Python Hackathon Project Notes…

Goal: Make a height-latitude cross-section through the atmosphere in CESM. Requires interpolation of the CAM grid from native grid to fixed pressure levels. Similar plots exist in the AMWG diagnostics package and are a standard plot in atmospheric science… yet there is a technical challenge here because the vertical interpolation from the CAM hybrid grid to pressure levels is non-standard.

Plan is to use the NCL function to do the interpolation - but python for everything else.

Note: Brian Medeiros has code like this that he is willing to share – we're off to the races!!

Step #1: Need to install PyNGL

We need to install PyNGL (http://www.pyngl.ucar.edu/Download/) because we want to use NCL function to do vertical interpolation of the native atmospheric grid to pressure levels https://www.ncl.ucar.edu/Document/Functions/Built-in/vinth2p.shtml

1) cd /gpfs/u/home/jenkay/NCAR-pangeo-tutorial/environments
2) Update the .yml file
cp env-analysis.yml env-analysis_pyngl.yml
vi env-analysis_pyngl.yml
Add -pyngl ; change the name at the top to analysis_pyngl
3) Create the environment
conda env create -f env-analysis_pyngl.yml
4) Our new environment will be called **analysis_pyngl**
Set this in the upper right hand side of the Jupyter Lab
5) Cheyenne went down but we checked installation at the command line:
Type "conda activate analysis_pyngl" to get into our new environment with pyngl installed
Type "ipython" for text only version
Type "import Ngl"

It worked… It seems like we have installed PyNGL :). Step #1 accomplished :)

Also -- Brian's initial version of this code worked with our PyNGL installation -- YEA!
/gpfs/u/home/jenkay/NCAR-pangeo-tutorial/hands-on-examples/jenkay_scripts/vertical_cross_section_example_firstcut.ipynb

Not too bad for a Monday when Cheyenne went down due to lightning ….

Step #2, #3, #4…. - Progress on Tuesday

1) We all checked out the code that Brian has been updating… He did all of the heavy lifting to make the code more efficient (subset first to reduce computational demands), more accurate (including a solution for the time issue in CAM), deal with missing values (i.e,. Antarctica), and many more things we are still learning about python related, and of course the plots are "beautified" a la Brian.

To get Brian's code from his git repository - **https://github.com/brianpm/hacknostics**: We got it using:

git clone https://github.com/brianpm/hacknostics

updated notebook can also be found:
/glade/u/home/brianpm/Code/yellowstone/py/vertical_cross_section_example.ipynb

We made progress along three different fronts to use skills learned during the hackathon:

1) testing the influence of DASK (Jen, Shima). We found adding DASK capacity actually reduced the speed of the code -- but that is likely because it was not that computationally demanding to begin with and there is overhead associated with using DASK, interesting :)….
2) animating i.e., making movies of the vertical cross-section plots (Aneesh)
    - Had to install cmaps package from here. Used pip to install this. This installs the NCL colormaps for use in plots.
    - Created a pull request for my modified jupyter notebook on Brian's git repository.
3) adding capabilities to use single variable timeseries (Brian, Jen)

Question from Jen: Can we add a height coordinate to the plot? Plot log-p and linear-ht for the height coordinate?
Note: I submitted this as an "issue" in Brian's github. See here:
https://github.com/brianpm/hacknostics/issues

After the happy hour… and later in the evening so no guarantees this is working :)... Jen tried github commands to initiate a pull request to Brian's github repo

Github Commands Used By Jen:
1) On my github site - I forked Brian's repo:
Result is https://github.com/jenkayco/hacknostics

2) I went to my "local directory" i.e., where I will do updates via github on Cheyenne
cd /gpfs/u/home/jenkay/NCAR-pangeo-tutorial/hands-on-examples/jenkay_scripts/github

3) I started by cloning my fork i.e., getting a local copy of my fork to modify.

git clone https://github.com/jenkayco/hacknostics

4) I went into the folder it created for my local copy of the fork (in this case named 'hacknostics'). I am now in a copy of the repository on my computer and it is automatically connected to the remote repository on your GitHub account. You can see that the address to the fork is already set up, you have set up a remote source of code (git remote –v).
cd hacknostics
git remote -v

What if the original repository you forked happens to change?? I'll want to be able to pull in those changes too. So I added another remote connection, this time to the original repository with its URL. I can name this remote connection anything you want, but typically people use the name upstream so I'll use that.
git remote add upstream https://github.com/brianpm/hacknostics

I can check the remotes you have set up using the following name.
git remote -v

5) Next I added a branch, locally, to my forked repository to work on my changes. I checked out my branch and its status.
git branch add-dask
git checkout add-dask
git status

6) Next I copied the code Shima/I worked on with DASK to my branch, added it and committed it to my branch.
cp ../../hacknostics/vertical_cross_section_example_dask.ipynb .
git add vertical_cross_section_example_dask.ipynb
git commit -m "add dask version of code vertical_cross_section_example_dask.ipynb"

7) I then pushed my branch (on Cheyenne) to update my fork (on the github website).
git push origin add-dask

I also confirmed that changes have been Pushed to my github site -- https://github.com/jenkayco/hacknostics!

8) From my fork - I then initiated a pull request to Brian's repo to incorporate my changes… We'll check if this worked tomorrow…

Final Steps - Wednesday

1) We completed pull requests with our progress from Tuesday to Brian's github (**https://github.com/brianpm/hacknostics**). Brian will need to contend with our changes for DASK (Jen/Shima), animating (Aneesh), and data input (Jen).

All of our final code is available here:
https://github.com/brianpm/hacknostics

Notes:

1) to transfer small text files from Cheyenne to your local laptop… Open X11 on your laptop and type:
scp jenkay@cheyenne.ucar.edu:/gpfs/u/home/jenkay/NCAR-pangeo-tutorial/hands-on-examples/jenkay_scripts/vertical_cross_section_example.ipynb .

Globus better for big files…

2) Creating a new environment with just pyngl (DO NOT DO THIS.. pyngl alone will not help us learn python :))
conda create --name pyn_env --channel conda-forge pyngl
source activate pyn_env
Our new environment is called **pyn_env**