JupyterHub on cheyenne or casper at NCAR

See documentation on NCAR’s Jupyterhub at:
https://www2.cisl.ucar.edu/resources/jupyterhub-ncar

To start a session, go to: https://jupyterhub.hpc.ucar.edu/

You will need a login on cheyenne/casper to use this
Use your credentials to sign in

Online documentation for NCAR JupyterHub is available here.
This development JupyterHub instance is subject to service interruptions on Tuesdays and Thursdays. To avoid any inconvenience, please use the stable instance.

Sign in

Username:

Password:

Online documentation for NCAR JupyterHub is available here.

Named Servers
In addition to your default server, you may have additional 4 server(s) with names. This allows you to have more than one server running at the same time.

<table>
<thead>
<tr>
<th>Server name</th>
<th>URL</th>
<th>Last activity</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name your server</td>
<td>Add New Server</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Example1</td>
<td></td>
<td>4 minutes ago</td>
<td>start</td>
</tr>
</tbody>
</table>

Click ‘Start My Server’
Select Casper PBS batch or Cheyenne PBS batch
- You need to use casper to access campaign storage
- Using a batch node allows you to specify project number and memory

Enter your project number

You may need to increase memory, e.g. 5 GB

Increase walltime only if needed

To reduce waiting time for Hub to start, using smallest memory and walltime possible
If the computer is busy you may need to wait for the server to connect.

If you have trouble connecting this way, you can try an alternate method: https://ncar.github.io/CAM-chem/cheyenne_jupyter.html
From the Launcher window, under ‘Other’ (scroll down), select ‘Terminal’. This will open a terminal window on Casper.

In the terminal window, get a copy of the tutorial notebooks:

```
> git clone https://github.com/NCAR/musica-tutorial
```

Navigate on the left panel to the new `musica-tutorial` directory to find the sample notebooks.
In the jupyter interface on the left side of the window navigate into this folder.

Open map_examples.ipynb
Click the play button to run each step of the notebook. Wait until [*] at left of command switches to a number before going on to next section. Creating plots may take a few seconds.

1. Import libraries to be used in this notebook

```python
import xarray as xr  # To read NetCDF files
import matplotlib.pyplot as plt  # Core library for plotting
import matplotlib.cm as cm  # To use different colormaps
from functions.Plot_2D import Plot_2D  # To draw a map
import cartopy.crs as ccrs  # For map projection
```
When you open or create a new jupyter notebook file, you can select which kernel is used. We recommend using **NPL-3.7.9**.

When you are finished using JupyterHub, go to ‘Hub Control Panel’, under ‘File’ - this opens a new browser window. Click ‘Stop My Server’. Then go back to original window and Log Out.
The map_examples notebook uses some standard python libraries, and the Plot_2D function (written by Duseong Jo, in your musica_tutorial/functions/ directory):

https://github.com/NCAR/CAM-chem/blob/main/docs_sphinx/examples/functions/Plot_2D.py

See more explanations of Plot_2D at:
https://wiki.ucar.edu/display/MUSICA/Plot+output+with+Python

**Model output:**
These tutorial examples read the MUSICAv0 Community Simulation for 2012-2013.
If you do not have a login on casper at NCAR, example files are available at:
ftp://ftp.acom.ucar.edu/user/emmons/musica_tutorial_nov2021/
The full dataset has just been published on the DASH Repository: https://doi.org/10.5065/tgbj-yv18

You can find out details of the content of these files by using ‘ncdump’ in the Terminal window in JupyterHub, e.g.:
> cd /glade/campaign/acom/acom-climate/tilmes/CO_CONUS/f.e22.FCcotagsNudged.ne0CONUSne30x8.cesm220.2012-01/atm/hist
> ncdump -h f.e22.FCcotagsNudged.ne0CONUSne30x8.cesm220.2012-01.cam.h1.2013-08.nc
> ncdump -h f.e22.FCcotagsNudged.ne0CONUSne30x8.cesm220.2012-01.cam.h1.2013-08.nc | grep O3

The tutorial notebooks also show how to find this information with python within the notebook.
More Tips:

- If you start reaching your memory limit (shown at the bottom of the Hub window), try restarting the kernel (find under the Kernel menu, or the circle with arrow symbol in the toolbar.)