CALIFORNIA DEPARTMENT OF WATER RESOURCES

DSM2 Learning Series: Planning Studies
Session 1: DSM2 Input Hands-on Exercises

October 27, 2023

Brad Tom

Modeling Support Office, Delta Modeling Section

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

DSM2 Learning Series

Skills Learned

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

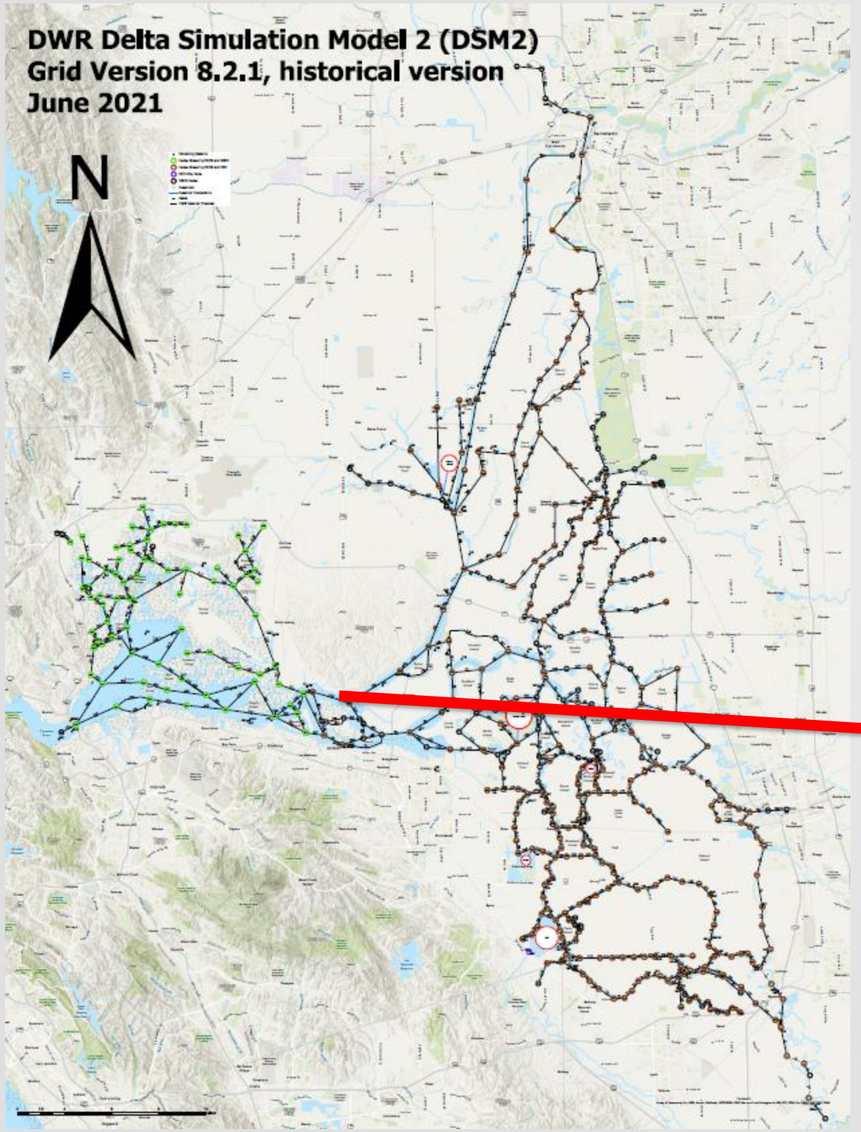
Topics Not Covered

How to

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

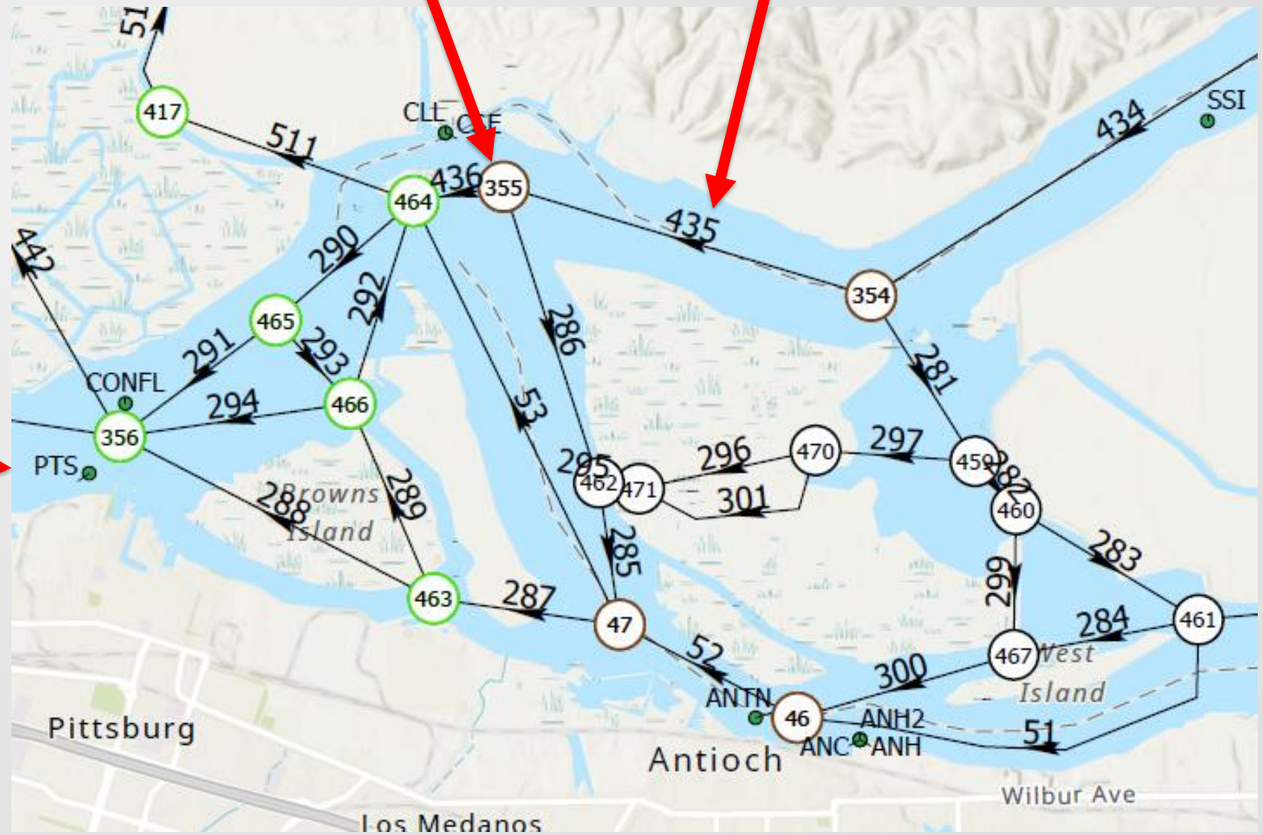
DSM2 grid map

https://data.cnra.ca.gov/dataset/dsm2-georeferenced-model-grid/



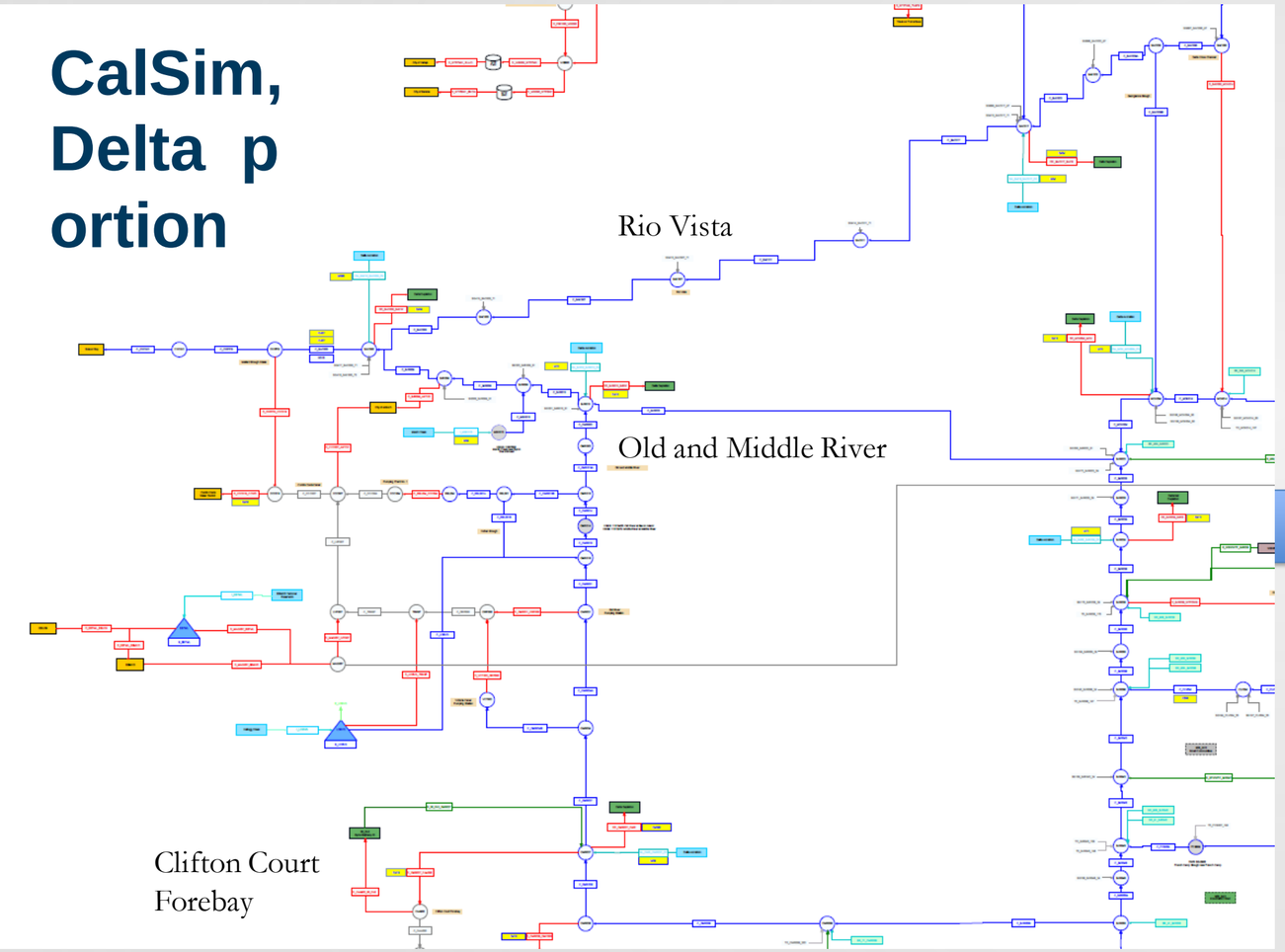
node

channel

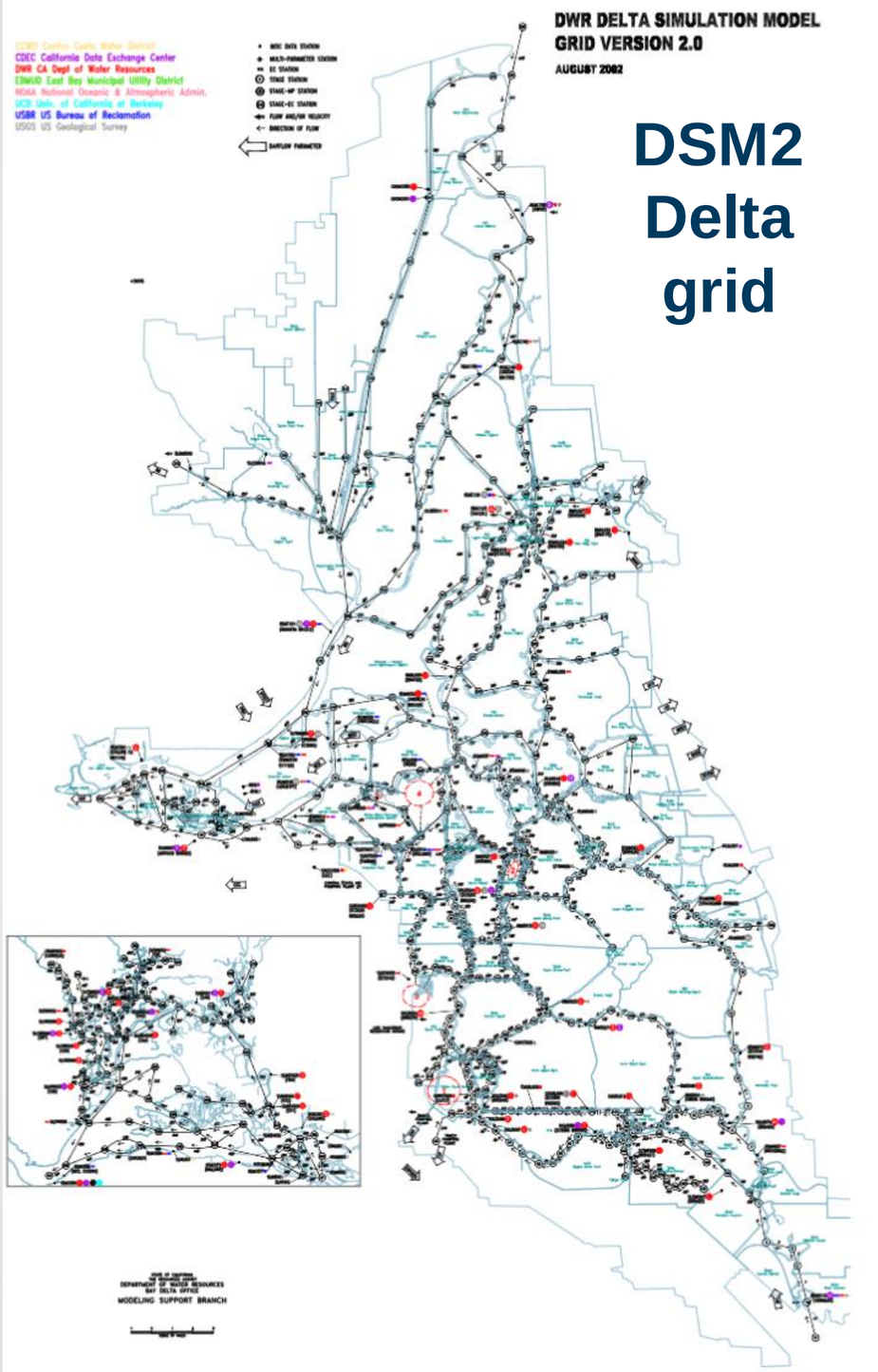


CalSim -> DSM2

CalSim, Delta portion



DSM2 Delta grid



Folders* in the CalSim/DSM2 Planning setup

Folder	Description
calsim_output	CalSim output
delta	DSM2 planning studies

*Red means we will not change anything in the folder

*Green means we will change something in the folder

Folders* in the CalSim/DSM2 Planning setup
The *Delta* folder

Folder	Description
calsim_output	CalSim output
Delta/DSM2_v822plan/	DSM2 planning studies
bin/	DSM2 executables
common_input/	Shared DSM2 inputs
postp/	Jupyter notebooks for plotting input/output
pydelmod_plan/	conda environment for jupyter notebooks
scripts/	Post-processing scripts
studies_planning	DSM2 example planning studies
timeseries_plan/	DSS inputs shared by all studies
vista/	Vscript/Vista application

*Red means we will not change anything in the folder

*Green means we will change something in the folder

Folders* in the example baseline study

Folder	Description
calsim_output	CalSim output
Delta/DSM2_v822plan/	DSM2 planning studies
studies_planning/baseline/	Existing conditions study
input	Study specific fixed input
output	Study output
scripts	For creating DSM2 input from CalSim output
timeseries	Study specific time series output

*Red means we will not change anything in the folder

*Green means we will change something in the folder

Planning Studies

Baseline vs Alternative

Baseline Study

Existing conditions

Alternative Study

Climate change hydrology (CalSim)

Sea level rise 55 cm (1.8 feet)

DSM2 Learning Series: Planning

DSM2 Learning Series

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

Topics Not Covered

How to

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

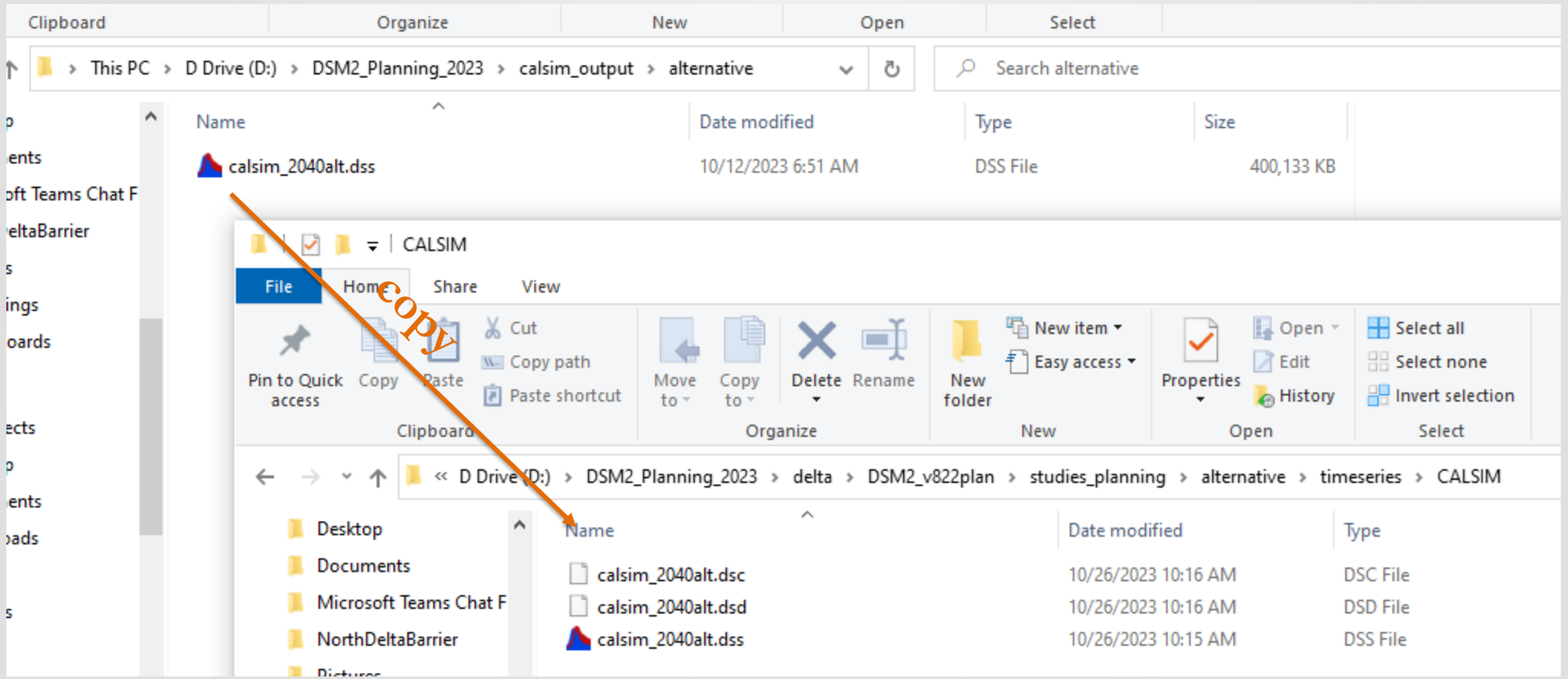
Setting up and running DSM2, plotting input

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

Running the DSM2 Pre-processor

alternative scenario: copy CalSim output to DSM2 folder

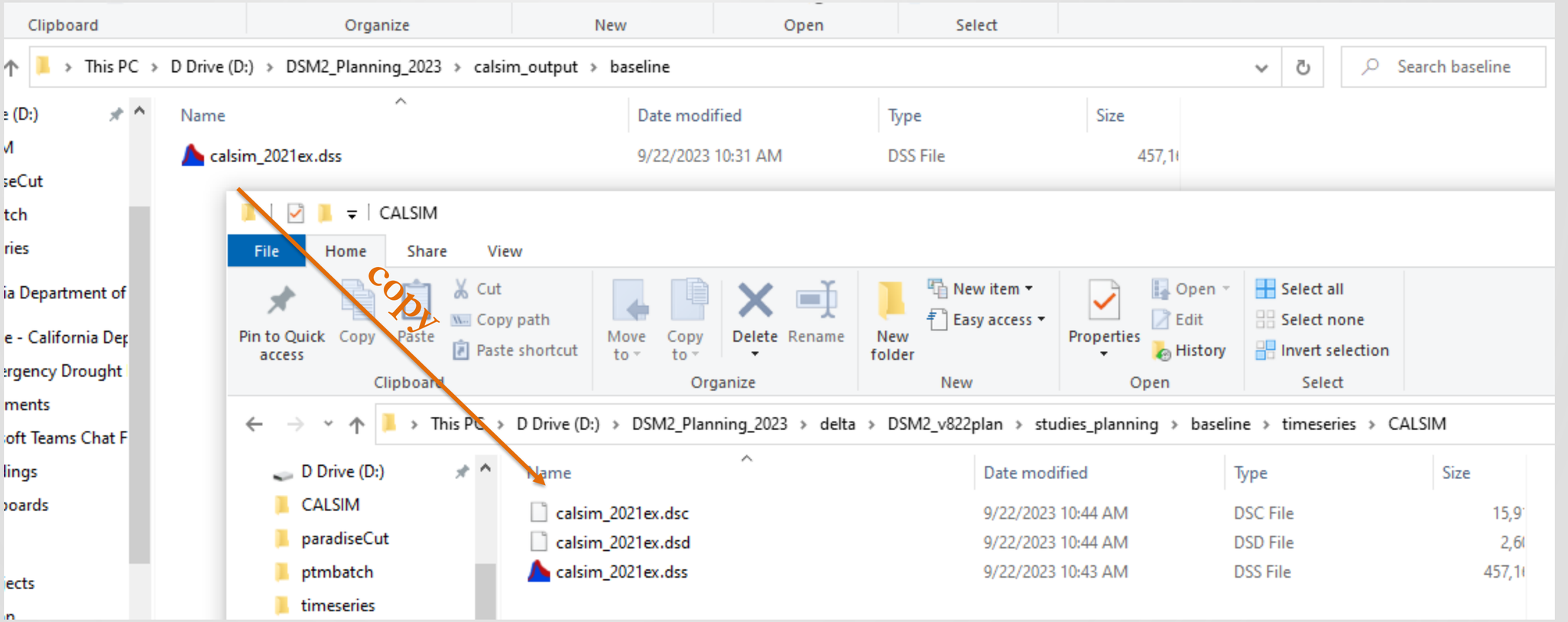
- For the alternative scenario,
  - Copy the CalSim output file for the scenario into the DSM2 planning study folder



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 the baseline scenario (only pre-process one run at a time),
  - Run the pre-processor create DSM2 DSS input

Starting the script

Command Prompt Prepro.bat config.inp

```
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"
```

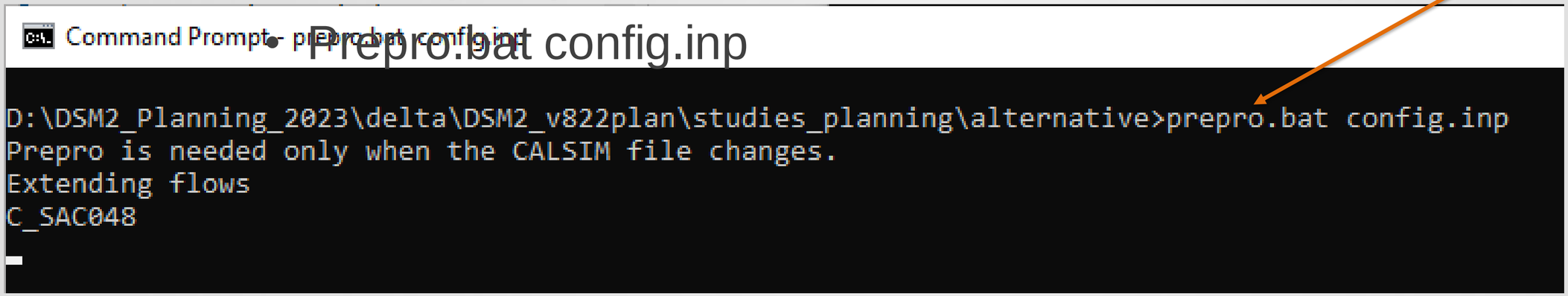
```
   or: python postpro.py *.dss {pathname} {out}.dss
read DSM2 15-MIN output file: timeseries/2021ex.dss
postprocess pathnames:
/DWR/RSAC054/STAGE/01DEC1920 - 01OCT2015/15MIN/HARMONIC_NGVD_20230413/
/DWR/RSAC054/STAGE/01JAN1921 - 01SEP2015/15MIN/PLAN_DETREND_NAVD_20230413/
/FILL+CHAN/RSAC054/EC/01JAN1921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

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

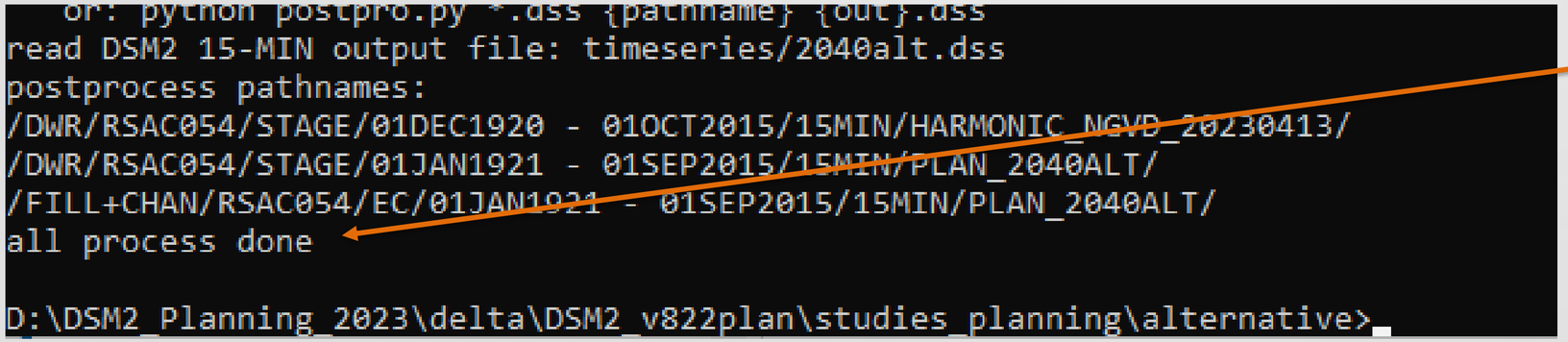
done

Running the DSM2 Pre-processor alternative study

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

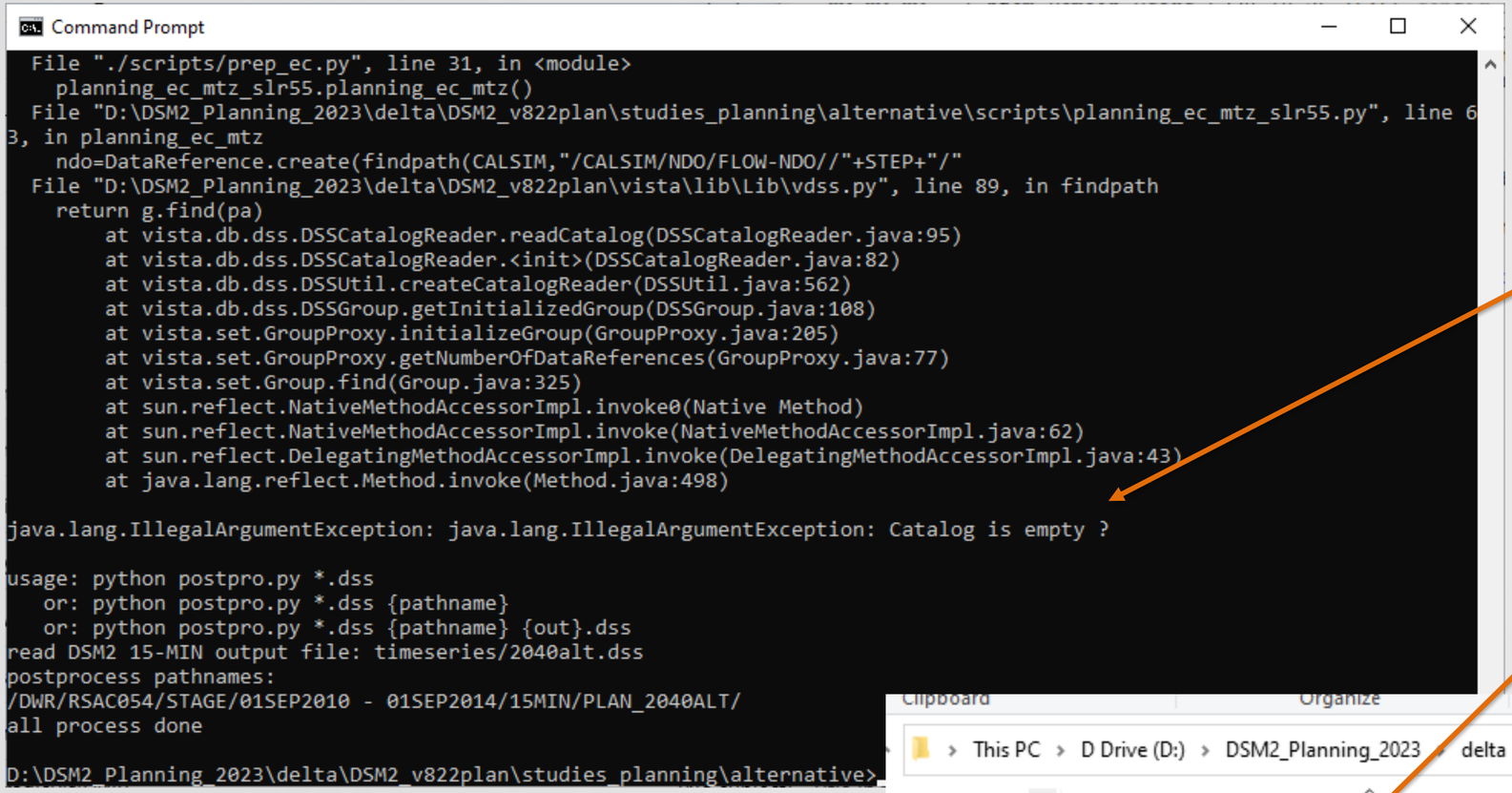


Starting the script



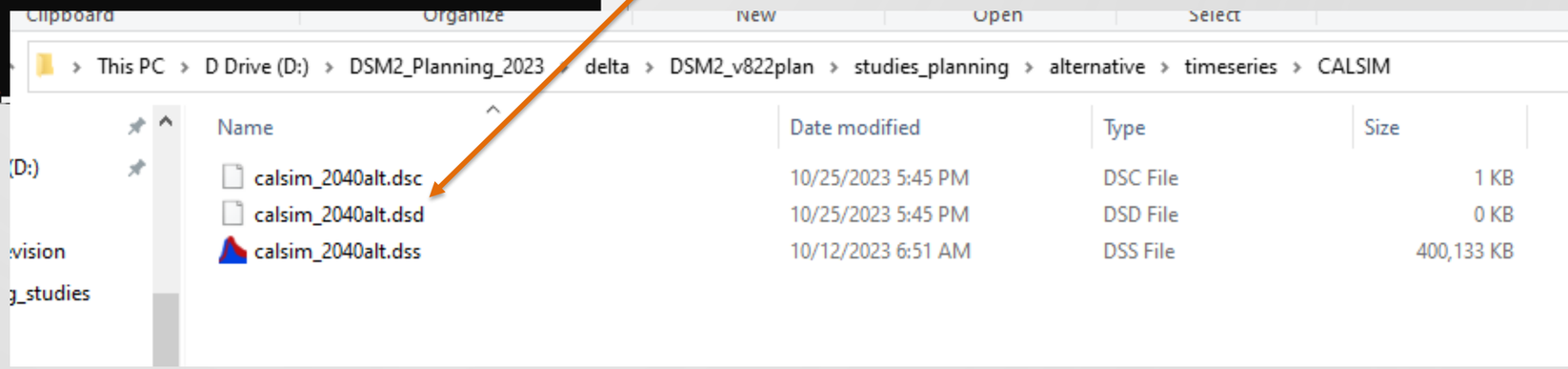
done

Running the DSM2 Pre-processor
Empty catalog error



"Catalog is empty ?" error

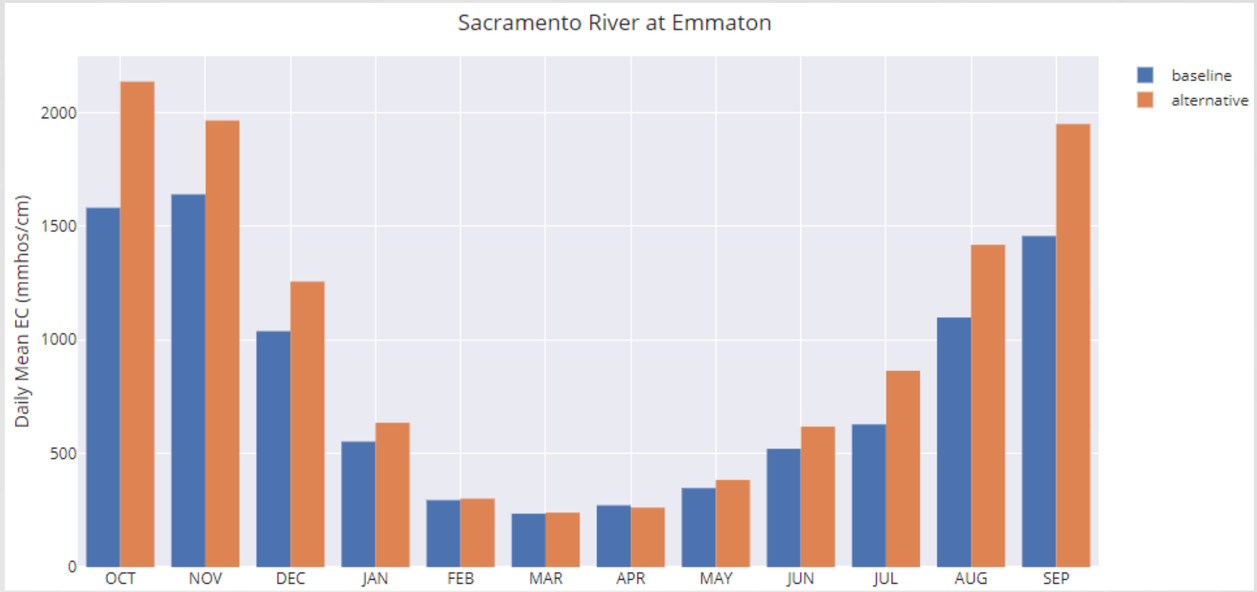
Delete the dsc and dsd files



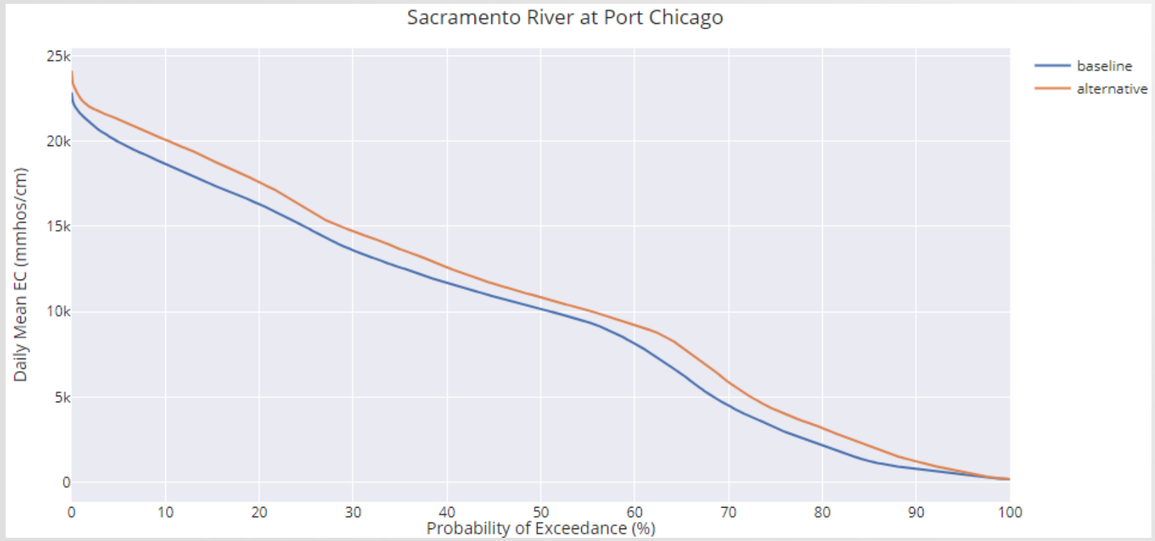
Jupyter notebook for plotting model input

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

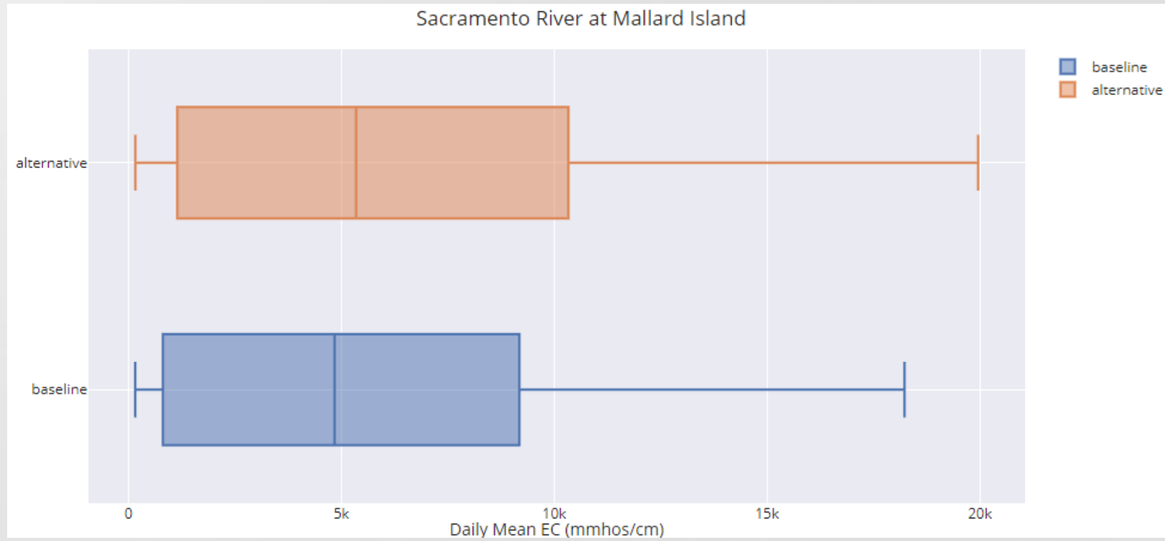
Plots Types created in input notebook



Daily mean bar chart, aggregated by month



Daily Mean Exceedance probability

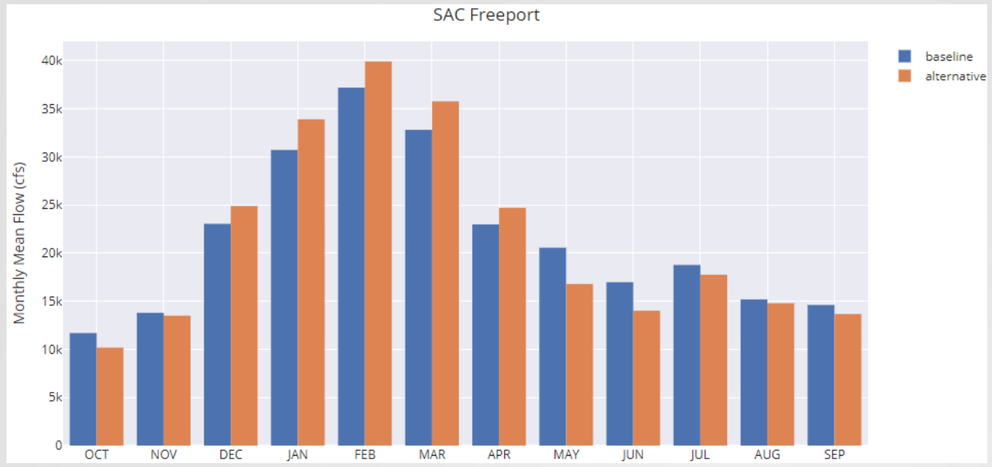


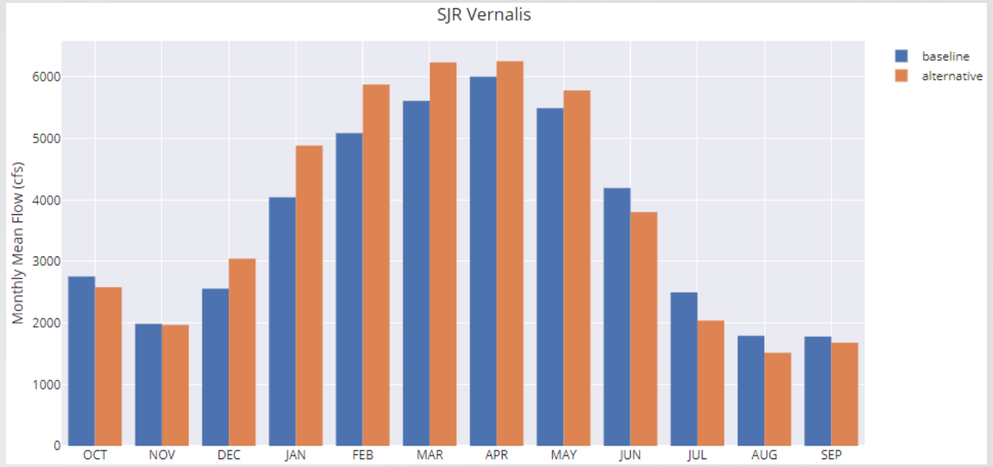
Box and whisker

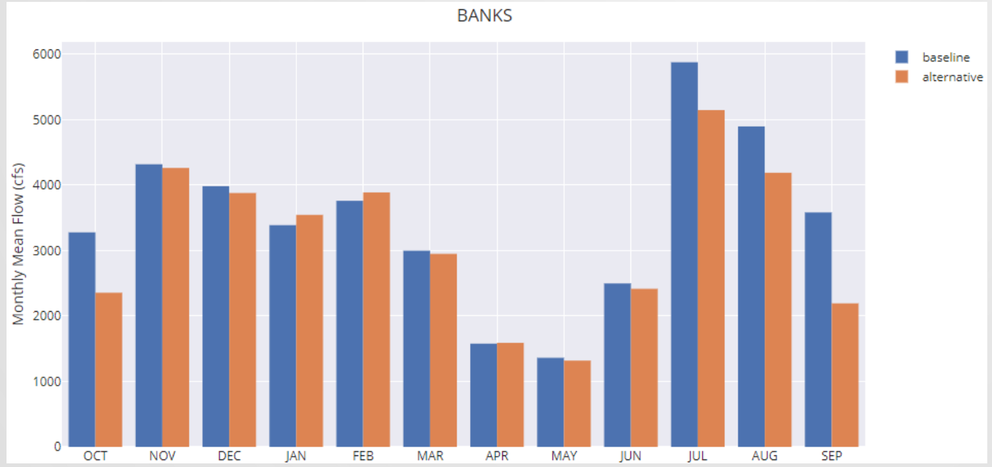
Delta Boundary Flows

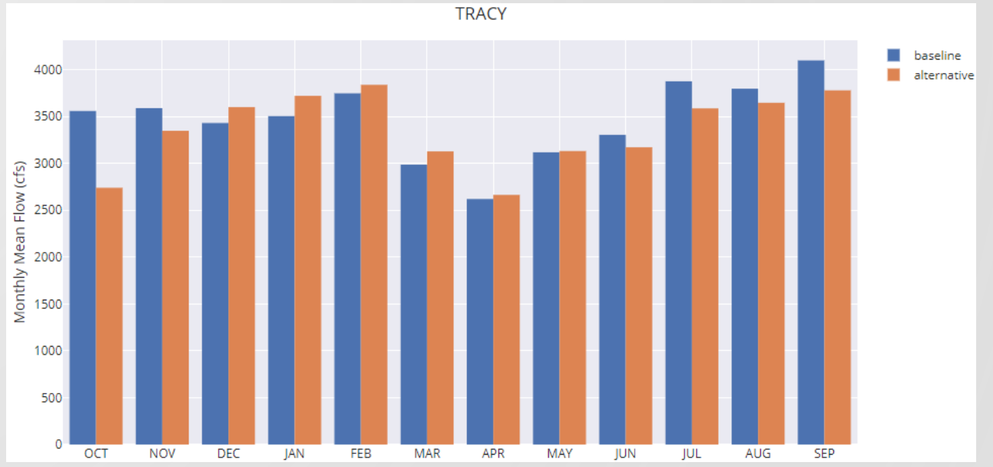
Inflow

Export

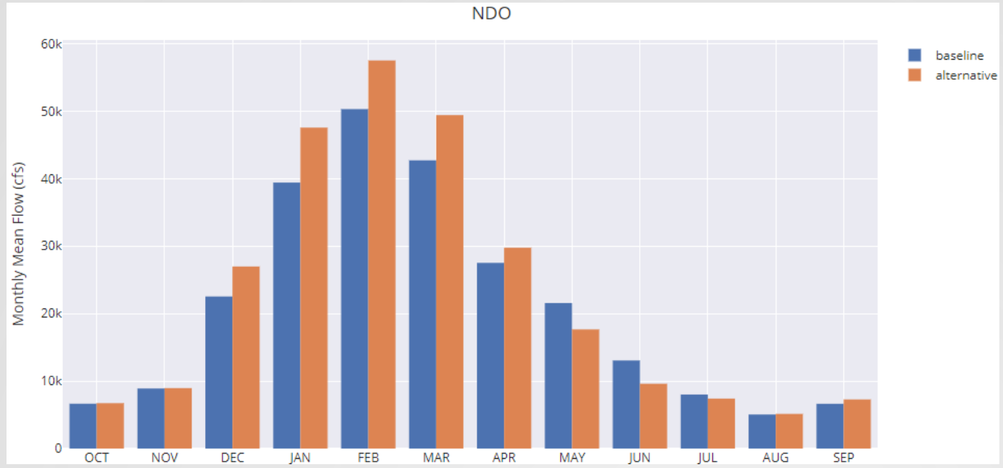




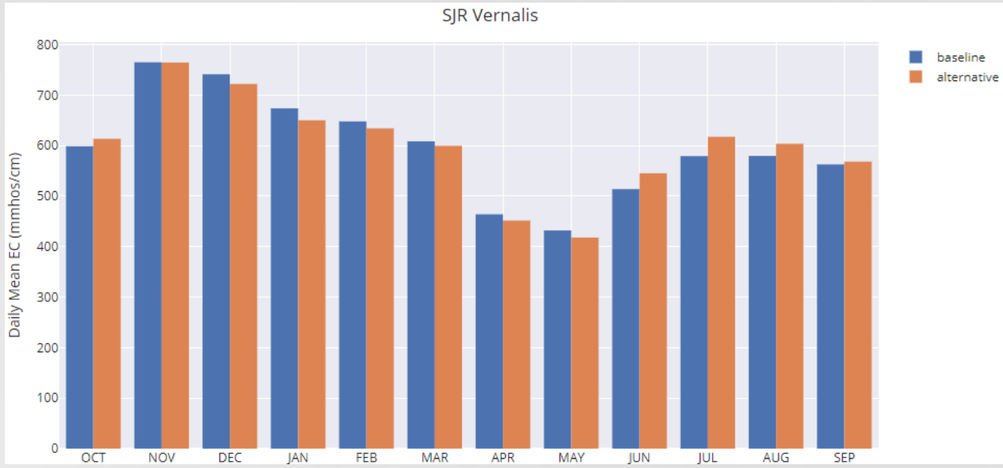




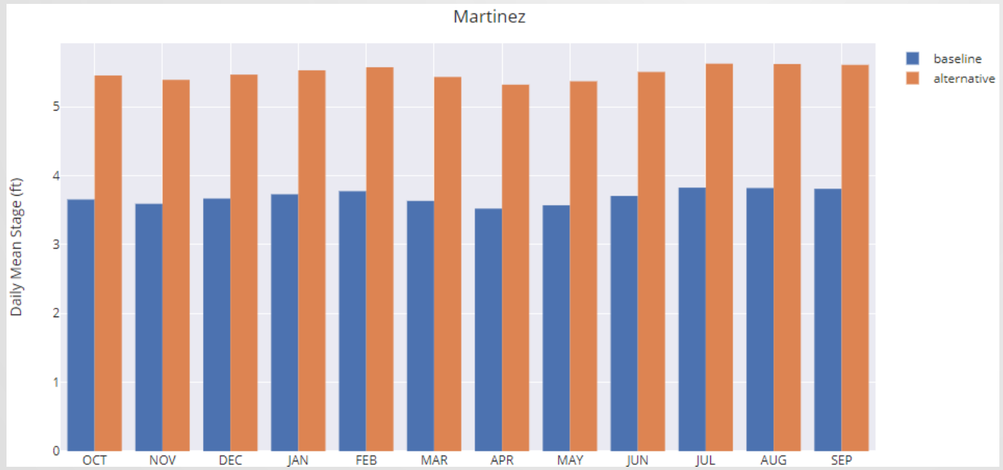
Other Delta Boundaries



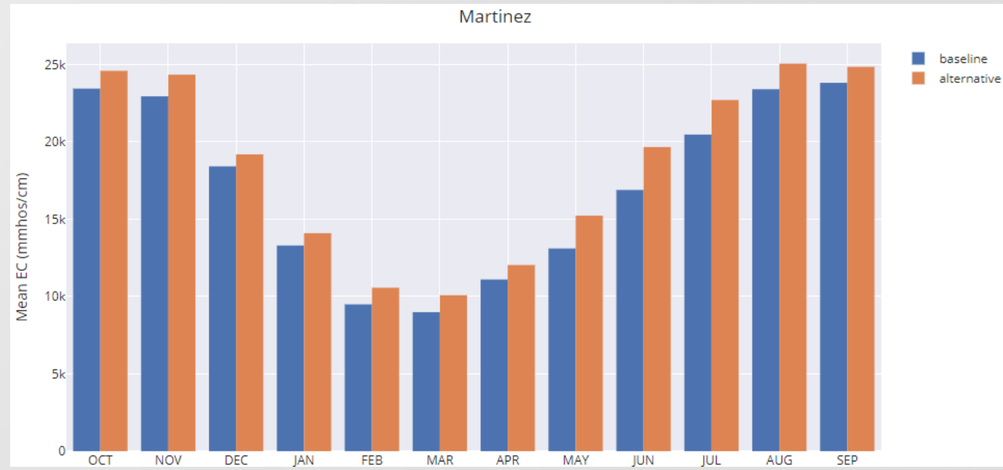
Monthly Mean Net Delta Outflow



SJR @ Vernalis EC Daily Mean EC



Martinez Mean Stage



Martinez Mean EC

DSM2 Learning Series: Planning

DSM2 Learning Series

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Topics Not Covered

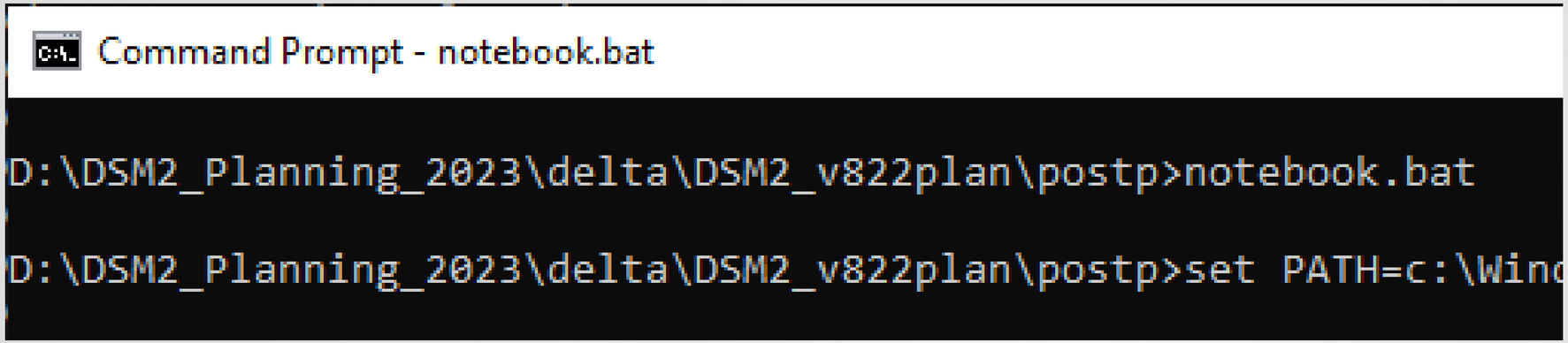
How to

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

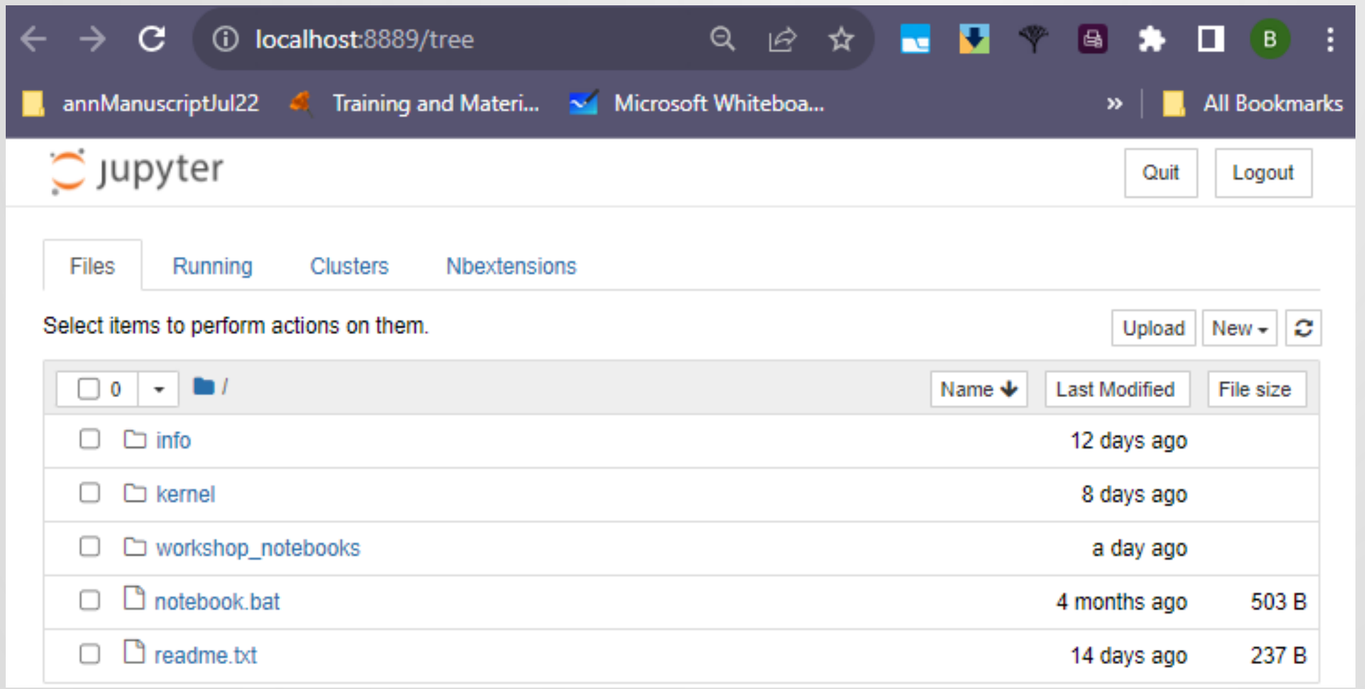
Plotting input with Jupyter notebook

starting Jupyter notebook application

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



2. Jupyter notebook opens in web browser

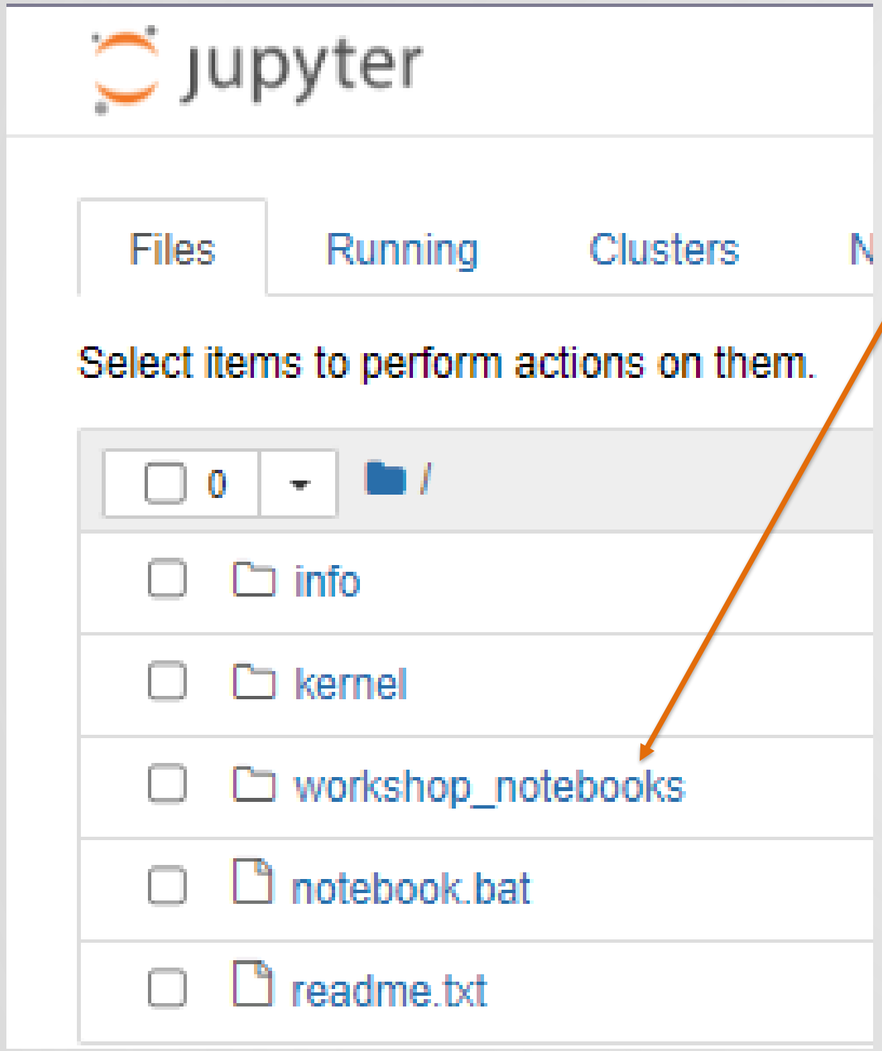


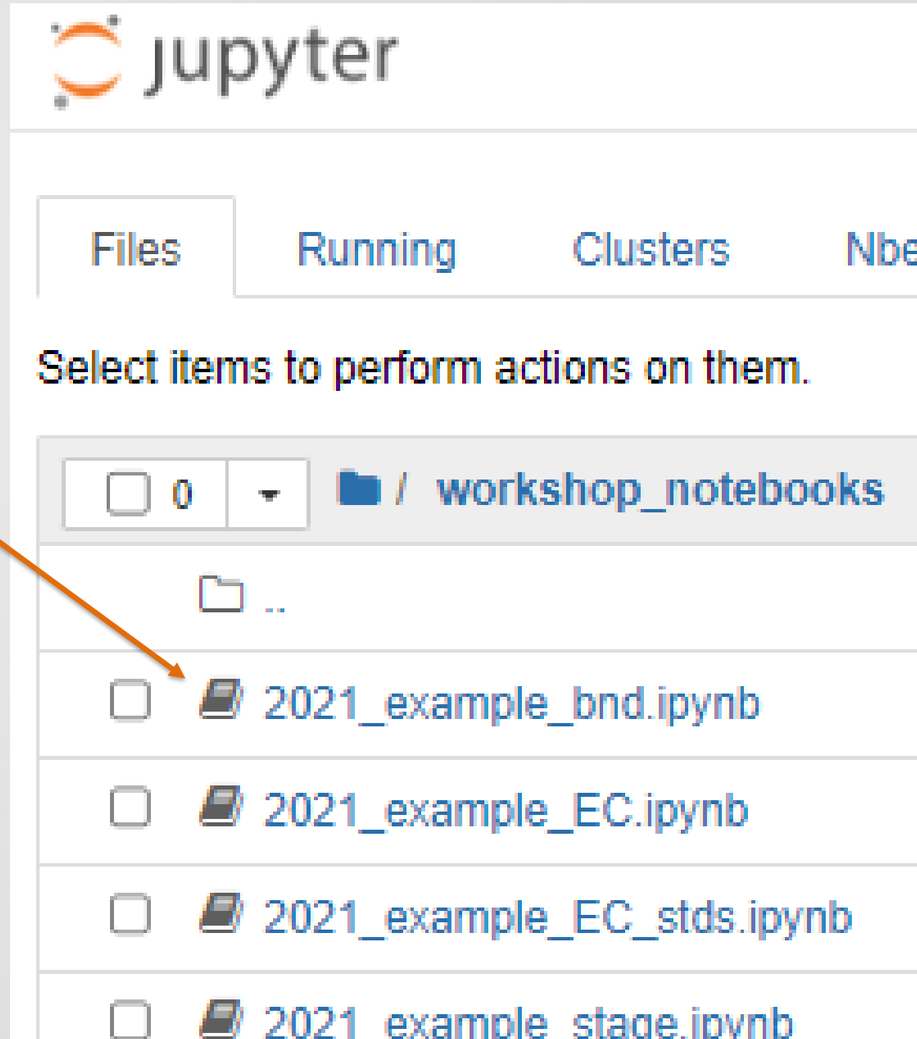
Plotting input with Jupyter notebook

Opening a notebook

1. Click "workshop_notebooks"

2. Open the file 2021_example_bnd.ipynb





Plotting input with Jupyter notebook
notebook configuration

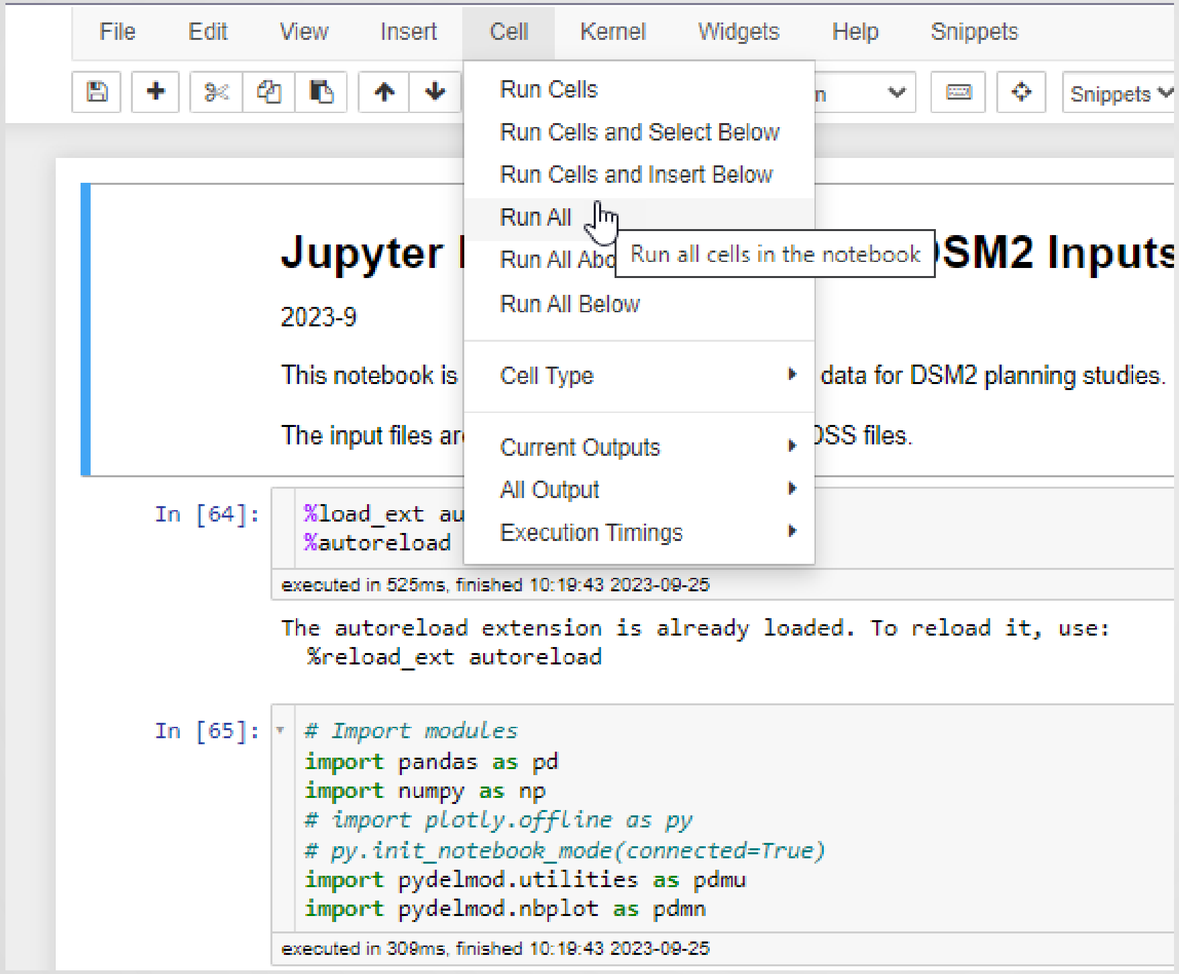
1. Make sure these lines point to your study folders/files

```
# 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

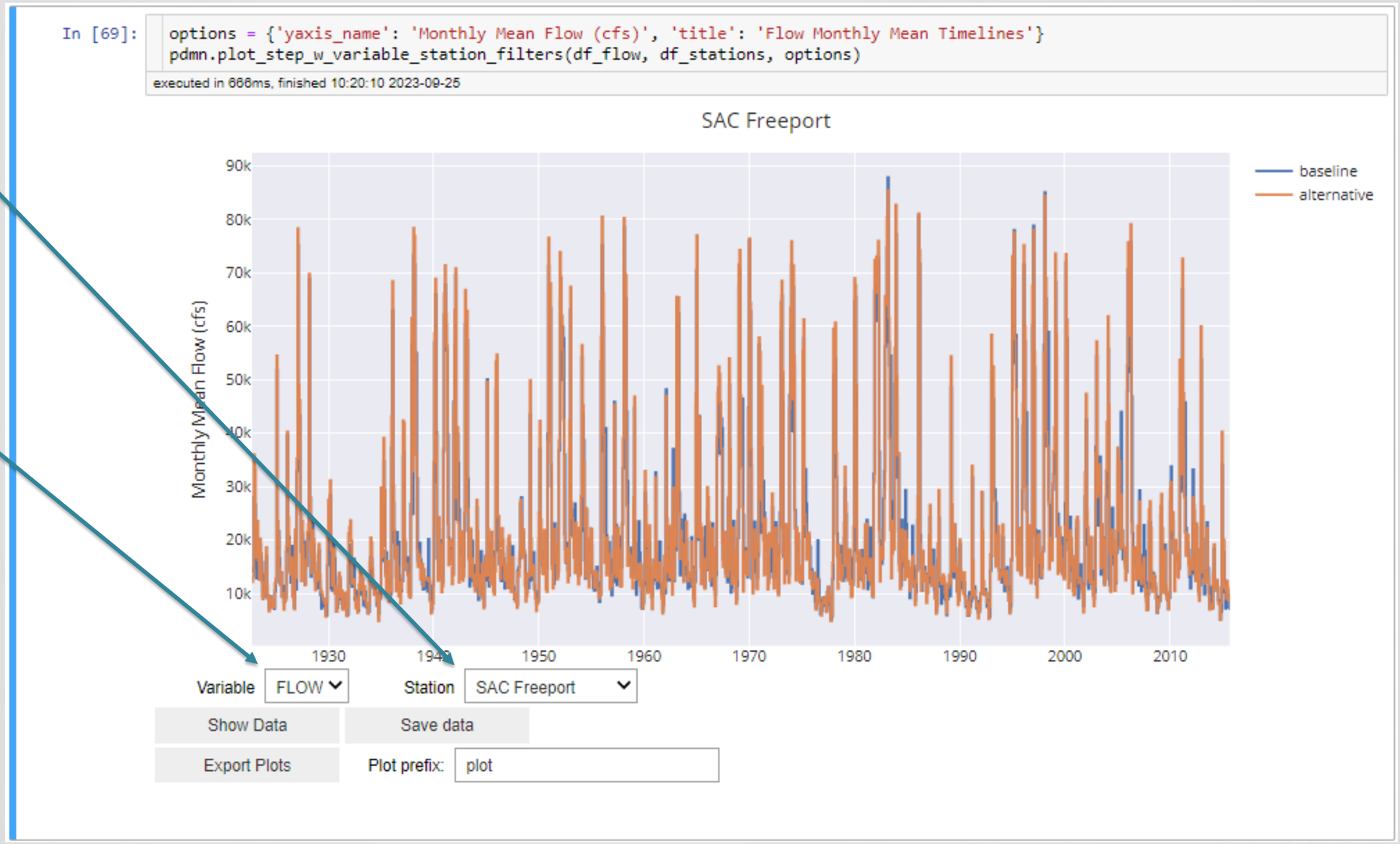
Changing variable type or station on Jupyter notebook plot

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



DSM2 Learning Series: Planning

DSM2 Learning Series

Skills Learned

- Session 1: DSM2 Planning study setup
- **Session 1 Hands-On Exercises:**
  - Pre-process CalSim output for DSM2
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  - **Running DSM2 planning studies**
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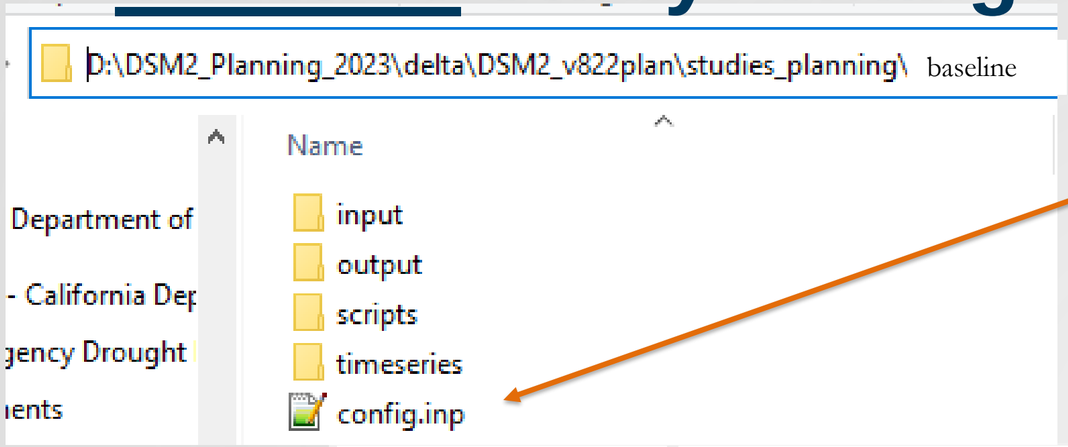
Topics Not Covered

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

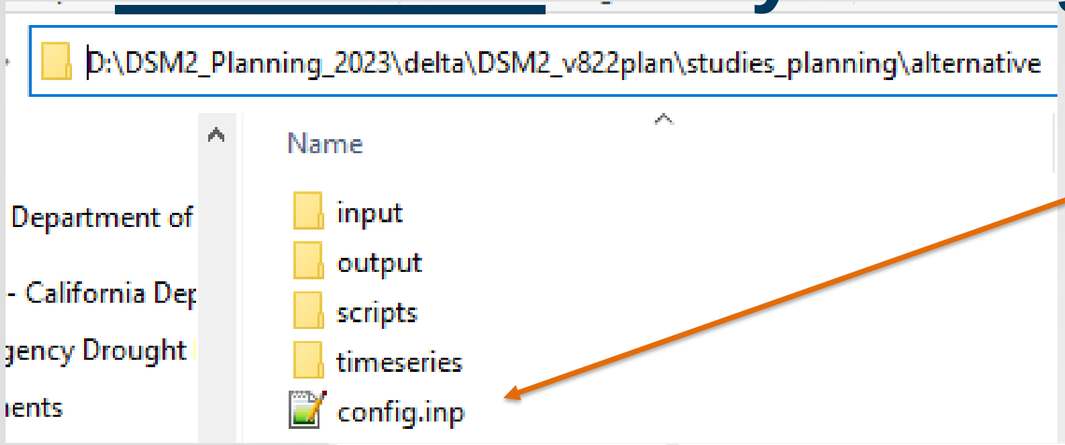
changelog.md | postpro_cal_config.yml | output_ecfp_rki (1).inp | config.inp

```
MODSTAGE_VERSION          PLAN_${DSM2MODIFIER}
MODEC_VERSION             PLAN_${DSM2MODIFIER}
SJR_PROCESS               MULTI_STEP                                  #SINGLE_STEP or MULTI_STEP

START_DATE                01FEB1921                                   #warm-up before 192110
QUAL_START_DATE           02FEB1921                                   #warm-up before 192110
#START_DATE       01OCT2010
#QUAL_START_DATE           02OCT2010
# START_DATE                01DEC1921     #01OCT1974 #     01DEC2014     #
# QUAL_START_DATE           02DEC1921     #02OCT1974 #     02DEC2014     #
PTM_START_DATE            ${QUAL_START_DATE}
END_DATE                  01OCT2015     #01OCT1991 #
#END_DATE         01OCT2014
START_TIME                0000
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

changelog.md | postpro_cal_config.yml | output_ecfp_rki (1).inp | config.inp

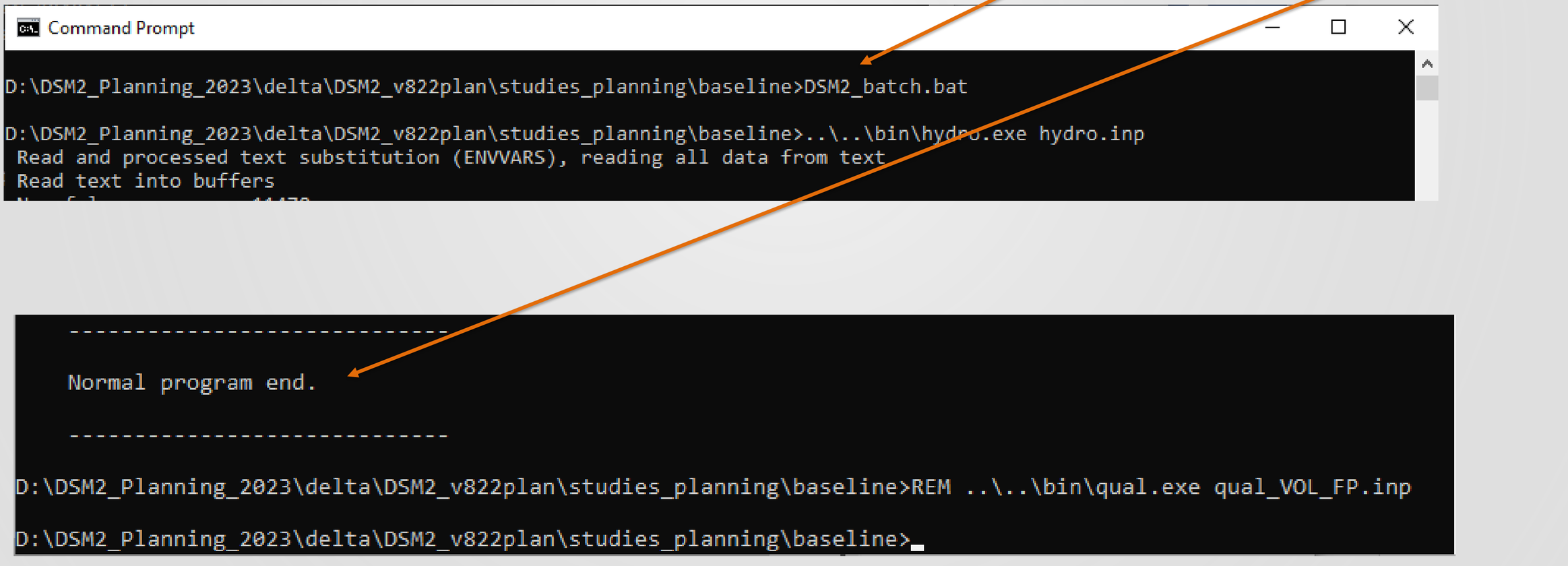
```
19  MODSTAGE_VERSION          PLAN_${DSM2MODIFIER}
20  MODEC_VERSION             PLAN_${DSM2MODIFIER}
21  SJR_PROCESS               MULTI_STEP                                  #SINGLE_STEP or MULTI_STEP
22
23  START_DATE                01FEB1921                                   #warm-up before 192110
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

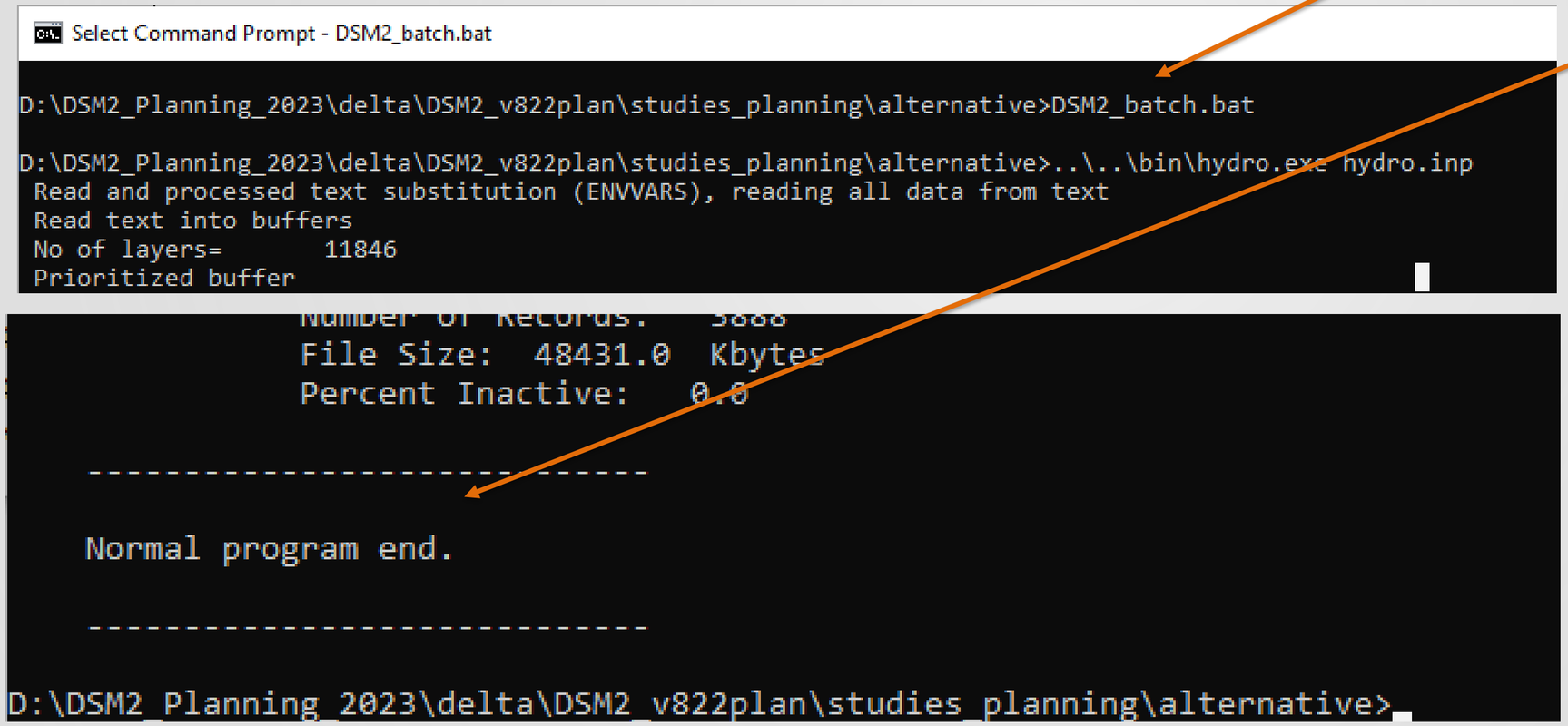
- For each scenario,
  - Run the studies
    - dsm2_batch.bat



Setting up and running DSM2

alternative study: running DSM2

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



Setting up and running DSM2

Running DSM2

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

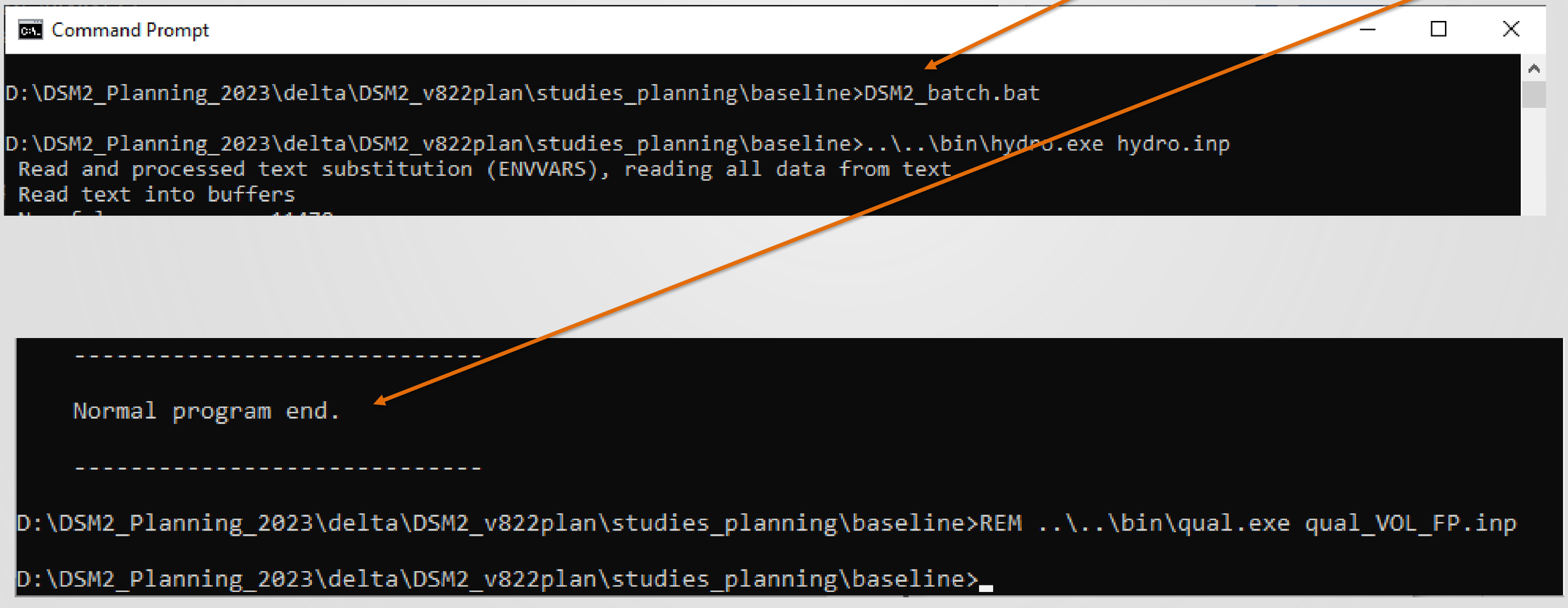
Use chat for questions

10:00

10-minute break

Starting the run

run complete



Download DSM2 Output, 4 years

- To download DSM2 outputs rather than running DSM2:
  - https://data.cnra.ca.gov/dataset/dsm2-example-planning-study-output

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

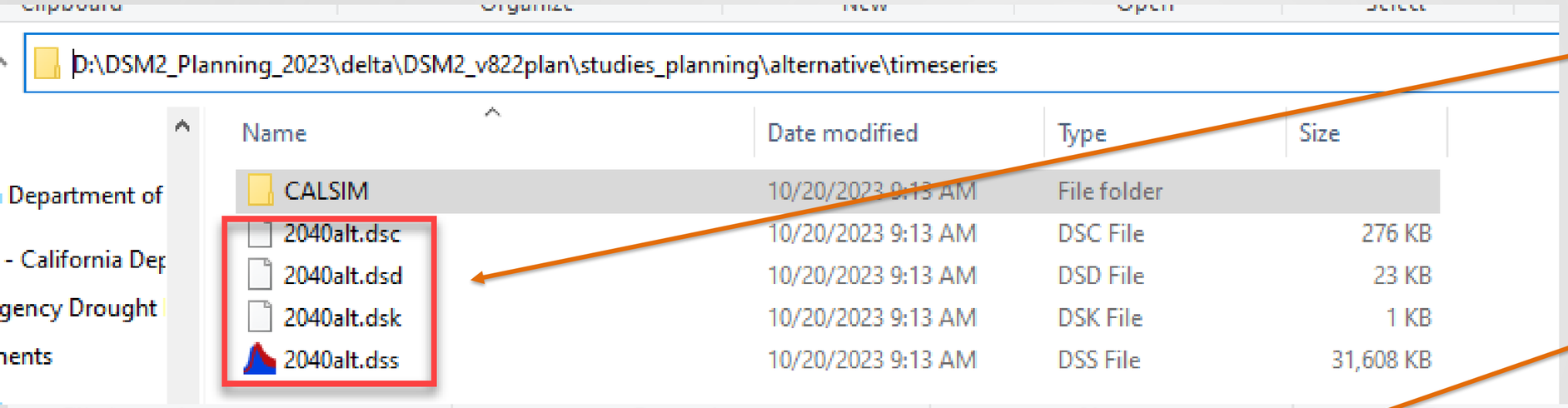
"Cannot Create New Catalog..."

"Catalog is empty"

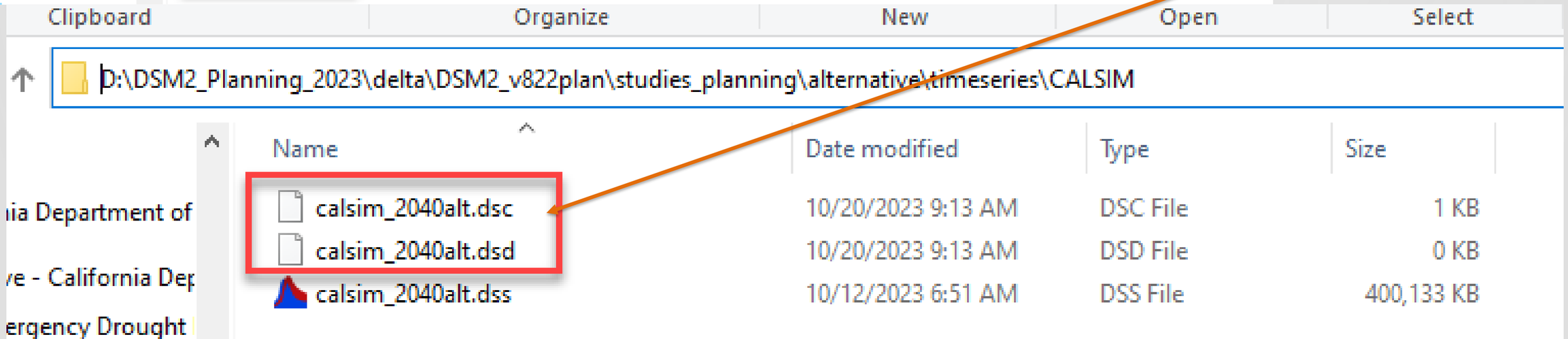
```
        at vista.set.GroupProxy.getNumberOfDataReferences(GroupProxy.java:77)
        at vista.set.Group.find(Group.java:325)
        at sun.reflect.NativeMethodAccessorImpl.invoke0(Native Method)
        at sun.reflect.NativeMethodAccessorImpl.invoke(NativeMethodAccessorImpl.java:62)
        at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



Delete all preprocessor output files

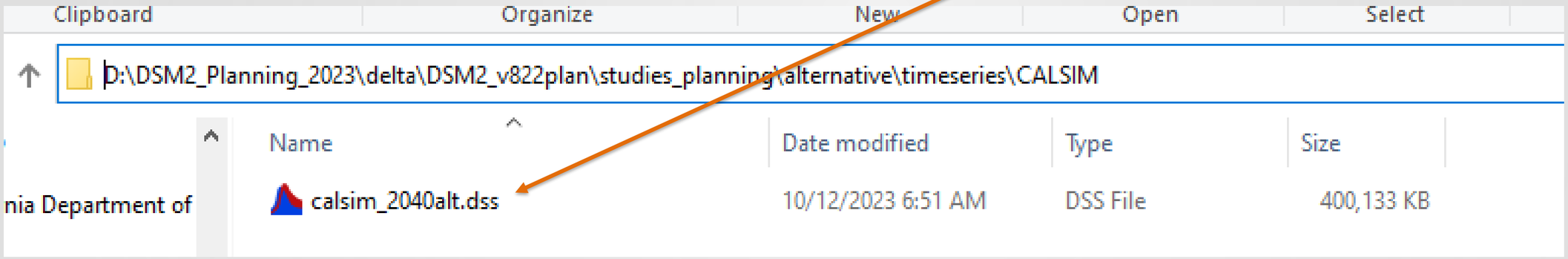


Delete bad catalog files

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