

## ASPA-UH-WRRC Integrated Groundwater Modeling Framework Workshop Activity Trace

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After a brief introduction to groundwater modeling, the need for a collaborative paradigm, and some of the data science tools used (see links below):

<https://www.youtube.com/watch?v=zKHaPU794fU>

<https://www.coursera.org/lecture/open-source-tools-for-data-science/what-are-jupyter-notebooks-GB0ZX>

<https://www.nature.com/articles/d41586-018-07196-1>

we jumped right into exploring the software used for the framework. First we installed Anaconda Navigator on our computers.

**Anaconda Navigator:** is a free and open-source distribution of the Python and R programming languages for scientific computing that aims to simplify package (software) management and deployment. Today we used Anaconda to download the packages needed to run the modeling scripts, and we used it to start our Jupyter Notebooks. ( <https://www.anaconda.com/distribution/> )



Once we had navigator installed we used it to download the specific packages by importing a list of packages through the environments tab in navigator (FloPy was one of them) that were required to open up the models. We could then open the actual model scripts in a couple of different Jupyter Notebooks

**Jupyter Notebooks:** Are an open source web application that you can use to create and share documents that contain live code, equations, visualizations, and text. Today we used Jupyter notebooks to run the scripts/models that I have already made. You can make your own scripts easily with Jupyter Notebooks too!



There were a lot of different notebooks opened today, we first looked at the **UH-ASPA streamflow data processing notebook**. The master copy of this can be found at:

[https://github.com/cshuler/ASPA-UH\\_Integrated\\_Modeling\\_Framework/blob/master/ASPA-UH\\_Stream\\_REPO/Run/UH\\_ASPA\\_Streamflow\\_process2.ipynb](https://github.com/cshuler/ASPA-UH_Integrated_Modeling_Framework/blob/master/ASPA-UH_Stream_REPO/Run/UH_ASPA_Streamflow_process2.ipynb)

The whole ASPA-UH\_Integrated\_Modeling\_Framework folder was also included on your flashdrive today as well, and we copied this folder onto our desktop, and thus could open the UH-ASPA streamflow data processing notebook from that location as well.

We also looked at the **weather station data processing notebook**, which was also included in the ASPA-UH\_Integrated\_Modeling\_Framework folder and can be found online at: [https://github.com/cshuler/ASPA-UH\\_Integrated\\_Modeling\\_Framework/tree/master/ASPA-UH\\_Wx\\_REPO](https://github.com/cshuler/ASPA-UH_Integrated_Modeling_Framework/tree/master/ASPA-UH_Wx_REPO)

We took a couple of minutes to look at the FloPy groundwater model notebooks which were not only on the flash drive but are also located at: [https://github.com/cshuler/ASPA-UH\\_Integrated\\_Modeling\\_Framework/tree/master/ASPA-UH-Flopy\\_REPO/Models/consolidated\\_SWI1](https://github.com/cshuler/ASPA-UH_Integrated_Modeling_Framework/tree/master/ASPA-UH-Flopy_REPO/Models/consolidated_SWI1)

Finally, we ran the example “Tutorial1” notebooks to get a hands on feel for creating a simple groundwater model. This was opened up from a folder that was installed on your flashdrive, and can also be accessed at: [https://github.com/cshuler/FloPy\\_Custom\\_tutorial](https://github.com/cshuler/FloPy_Custom_tutorial)

**Please remember that all of these notebooks can be opened on your computer now through the following steps:**

- 1: Making sure that the respective file folders “ASPA-UH\_Integrated\_Modeling\_Framework-master” and “FloPyTutorial” from either your flash drive you received today, or downloaded from the above links are located (most easily) on your desktop.
- 2: Opening up the Anaconda navigator program from your start menu
- 3: Making sure that the “ASPA-Framework” environment is selected on the “environments” tab in Anaconda
- 4: Going back to the Home tab in Anaconda, and launching Jupyter notebooks
- 5: Once Jupyter opens with a list of folders on your computer, navigating to whichever .ipynb file that you want to explore
- 6: Simply clicking on that file and it will open another tab in your browser which gives you a live code environment to examine and play around.

We also explored the ability to copy and paste address for GitHub repositories into the **Binder** application ( <https://mybinder.org/> ), which allowed us to run the notebooks in the cloud, and not on our computers. This is useful when you do not have (or want) the software installed on your machine. An example of a repository that you can (and we did) paste into binder is: [https://github.com/cshuler/ASPA-UH\\_Stream\\_REPO](https://github.com/cshuler/ASPA-UH_Stream_REPO)

Again I know this is a ton of information, but remember, the goal here was simply to get exposure to these ideas, not to learn how to do everything. If you realize that this sort of thing might be useful to you, or you would just like to learn more, please do not hesitate to contact me and I can answer questions and help you to design your study/analysis/data exploration goals.

**Faafetai Tele Lava!**