**­­U.S. Greenhouse Gas (GHG) Center JupyterHub Video Tutorial Script Outline**
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* Login
	+ Navigate to the [U.S. GHG Center](https://earth.gov/ghgcenter/)
	+ Navigate to the “Hub” tab, along the top banner, to access the U.S. GHG Center JupyterHub welcome page.
	+ From the U.S. GHG Center JupyterHub welcome page login.
		- New users please see the documentation on how to request the required login access [here](https://us-ghg-center.github.io/ghgc-docs/services/jupyterhub.html).
* Servers
	+ The U.S. GHG Center JupyterHub allows users to start server sessions to access various available functionalities.
		- Server sessions can be manually terminated by navigating to the hub control panel and clicking “stop my server.”
		- Currently it is not possible to quit a RStudio session through the JupyterHub interface.
		- To quit an RStudio session, navigate to the JupyterHub home page by following the link [here](https://hub.ghg.center/hub/home), and clicking “stop my server.”
	+ Named Servers
		- Users can name additional servers from the start server menu.
		- This allows multiple server sessions to be active at once.
* Key Features
	+ Modified Pangeo Notebook
		- Opens a virtual machine out of a web browser.
		- Users can create and manage notebook files.
		- Users can view the U.S. GHG Center notebook files.
		- Code can be written in code cells and must be in python.
	+ Rocker Geospatial with RStudio
		- Allows users to access an R environment with several geospatial programs preinstalled.
		- Allows users to view the U.S. GHG Center notebook files.
		- Provides a series of containers for geospatial applications.
	+ QGIS on Linux Desktop
		- Runs a Linux virtual desktop, in the browser, with QGIS installed.
		- Allows a user to access QGIS and U.S. GHG Center datasets through a QGIS plugin called STAC API Browser.
		- Once datasets have been imported into QGIS they can be analyzed and interacted with to create various outputs.
	+ Bring Your Own Image
		- Allows a user to upload their own images for use on the U.S. GHG Center JupyterHub.
* Modified Pangeo Notebook Usage
	+ Creating Notebooks
		- Notebooks can be created through the JupyterLab interface by navigating to either the file tab or the + symbol.
	+ Managing Notebooks
		- Notebook file management can be accessed through the JupyterLab interface tab and context menus.
			* Notebooks can be opened, renamed, copied, pasted, duplicated, downloaded, and deleted.
			* Additional notebook management includes, copying the download link, copying the path, and copying the shareable link of the notebook.
		- Notebook content management can be accessed the JupyterLab interface context menu, and the tab menus of the notebook and its cells.
			* Notebook instance can be run, stopped, restarted, restarted & re-run, interrupted, and saved.
			* Notebooks include three cells types (code, markdown, raw) which can be run, moved, copied, pasted, duplicated, split, merged, cleared, formatted, and deleted.
	+ Writing Code in Notebooks
		- Code must be written in code cells.
		- Code is written in Python.
	+ Executing Code in Notebooks
		- Code execution order is conveyed on the left hand side of the code cell by the notation [x], where x is an integer indicating the order of execution.
		- Code cell dependent on the execution of other code cells, should be run after the independent code cells.
		- Keyboard Shortcut Commands
			* Run Cell: CTRL + ENTER
			* Run Cell & Advance: SHIFT + ENTER
			* Enter Edit Mode: ENTER
			* Command Palette: CTRL + SHIFT + C
	+ Saving Notebooks
		- All changes made in a specific server or virtual machine instance are automatically changed.
		- Notebooks can be saved and downloaded.
		- Notebooks can be pushed to GitHub repositories.
	+ Sharing Notebooks
		- Sharing the versions of the notebooks as they appear on the U.S. GHG Center GitHub repo can be shared through the:
			* Access nbgitpuller links found on the U.S. GHG Center website.
			* Shareable URL links that can be created through JupyterLab.
		- Sharing instanced or personal versions of notebooks for collaboration through the U.S. GHG JupyterHub.
			* Create a private GitHub repository.
			* Invite all collaborators to the private GitHub repository.
			* Repository setup
				+ If the original data is in a pre-existing repository

A local repository clone of the original repository may be available in the JupyterLab interface upon login.

The repository may need to be cloned locally from the original repository by accessing the terminal through the JupyterLab interface.

* + - * + New-Repo

When making a new repository, make a new repository on GitHub, and clone it locally to your individual virtual machine.

* + - * GitHub
				+ To clone from, push to, and pull from a private GitHub repository, you will need to [create an access token](https://docs.github.com/en/authentication/keeping-your-account-and-data-secure/managing-your-personal-access-tokens), to provide as a password. Use the JupyterLab terminal.
				+ Ensure you have adequate permissions for accessing a private repo.
			* Real-Time Collaboration
				+ JupyterLab has a built-in real team collaboration extension.
				+ [Real-time collaboration documentation](https://jupyterlab.readthedocs.io/en/stable/user/rtc.html)
				+ May be implemented by U.S. GHG Center developers in the future.