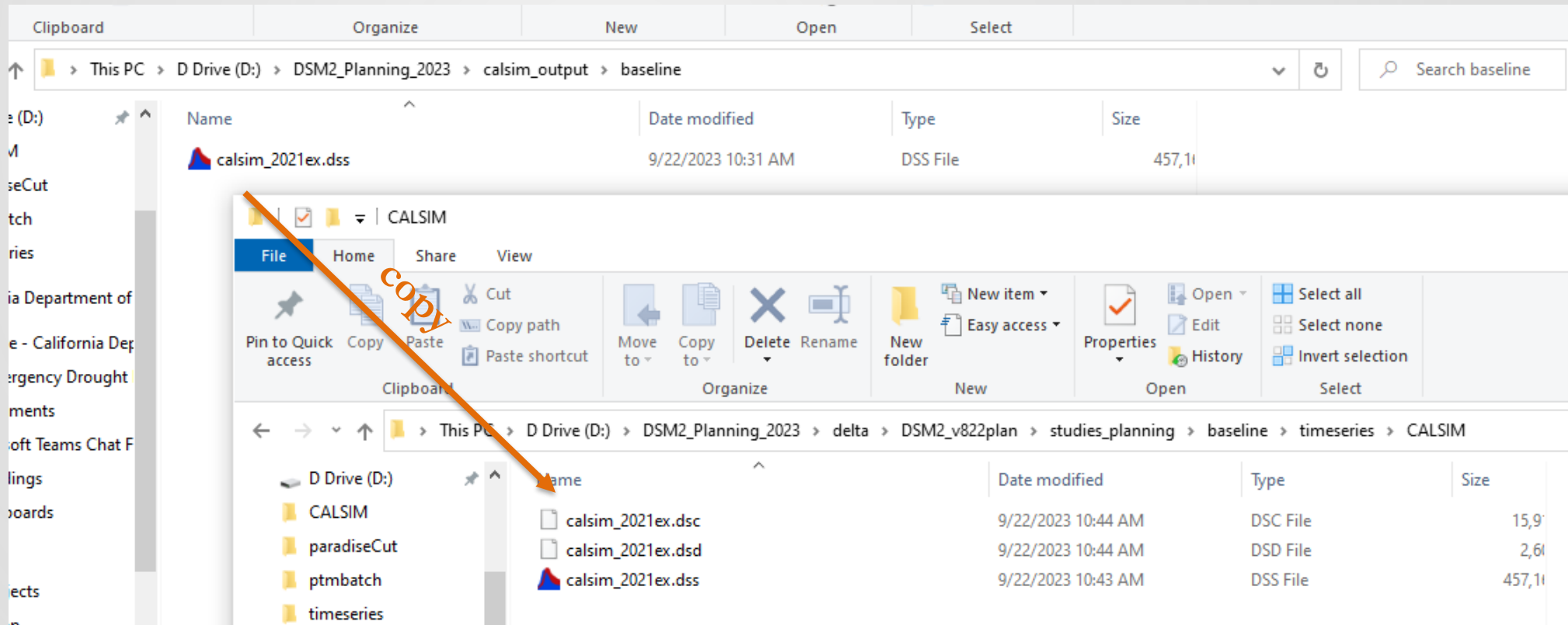
- For the alternative scenario,
 - Copy the CalSim output file for the scenario into the DSM2 planning study folder



Running the DSM2 Pre-processor

baseline scenario: copy CalSim output to DSM2 folder

- For the baseline scenario,
 - Copy the CalSim output file for the scenario into the DSM2 planning study folder



Running the DSM2 Pre-processor baseline study

- For each scenario (only pre-process one run at a time),
 - Run the pre-processor create DSM2 DSS input
 - Prepro.bat config.inp

Starting the
script

Command Prompt

```
D:\DSM2_Planning_2023\delta\DSM2_v822plan\studies_planning\baseline>prepro.bat config.inp
```

```
D:\DSM2_Planning_2023\delta\DSM2_v822plan\studies_planning\baseline>if {config.inp} == {} (  
echo "usage:  prepro config-file"
```

```
or: python postpro.py *.dss {pathname} {out}.dss  
read DSM2 15-MIN output file: timeseries/2021ex.dss  
postprocess pathnames:  
/DWR/RSAC054/STAGE/01DEC1920 - 01OCT2015/15MIN/HARMONIC_NGVD_20230413/  
/DWR/RSAC054/STAGE/01JAN1921 - 01SEP2015/15MIN/PLAN_DETREND_NAVD_20230413/  
/FILL+CHAN/RSAC054/EC/01JAN1921 - 01SEP2015/15MIN/PLAN_2021EX/  
all process done
```

done

```
D:\temp\DSM2_Planning_2023\delta\DSM2_v822plan\studies_planning\baseline>
```


Running the DSM2 Pre-processor alternative study

- For each scenario (only pre-process one run at a time),
 - Run the pre-processor create DSM2 DSS input
 - Prepro.bat config.inp

Starting the
script

Command Prompt - prepro.bat config.inp

```
D:\DSM2_Planning_2023\delta\DSM2_v822plan\studies_planning\alternative>prepro.bat config.inp
Prepro is needed only when the CALSIM file changes.
Extending flows
C_SAC048
_
```

```
or: python postpro.py *.dss {pathname} {out}.dss
read DSM2 15-MIN output file: timeseries/2040alt.dss
postprocess pathnames:
/DWR/RSAC054/STAGE/01DEC1920 - 01OCT2015/15MIN/HARMONIC_NGVD_20230413/
/DWR/RSAC054/STAGE/01JAN1921 - 01SEP2015/15MIN/PLAN_2040ALT/
/FILL+CHAN/RSAC054/EC/01JAN1921 - 01SEP2015/15MIN/PLAN_2040ALT/
all process done
```

done

```
D:\DSM2_Planning_2023\delta\DSM2_v822plan\studies_planning\alternative>_
```

Running the DSM2 Pre-processor

Empty catalog error

```
Command Prompt
File "./scripts/prep_ec.py", line 31, in <module>
  planning_ec_mtz_slr55.planning_ec_mtz()
File "D:\DSM2_Planning_2023\delta\DSM2_v822plan\studies_planning\alternative\scripts\planning_ec_mtz_slr55.py", line 6
3, in planning_ec_mtz
  ndo=DataReference.create(findpath(CALSIM,"/CALSIM/NDO/FLOW-NDO//"+STEP+"/"
File "D:\DSM2_Planning_2023\delta\DSM2_v822plan\vista\lib\Lib\vdss.py", line 89, in findpath
  return g.find(pa)
    at vista.db.dss.DSSCatalogReader.readCatalog(DSSCatalogReader.java:95)
    at vista.db.dss.DSSCatalogReader.<init>(DSSCatalogReader.java:82)
    at vista.db.dss.DSSUtil.createCatalogReader(DSSUtil.java:562)
    at vista.db.dss.DSSGroup.getInitializedGroup(DSSGroup.java:108)
    at vista.set.GroupProxy.initializeGroup(GroupProxy.java:205)
    at vista.set.GroupProxy.getNumberOfDataReferences(GroupProxy.java:77)
    at vista.set.Group.find(Group.java:325)
    at sun.reflect.NativeMethodAccessorImpl.invoke0(Native Method)
    at sun.reflect.NativeMethodAccessorImpl.invoke(NativeMethodAccessorImpl.java:62)
    at sun.reflect.DelegatingMethodAccessorImpl.invoke(DelegatingMethodAccessorImpl.java:43)
    at java.lang.reflect.Method.invoke(Method.java:498)
java.lang.IllegalArgumentException: java.lang.IllegalArgumentException: Catalog is empty ?

usage: python postpro.py *.dss
       or: python postpro.py *.dss {pathname}
       or: python postpro.py *.dss {pathname} {out}.dss
read DSM2 15-MIN output file: timeseries/2040alt.dss
postprocess pathnames:
/DWR/RSAC054/STAGE/01SEP2010 - 01SEP2014/15MIN/PLAN_2040ALT/
all process done
D:\DSM2_Planning_2023\delta\DSM2_v822plan\studies_planning\alternative>
```

"Catalog is empty ?" error

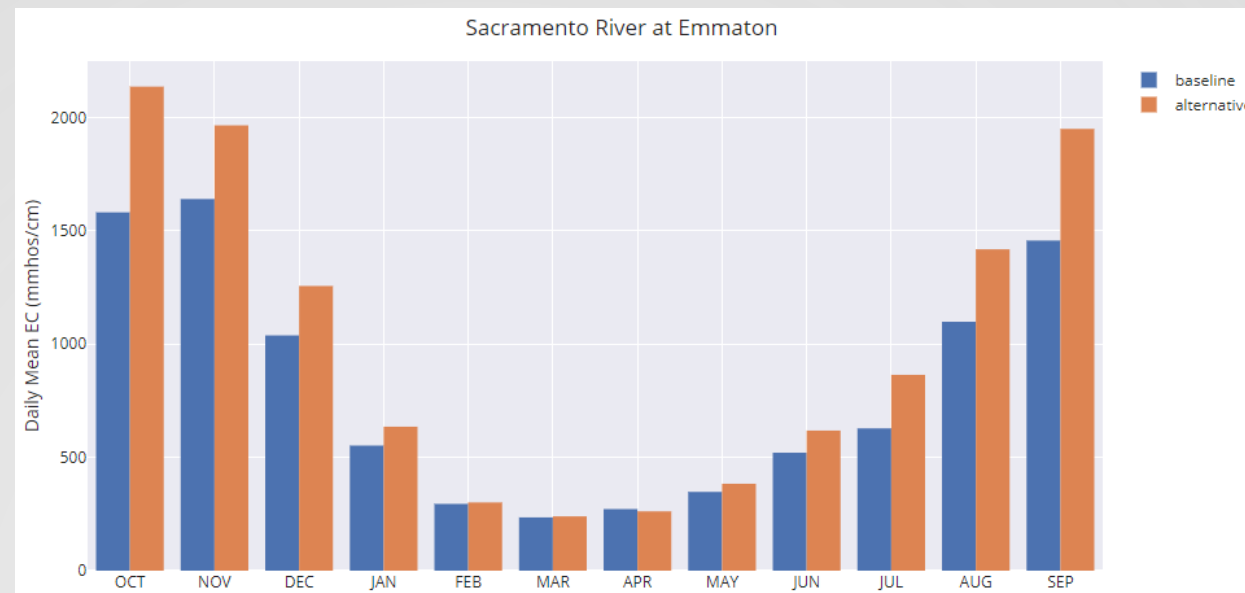
Delete the dsc and dsd files

Name	Date modified	Type	Size
calsim_2040alt.dsc	10/25/2023 5:45 PM	DSC File	1 KB
calsim_2040alt.dsd	10/25/2023 5:45 PM	DSD File	0 KB
calsim_2040alt.dss	10/12/2023 6:51 AM	DSS File	400,133 KB

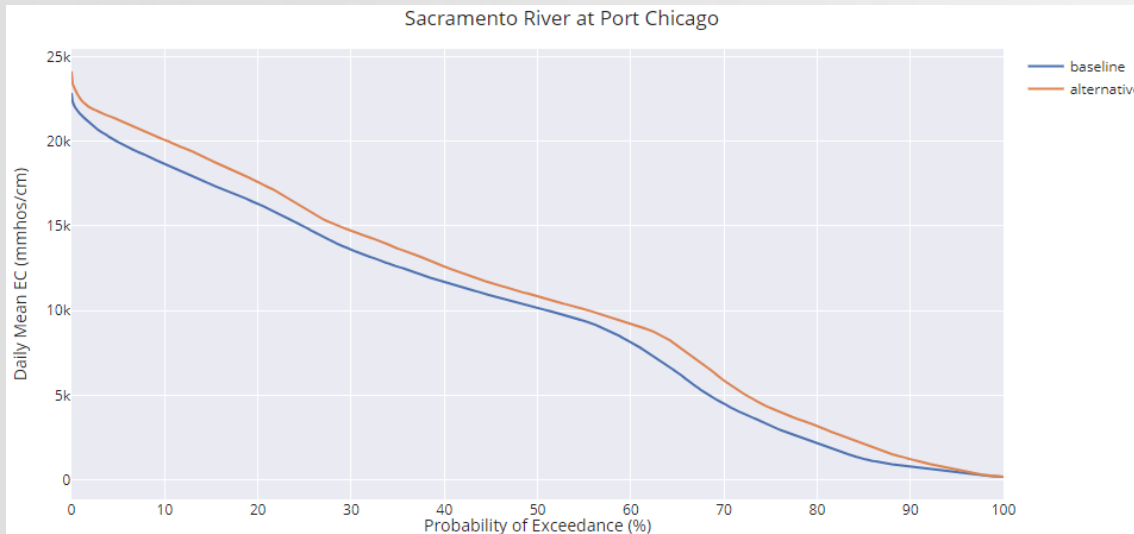
Jupyter notebook for plotting model input

Notebook filename	Purpose
2021_example_bnd.ipynb	Compare DSM2 boundary inputs (flow, stage, EC) from multiple scenarios.

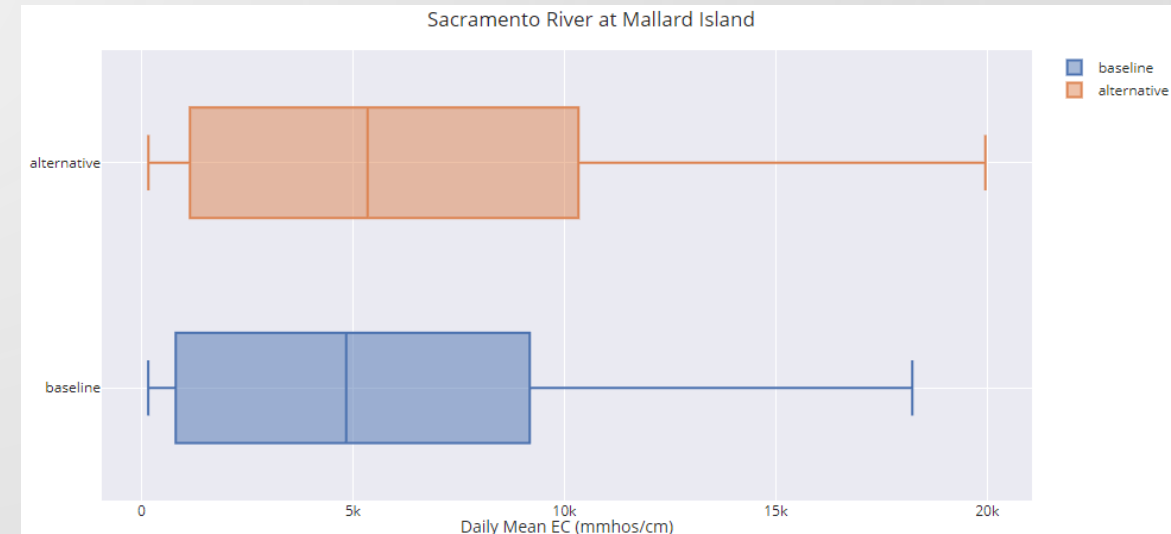
Plots Types created in input notebook



Daily mean bar chart, aggregated by month



Daily Mean Exceedance probability

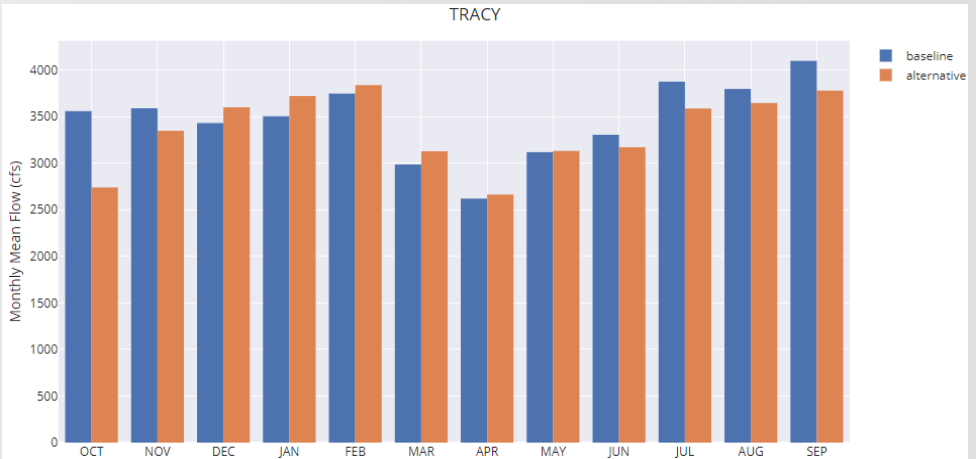
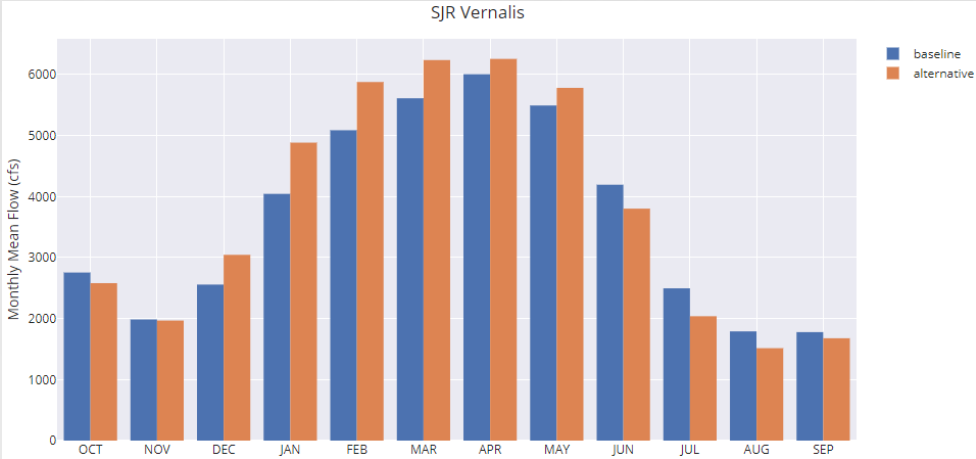
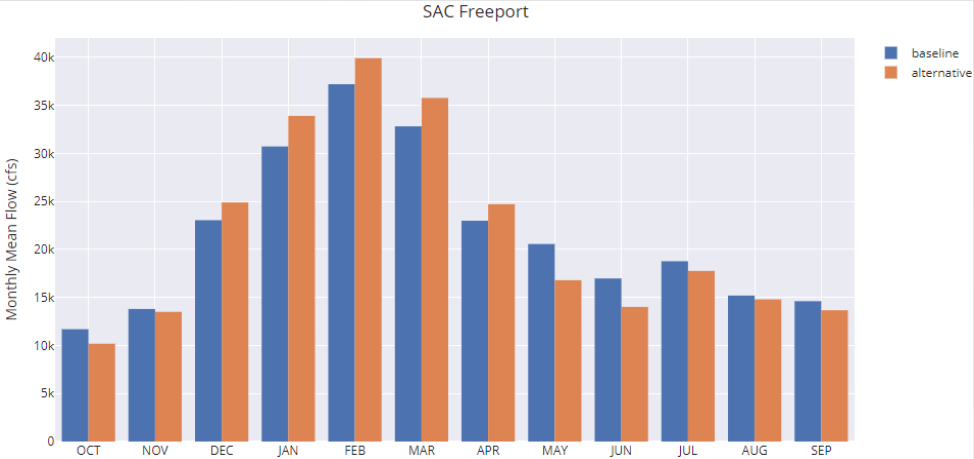


Box and whisker

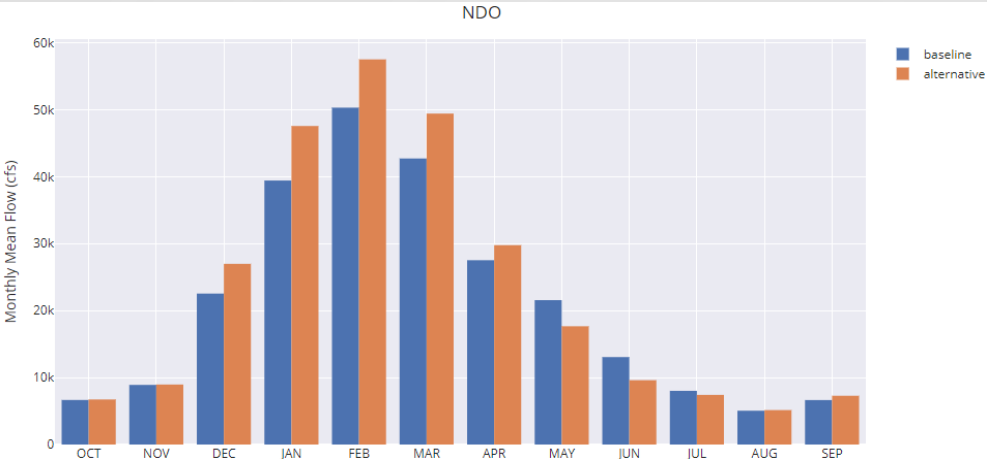
Delta Boundary Flows

Inflow

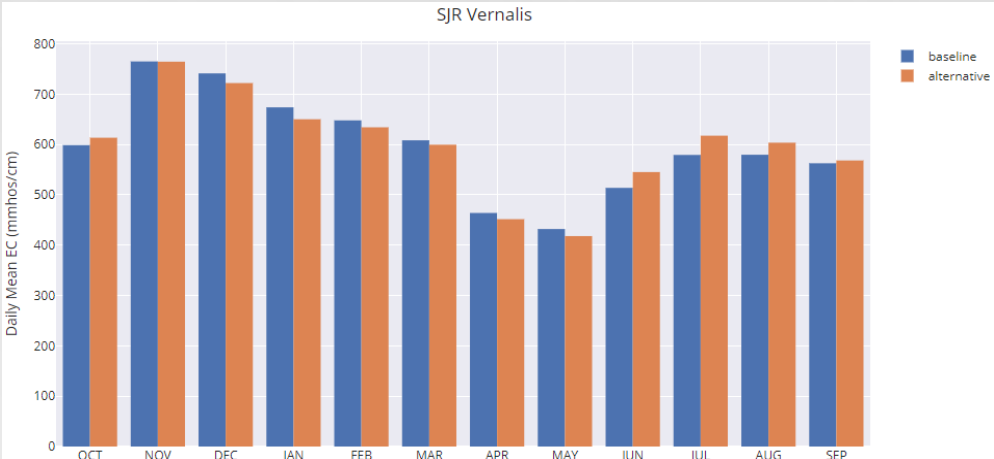
Export



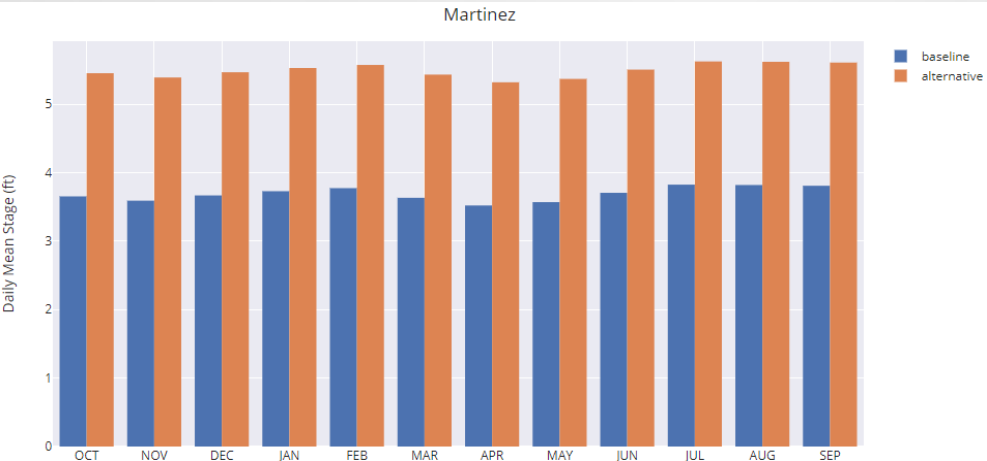
Other Delta Boundaries



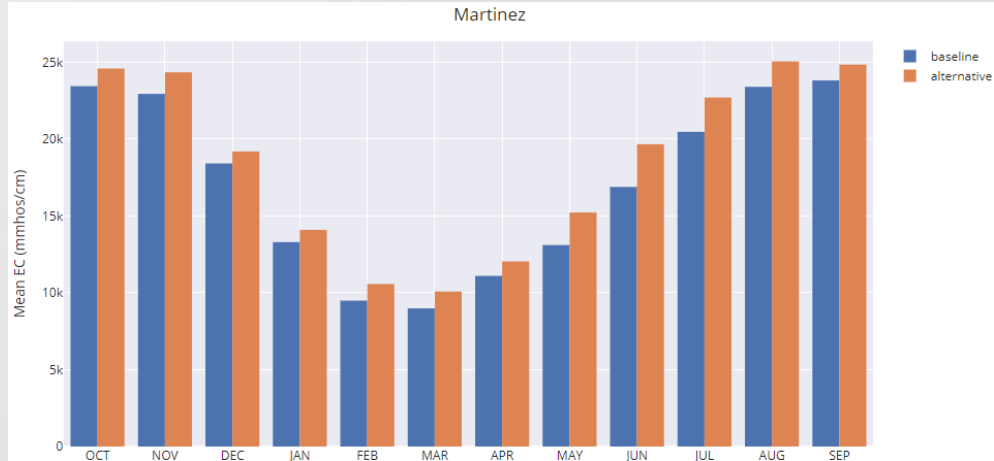
Monthly Mean Net Delta Outflow



SJR @ Vernalis EC Daily Mean EC



Martinez Mean Stage



Martinez Mean EC

DSM2 Learning Series: **Planning**

Skills Learned

- Session 1: DSM2 Planning study setup
- **Session 1 Hands-On Exercises:**
 - Pre-process CalSim output for DSM2
 - **Plotting DSM2 input with Jupyter notebooks**
 - Running DSM2 planning studies
- Session 2: Plotting DSM2 output with Jupyter notebooks



DSM2 Learning Series

Topics Not Covered

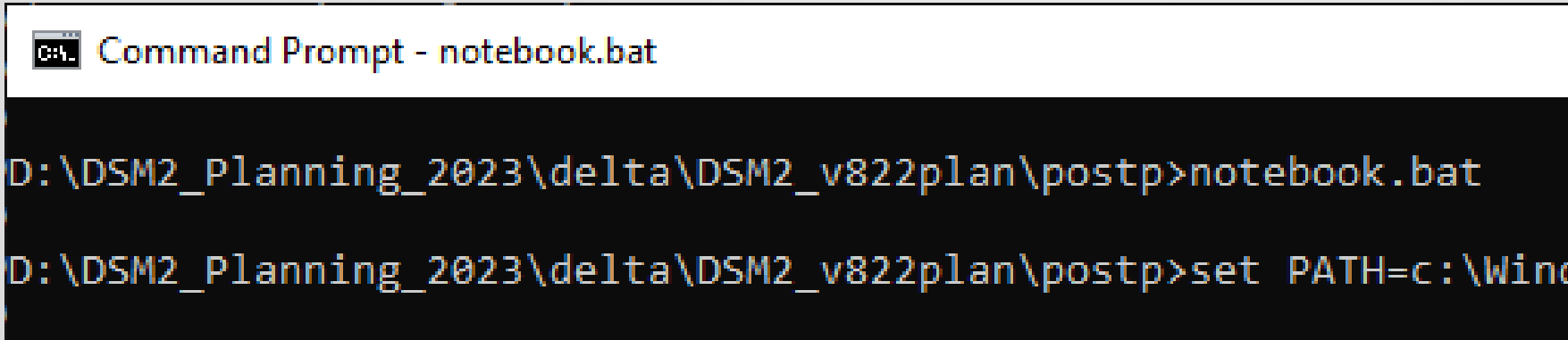
How to

- Run CalSim
- Change channel geometry
- Add/remove/change structures

Plotting input with Jupyter notebook

starting Jupyter notebook application

1. Use "notebook.bat" to start jupyter notebook

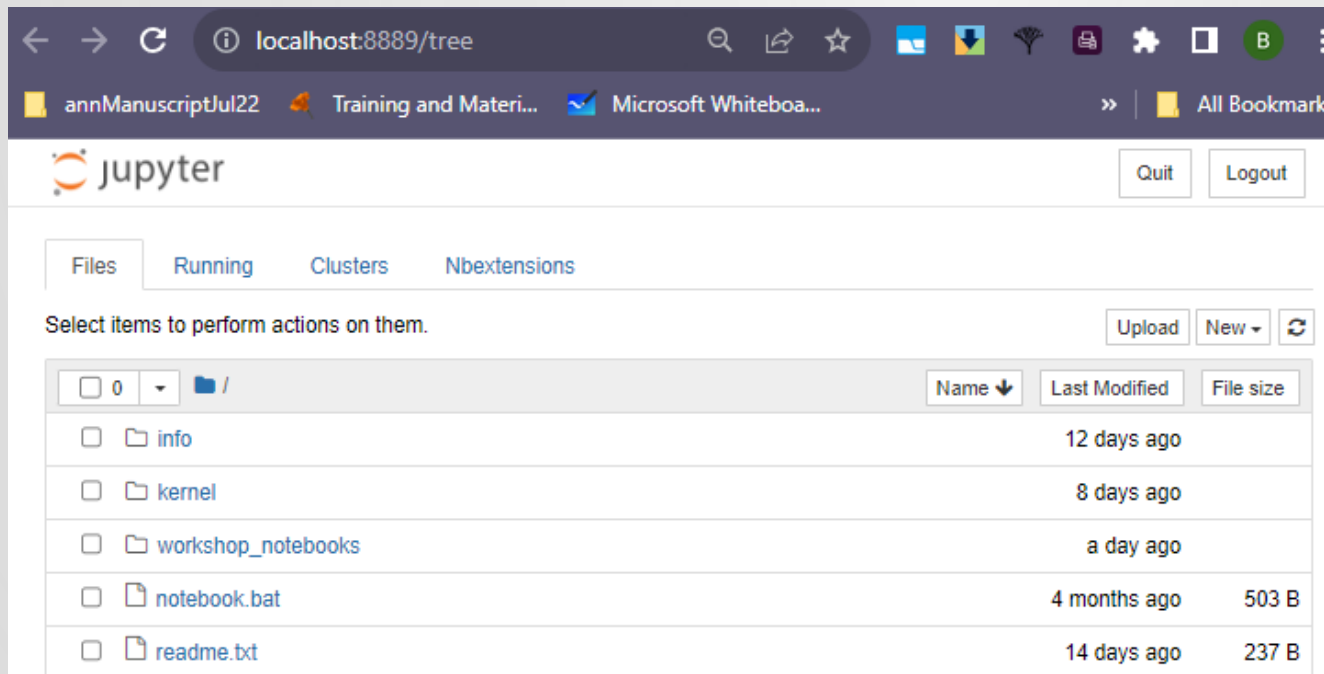


```
C:\> Command Prompt - notebook.bat

D:\DSM2_Planning_2023\delta\DSM2_v822plan\postp>notebook.bat

D:\DSM2_Planning_2023\delta\DSM2_v822plan\postp>set PATH=c:\Wind
```

2. Jupyter notebook opens in web browser



Plotting input with Jupyter notebook

Opening a notebook

1. Click "workshop_notebooks"

2. Open the file
2021_example_bnd.ipynb

 jupyter

Files

Running

Clusters

N

Select items to perform actions on them.

☐ 0   /

☐  info

☐  kernel

☐  workshop_notebooks

☐  notebook.bat

☐  readme.txt

 jupyter

Files

Running

Clusters

Nbe

Select items to perform actions on them.

☐ 0   / workshop_notebooks

 ..

☐  2021_example_bnd.ipynb

☐  2021_example_EC.ipynb

☐  2021_example_EC_stds.ipynb

☐  2021_example_stage.ipynb

Plotting input with Jupyter notebook notebook configuration

1. Make sure these lines point to your study folders/files

```
# Read in scenarios
dir_plan = '../..'/studies_planning/'
dir2021base = dir_plan+'baseline/'
dir2040alt = dir_plan+'alternative/'

scenarios = [
    {'name': 'baseline',      'fpath': dir2021base+"timeseries/2021ex"},
    {'name': 'alternative',   'fpath': dir2040alt+"timeseries/2040alt"}
]

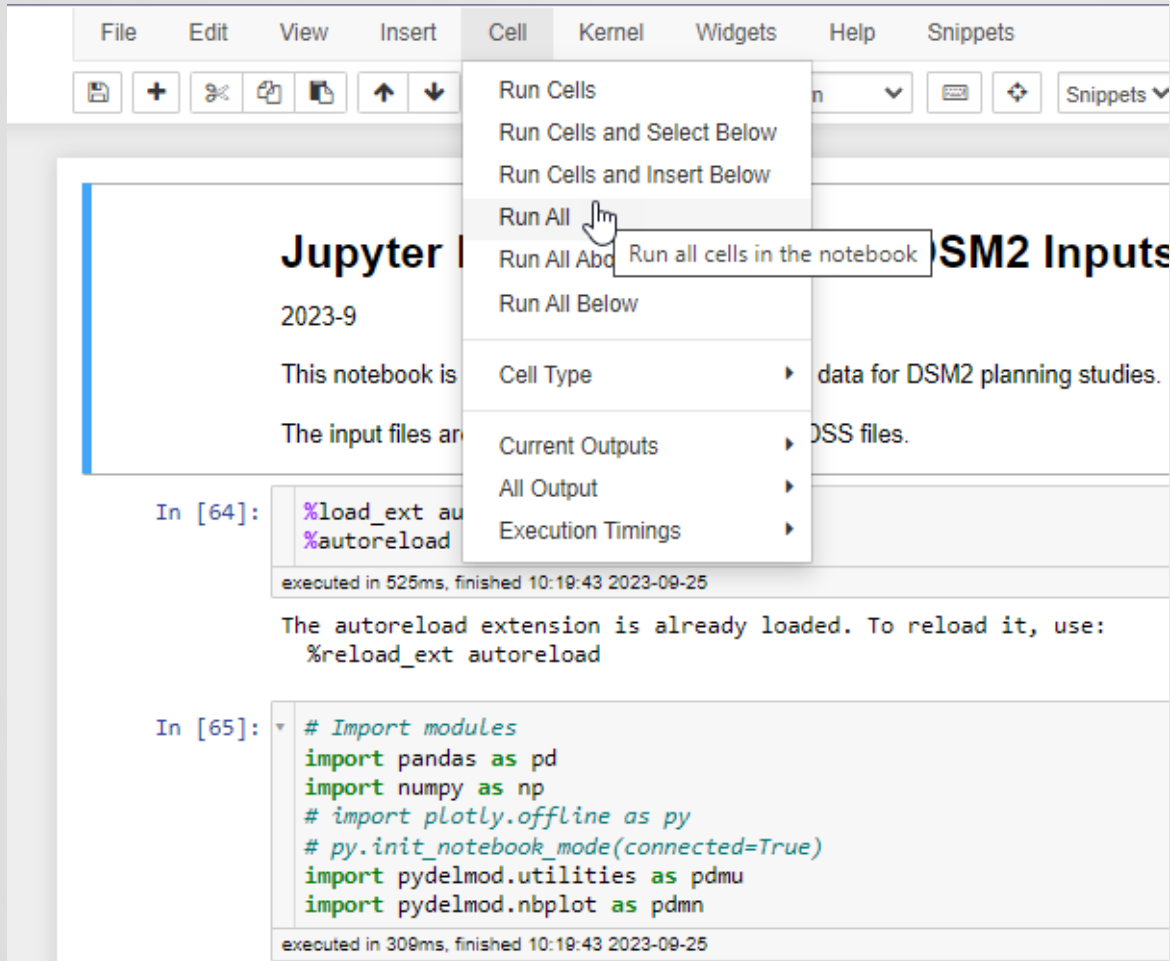
# Add a wateryear type column
wyt_c3f2020 = dir_plan+"baseline/timeseries/CALSIM/calsim_2021ex.DSS"
df_wyt2020 = pdmu.read_calsim3_wateryear_types(wyt_c3f2020)

# period93 = ['1922-10-1', '2015-9-30']
period93 = ['2010-10-1', '2014-9-30']
```

2. Modify for 4 year time period

Plotting input with Jupyter notebook

Run all cells



Plotting input with Jupyter notebook

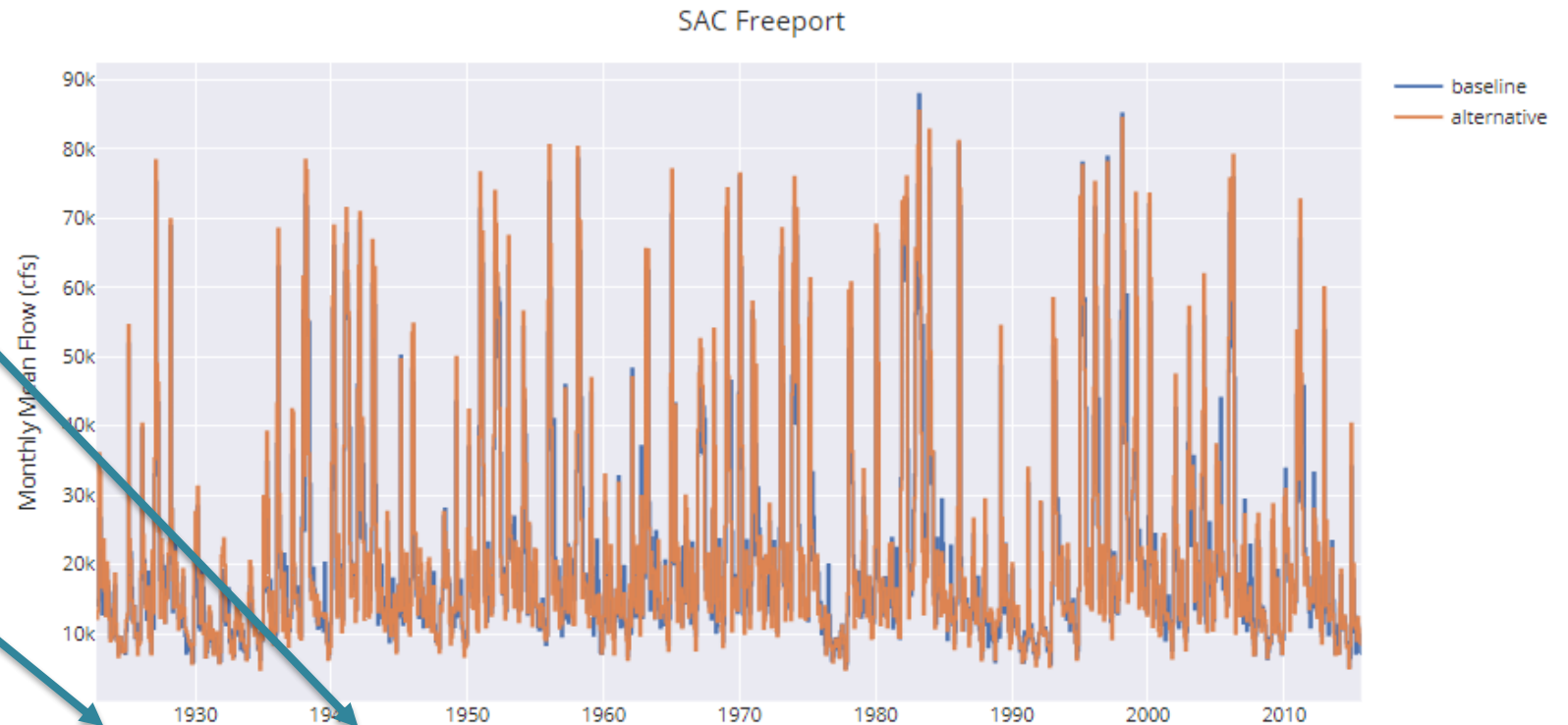
Changing variable type or station on Jupyter notebook plot

Select station

Select variable

```
In [69]: options = {'yaxis_name': 'Monthly Mean Flow (cfs)', 'title': 'Flow Monthly Mean Timelines'}  
pdmn.plot_step_w_variable_station_filters(df_flow, df_stations, options)
```

executed in 666ms, finished 10:20:10 2023-09-25



Variable FLOW

Station SAC Freeport

Show Data

Save data

Export Plots

Plot prefix: plot

DSM2 Learning Series: **Planning**

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 - **Running DSM2 planning studies**
- Session 2: Plotting DSM2 output with Jupyter notebooks



DSM2 Learning Series

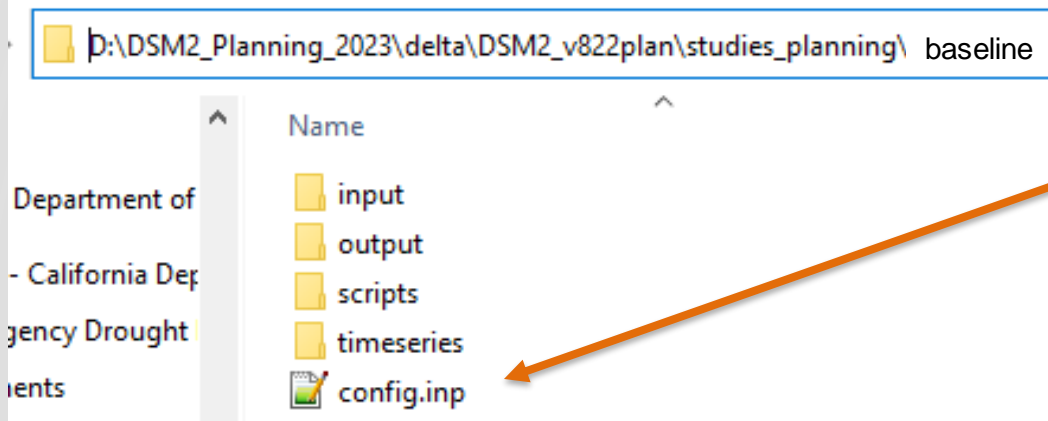
Topics Not Covered

How to

- Run CalSim
- Change channel geometry
- Add/remove/change structures

Setting up and running DSM2

baseline study: change starting and ending dates



1. open the config.inp file

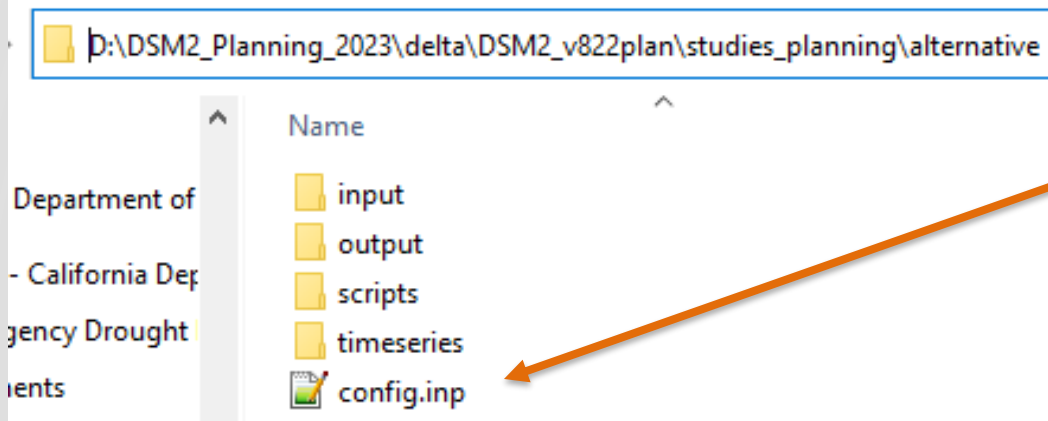
2. Comment/uncomment
START_DATE, QUAL_START_DATE,
END_DATE to create a four year run, 2010-2014

```
changelog.md x postpro_cal_config.yml x output_ecfp_rki (1).inp x config.inp x
19  MODSTAGE_VERSION      PLAN_ ${DSM2MODIFIER}
20  MODEC_VERSION         PLAN_ ${DSM2MODIFIER}
21  SJR_PROCESS           MULTI_STEP           #SINGLE_STEP or MULTI_STEP
22
23  START_DATE             01FEB1921           #warm-up before 192110
24  QUAL_START_DATE        02FEB1921           #warm-up before 192110
25  #START_DATE            01OCT2010
26  #QUAL_START_DATE       02OCT2010
27  # START_DATE           01DEC1921           #01OCT1974 # 01DEC2014 #
28  # QUAL_START_DATE      02DEC1921           #02OCT1974 # 02DEC2014 #
29  PTM_START_DATE         ${QUAL_START_DATE}
30  END_DATE               01OCT2015           #01OCT1991 #
31  #END_DATE              01OCT2014
32  START_TIME             0000
33  END_TIME               0000
```

Note: The pre-processor needed to be run with a longer time period; that is why we are changing the dates now.

Setting up and running DSM2

alternative study: change starting and ending dates



1. open the config.inp file

2. Comment/uncomment
START_DATE, QUAL_START_DATE,
END_DATE to create a four year run, 2010-2014

```
19  MODSTAGE_VERSION      PLAN_ ${DSM2MODIFIER}
20  MODEC_VERSION        PLAN_ ${DSM2MODIFIER}
21  SJR_PROCESS           MULTI_STEP           #SINGLE_STEP or MULTI_STEP
22
23  START_DATE             01FEB1921           #warm-up before 192110
24  QUAL_START_DATE        02FEB1921           #warm-up before 192110
25  #START_DATE            01OCT2010
26  #QUAL_START_DATE        02OCT2010
27  # START_DATE           01DEC1921           #01OCT1974 # 01DEC2014 #
28  # QUAL_START_DATE      02DEC1921           #02OCT1974 # 02DEC2014 #
29  PTM_START_DATE         ${QUAL_START_DATE}
30  END_DATE               01OCT2015           #01OCT1991 #
31  #END_DATE              01OCT2014
32  START_TIME             0000
33  END_TIME               0000
```

Note: The pre-processor needed to be run with a longer time period; that is why we are changing the dates now.

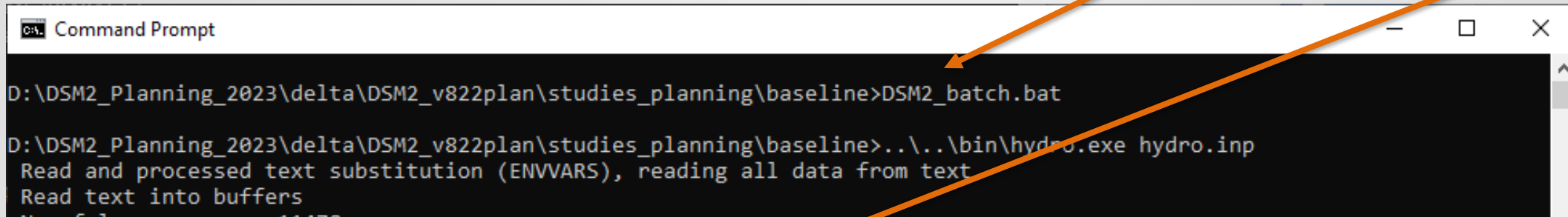
Setting up and running DSM2

baseline study: running DSM2

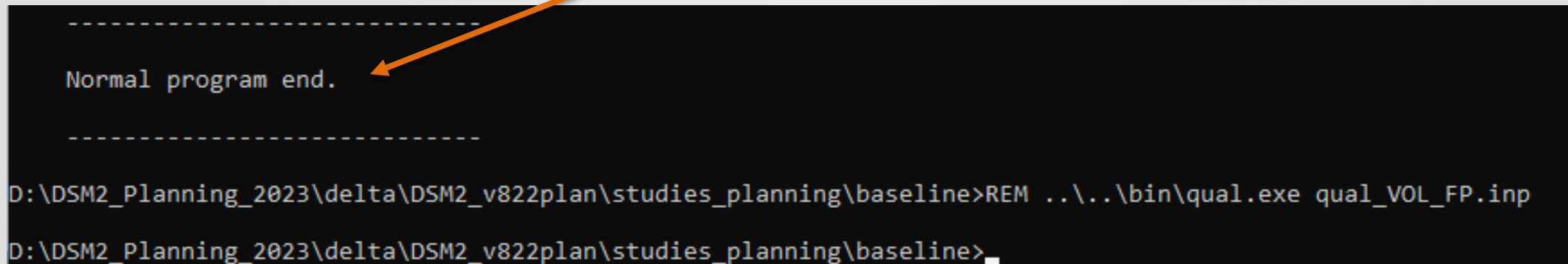
- For each scenario,
 - Run the studies
 - dsm2_batch.bat

Starting the run

Run complete



```
Command Prompt
D:\DSM2_Planning_2023\delta\DSM2_v822plan\studies_planning\baseline>DSM2_batch.bat
D:\DSM2_Planning_2023\delta\DSM2_v822plan\studies_planning\baseline>..\..\bin\hydro.exe hydro.inp
Read and processed text substitution (ENVVARS), reading all data from text
Read text into buffers
```



```
-----
Normal program end.
-----
D:\DSM2_Planning_2023\delta\DSM2_v822plan\studies_planning\baseline>REM ..\..\bin\qual.exe qual_VOL_FP.inp
D:\DSM2_Planning_2023\delta\DSM2_v822plan\studies_planning\baseline>_
```

Setting up and running DSM2

alternative study: running DSM2

- For each scenario,
 - Run the studies
 - dsm2_batch.bat

Starting the run

Run complete

```
Select Command Prompt - DSM2_batch.bat

D:\DSM2_Planning_2023\delta\DSM2_v822plan\studies_planning\alternative>DSM2_batch.bat

D:\DSM2_Planning_2023\delta\DSM2_v822plan\studies_planning\alternative>..\..\bin\hydro.exe hydro.inp
Read and processed text substitution (ENVVARS), reading all data from text
Read text into buffers
No of layers=      11846
Prioritized buffer

NUMBER OF RECORDS:      3888
File Size:  48431.0  Kbytes
Percent Inactive:      0.0

-----

Normal program end.

-----

D:\DSM2_Planning_2023\delta\DSM2_v822plan\studies_planning\alternative>
```

Running DSM2


- For each scenario,
 - Run the studies
 - dsm2_batch.bat

Use chat for questions

10:00
10-minute
break

Starting the run


run complete



The screenshot shows a Windows Command Prompt window with the title "Command Prompt". The command prompt is at the directory `D:\DSM2_Planning_2023\delta\DSM2_v822plan\studies_planning\baseline`. The first command executed is `DSM2_batch.bat`. The second command is `..\..\bin\hydro.exe hydro.inp`, which produces the following output:

```
D:\DSM2_Planning_2023\delta\DSM2_v822plan\studies_planning\baseline>DSM2_batch.bat

D:\DSM2_Planning_2023\delta\DSM2_v822plan\studies_planning\baseline>..\..\bin\hydro.exe hydro.inp
Read and processed text substitution (ENVVARS), reading all data from text
Read text into buffers
Use of ...
```

```
-----  
Normal program end.   
-----  
  
D:\DSM2_Planning_2023\delta\DSM2_v822plan\studies_planning\baseline>REM ..\..\bin\qual.exe qual_VOL_FP.inp  
  
D:\DSM2_Planning_2023\delta\DSM2_v822plan\studies_planning\baseline>
```


Dates in config.inp files

- Pre-processor should be run for 100 years
- DSM2 simulations for this class should be run for 4 years
- Input notebook can be run for 100 years
- Output notebooks can only be run for 4 years

Questions?

Please enter questions into the chat



Brad Tom (Bradley.Tom@water.ca.gov)

Extra slides

Running the DSM2 Pre-processor

Preprocessor errors: can't create DSS catalog files

"Cannot Create New Catalog..."

"Catalog is empty"

```
at vista.set.GroupProxy.getNumberOfDataReferences(GroupProxy.java:77)
at vista.set.Group.find(Group.java:325)
at sun.reflect.NativeMethodAccessorImpl.invoke0(Native Method)
at sun.reflect.NativeMethodAccessorImpl.invoke(NativeMethodAccessorImpl.java:62)
at sun.reflect.DelegatingMethodAccessorImpl.invoke(DelegatingMethodAccessorImpl.java:43)
at java.lang.reflect.Method.invoke(Method.java:498)
```

```
java.lang.IllegalArgumentException: java.lang.IllegalArgumentException: Catalog is empty ?
```

```
read DSM2 15-MIN output file: timeseries/2021ex.dss
postprocess pathnames:
```

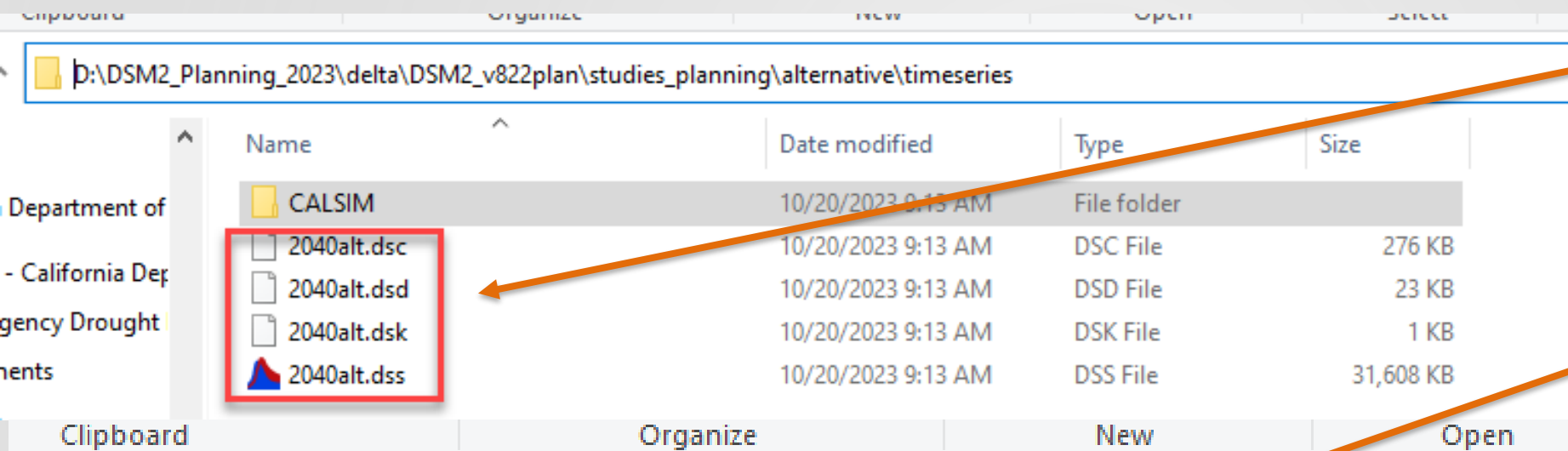
```
**** ERROR - ZCAT: Catalog file Currently in use;
Cannot Create New Catalog at this Time.
```

```
/DWR/RSAC054/STAGE/01DEC1920 - 01OCT2015/15MIN/HARMONIC_NGVD_20230413/
/DWR/RSAC054/STAGE/01JAN1921 - 01SEP2015/15MIN/PLAN_DETREND_NAVD_20230413/
/FILL+CHAN/RSAC054/EC/01JAN1921 - 01SEP2015/15MIN/PLAN_2021EX/
all process done
```

```
D:\DSM2 Planning 2023\delta\DSM2 v822plan\studies planning\baseline>
```

Running the DSM2 Pre-processor

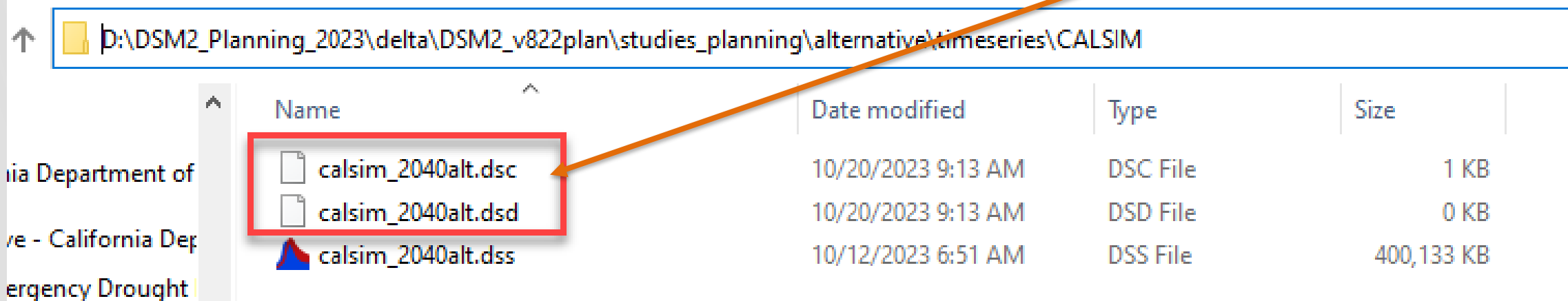
Fixing preprocessor errors



Name	Date modified	Type	Size
CALSIM	10/20/2023 9:13 AM	File folder	
2040alt.dsc	10/20/2023 9:13 AM	DSC File	276 KB
2040alt.dsd	10/20/2023 9:13 AM	DSD File	23 KB
2040alt.dsk	10/20/2023 9:13 AM	DSK File	1 KB
2040alt.dss	10/20/2023 9:13 AM	DSS File	31,608 KB

Delete all preprocessor output files

Delete bad catalog files

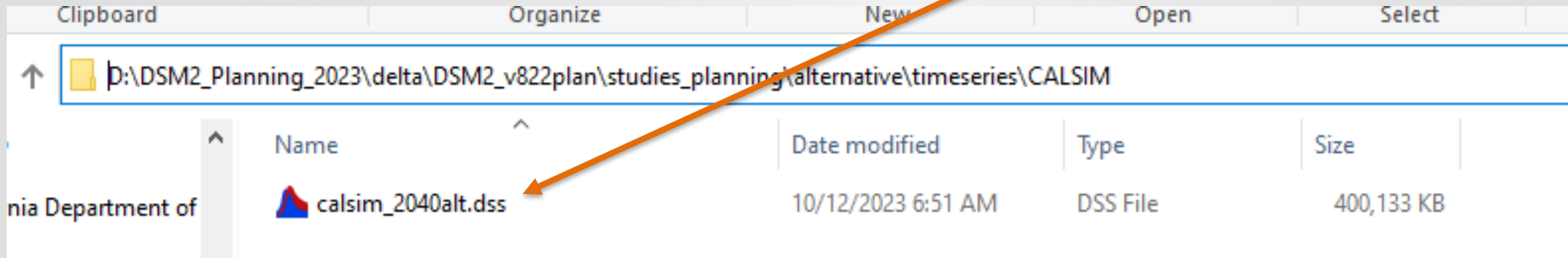


Name	Date modified	Type	Size
calsim_2040alt.dsc	10/20/2023 9:13 AM	DSC File	1 KB
calsim_2040alt.dsd	10/20/2023 9:13 AM	DSD File	0 KB
calsim_2040alt.dss	10/12/2023 6:51 AM	DSS File	400,133 KB

Setting up and running DSM2

Fixing preprocessor errors

1. Double click CalSim output file to open in HEC-DSSVue. This will create the catalog file.



2. Re-run the preprocessor

Box & Whisker Plot

