

Coupled Groundwater/Surface-Water Modeling using GSFLOW Class ID2447

BLM-CA Multi-Use Conference Room, 2800 Cottage Way, Sacramento, CA

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Laptop Requirement

Each course participant is expected to arrive with a laptop computer that has the required software installed and tested according to the instructions presented here. Laptop computers should be running the Windows operating system. It is important that you try this installation as soon as possible so that there is time to fix any installation problems that occur.

For this class, we expect that everyone will be running a 64-bit version of Windows.

Software Requirements

We ask that you download the following file, and follow the instructions provided here.

ftp://ftpext.usgs.gov/pub/wr/ca/menlo.park/rniswon/gsflowID2447_classrepo.zip

Software to install prior to the class

- Install Git for Windows from this link <https://git-scm.com/downloads>. Git is very helpful for controlling changes to files and directories. Although it is not necessary to know git, it is very helpful to know the basics. If you are interested, you may check out this website for a quick tutorial <https://rogerdudler.github.io/git-guide/>
- ArcGIS 10.5 or newer (will include Python 2.7)
- [USDA Soil Data Viewer](#): This will require administrator privileges, please have IT do this for you prior to the class. Download for non-USDA CCE platforms then follow steps on website to register as add-in to ArcMap.
- Microsoft Access
- Miniconda (see instructions below)

Install Instructions

1. Download class materials from this ftp site
ftp://ftpext.usgs.gov/pub/wr/ca/menlo.park/rniswon/gsflowID2447_classrepo.zip
2. Unzip the folder [gsflowID2447_classrepo](#) and run the batch file 'update_repo.bat' by clicking on it. This command uses git to update your class files.

3. In the [gsflowID2447_classrepo](#) navigate to the folder [install](#). Open the file [arcpy.py](#) using any text editor. Inside the file we added the locations of ArcGIS python libraries. If your ArcGIS is installed in a different location or has a different version, then replace 'C:\ArcGIS\Desktop10.6' with the local path name. For example, if you are using an older version of ArcGIS, you need to change the three paths to use 'C:\ArcGIS\Desktop10.5'.

[C:\ArcGIS\Desktop10.5\bin64](#)
[C:\ArcGIS\Desktop10.5\arcpy](#)
[C:\ArcGIS\Desktop10.5\ArcToolbox\Scripts](#)

4. Install 64-bit [Miniconda](#) – from this link. Either Python 3.7 or 2.7 versions can be installed. Click on the installed executable and accept the default settings, except for the “Advanced options” window make sure to uncheck the two options.
5. From the “Windows start menu” open the Anaconda Prompt. In the opened command window, notice that the regular command prompt has slightly changed to “(base) c:\Users\username”. The word in the parenthesis (base) is the Anaconda Environment name. It's not required to know what this means as we will learn about in the class. For more information about managing your Anaconda Environment please visit this link <https://docs.conda.io/projects/conda/en/latest/user-guide/tasks/manage-environments.html>
6. From the Anaconda prompt, navigate to the folder 'install' in the class material folder you previously installed in steps 1 and 2. Type “python setup_env.py gsflow” to generate a new environment with the name GSFLOW. This step also will install the necessary Python packages and automatically connect these packages to your environment with ArcGIS.
7. Now, activate the “gsflow environment” by typing “activate gsflow” at the Anaconda prompt. Notice the environment name will change to “(GSFLOW) D:\YourPath.”
8. Tests all exercises by typing “python autotest_notebooks.py > test_results.txt” at the Anaconda command prompt.
9. Please send the file “test_results.txt” located in the “install” folder to Rich (rniswon@usgs.gov) ASAP.

Overview

We have designed the course files to be structured in the following manner. It's important that folders are named according to the list below.

- gsflowID2447 (main directory)
- installation (Scripts for installing the software. Provided in the zip file.)
- Arcpy (Python distribution we will use for this class. Arcpy comes standard with ArcGIS 10.5 or 10.6).
- gsflowID2447_classrepo.git (course repository mirroring https://github.com/rniswon/gsflowID2447_classrepo). We will use Github to

update the repository on the first day of class and possibly during the class in case updates are made between now and then. Your local repository can be updated by clicking on the update_repo.bat file.

Data Requirements for developing a new GSFLOW model (not required for the GSFLOW class).

The data below only must be attained by students if they are starting a new project that is NOT the Sagehen example. Input data will be developed using Gsflow-Arcpy, a series of Arcpy scripts that use ancillary datasets to develop GSFLOW specific input. Almost all the data required by Gsflow-Arcpy can be downloaded for basins in the United States using the USDA Geospatial Data Gateway <https://gdg.sc.egov.usda.gov/> and elevation data can be downloaded as IMG format from <https://www.usgs.gov/core-science-systems/ngp/tnm-delivery/>.

1. 10m (1/3 arc-second) Elevation data
2. Study area or watershed pour points as shapefiles; for watersheds that contain multiple subbasins, pour points should be provided for each subbasin.
3. Vegetation type and coverage, downloaded as tiles for the study area from <http://www.landfire.gov/vegetation.php>
4. Soils (STATSGO or SSURGO data sets) can be downloaded from <https://gdg.sc.egov.usda.gov/>
5. Impervious cover (Land Cover) for 2011 can be downloaded from NLCD from http://www.mrlc.gov/nlcd11_data.php
6. Climate stations (precipitation, daily minimum and maximum temperatures) for stations located within watershed. Climate station data can be provided by many sources, including local agencies and regionally specific climate data should be located for each particular watershed. Common sources include <https://gis.ncdc.noaa.gov/maps/ncei/summaries/daily> and <https://wrcc.dri.edu/> and http://www.wcc.nrcs.usda.gov/snow/snow_map.html
7. PRISM 30-year monthly average (normals) precipitation and maximum and minimum temperatures at an 800m resolution can be downloaded here <http://www.prism.oregonstate.edu/normals/>
8. Surficial geology <https://mrdata.usgs.gov/geology/state/>

Tutorial and Documentation links

Although the class does not require Python programming experience, we will be using basic Python within Jupyter Notebooks (or Jupyter lab) and familiarity can be helpful. Basic instruction can be provided at:

<https://www.codecademy.com/learn/learn-python>

YouTube videos for 24 lectures describing PRMS are available from:

https://wwwbrr.cr.usgs.gov/projects/SW_MoWS/Recordings.html

It is highly recommended that these be watched prior to the class. For example, an overview of PRMS is available at: https://www.youtube.com/watch?v=qX_lktsYW4. Note, we will be using GSFLOW-ArcPy in the class and not the Weasel software.

Documentation and additional resources are available at:

http://wwwbrr.cr.usgs.gov/projects/SW_MoWS/GSFLOW.html,

<http://water.usgs.gov/ogw/gsfLOW/index.html>,

https://wwwbrr.cr.usgs.gov/projects/SW_MoWS/Bibliography.html

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Harbaugh, A.W., 2005, MODFLOW-2005, the U.S. Geological Survey modular ground-water model--the Ground-Water Flow Process: U.S. Geological Survey Techniques and Methods 6-A16, <https://pubs.usgs.gov/tm/2005/tm6A16/>

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<https://pubs.usgs.gov/tm/2006/tm6A13/pdf/tm6a13.pdf>

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