Using CASA: reference material

1 How to begin

This outlines the basics to get started with CASA. CASA operates in a terminal (or xterm). Ensure that you have sufficient disk space (data 'reduction' is a misnomer, as data usually expands during calibration and imaging!) and that you can open additional windows, such as the casalogger. Please do *not* start CASA within the CASA installation! Commands in magenta are to be entered in the terminal, while blue is for use within CASA.

EXAMPLE locations, you will be given the correct ones.

How to start CASA:

`casapath = [/Users/jackradcliffe/CASA/casa-release-6.6.5-14.py3.8/bin/casa]`

Where to find the data:

`datapath = [/Users/jackradcliffe/Astro/DARA/EVN_cont/part1]`

Where you see `[]`, replace it with the actual path and remove the `[]`. You will be informed of the directory to create for your work; this is just an example. The last command starts CASA, which should display this in the terminal and generate a logger as shown in Fig. 1.

```
$ cd [datapath]
$ mkdir DARA
$ cd DARA
$ [casapath]
```

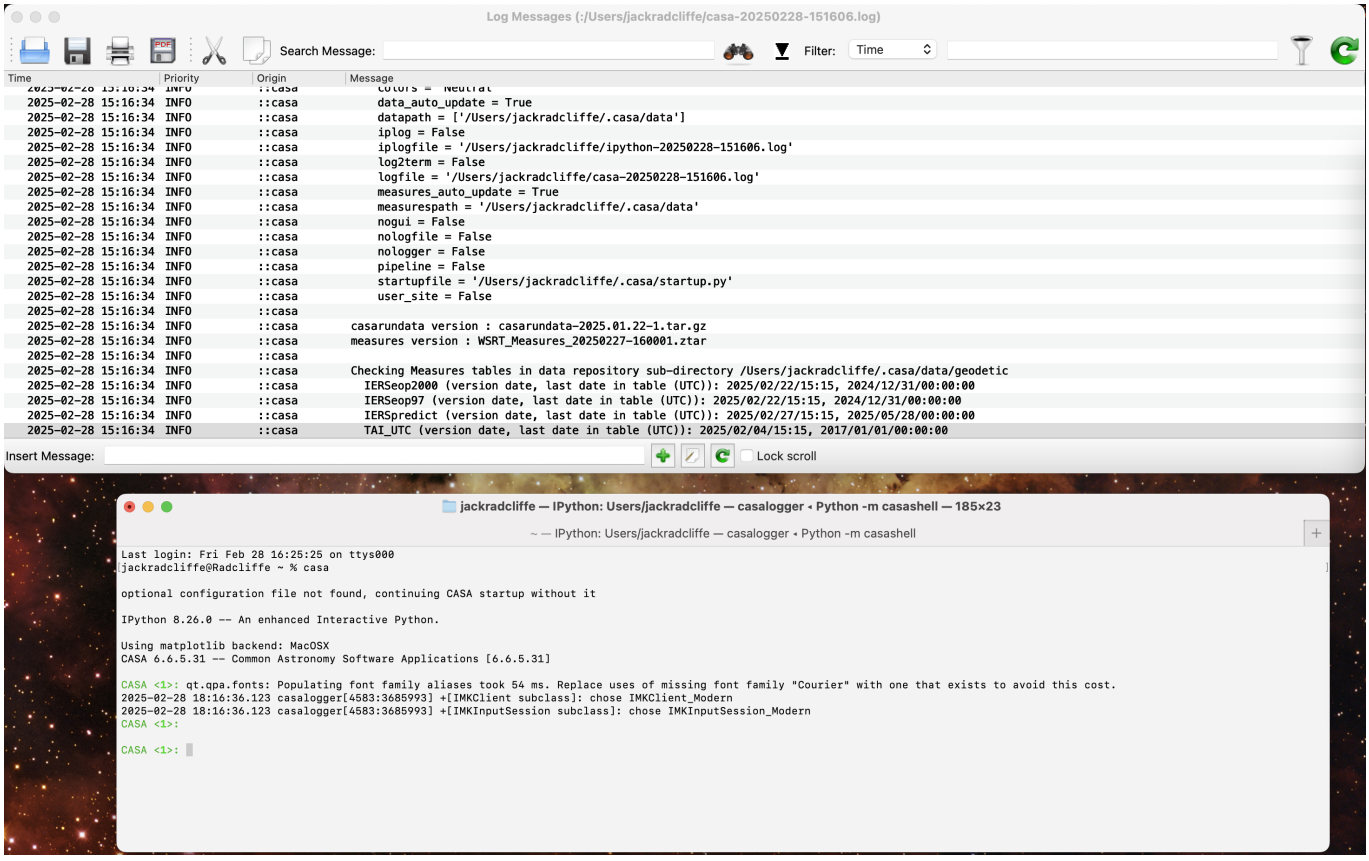

Figure 1: Starting CASA. Use tabs at the top of the logger to make the font bigger/smaller etc.

Copy the test data. `testdata.tgz` includes a small measurement set (MS; which contains the visibilities), a test script, and an image. This serves as an example, not the data you will use later. You can execute any Linux shell command in CASA by placing `!` before it. The final dot in the first line indicates that the

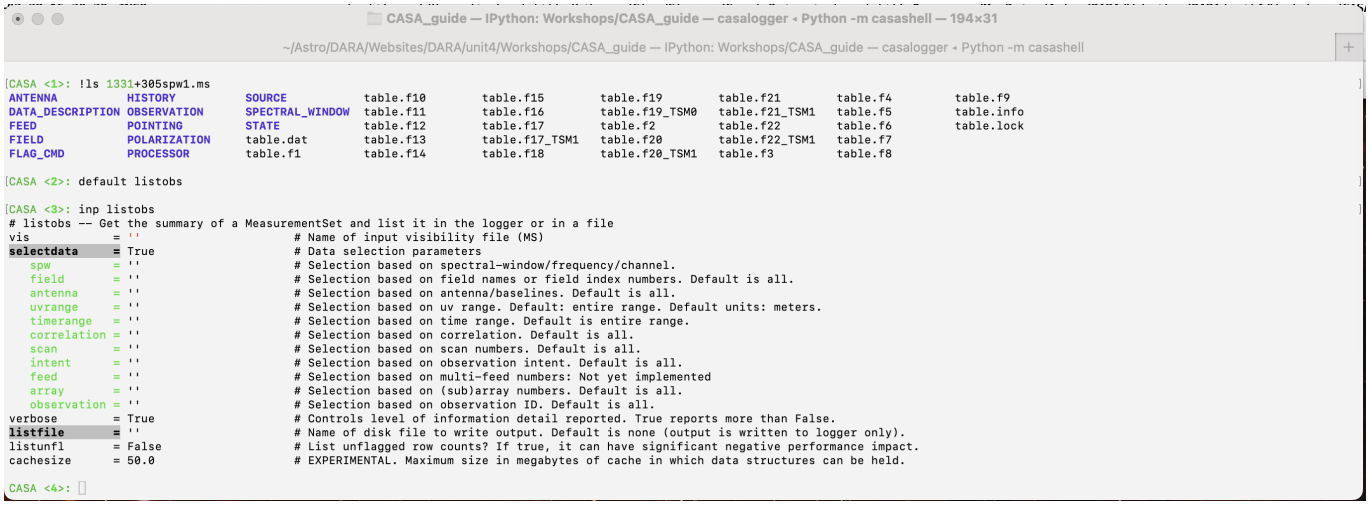

Figure 2: The format of a measurement set and the execution of a Linux command using `!` (top) along with a CASA task directly (bottom).

copy will go to the directory you are currently working in (pwd). The second line extracts the data from a compressed format, and the third line shows that an MS is simply a collection of directories (see Fig. 2).

```
!cp  [datapath]/testdata.tgz .
!tar -zxvf testdata.tgz
!ls 1331+305spw1.ms
```

You can also look at the inputs to a task:

```
default('listobs')
inp('listobs')
```

2 Checking tasks and plotting the measurement set

Enter the `listobs` parameters in the CASA terminal to obtain a file listing. In this case, all you need to do is change the file name. Next, enter the task name to execute it, and the output will appear in the logger (see Fig. 3):

```
vis='1331+305spw1.ms'
listobs()
```

You can plot what is in the MS using the task `plotms`. This demonstrates an alternative way to run a CASA task, designed for scripting. Don't worry about what the parameters mean for now; this is just to check that it is working. You should see the plotms window as shown in Fig. 4. If not, check the terminal and the logger; for example, is the file not found?

```
plotms(vis='1331+305spw1.ms', field='1331+305', xaxis='uvdist', yaxis='amp', avgchannel='128')
```

3 Running a script and plotting a calibration table

You can run a Python script with CASA commands like this. The first step is to show you what is in this small file; usually, you'd use a text editor in a separate window. This indicates that the calibration table `1331_precal.p1` should be written, which you should see when you use `!ls`:

```
!more testcal.py
execfile('testcal.py')
!ls
```

See Fig. 5 and check the logger and terminal for any error messages.

To plot the table and check again that plotms is working:

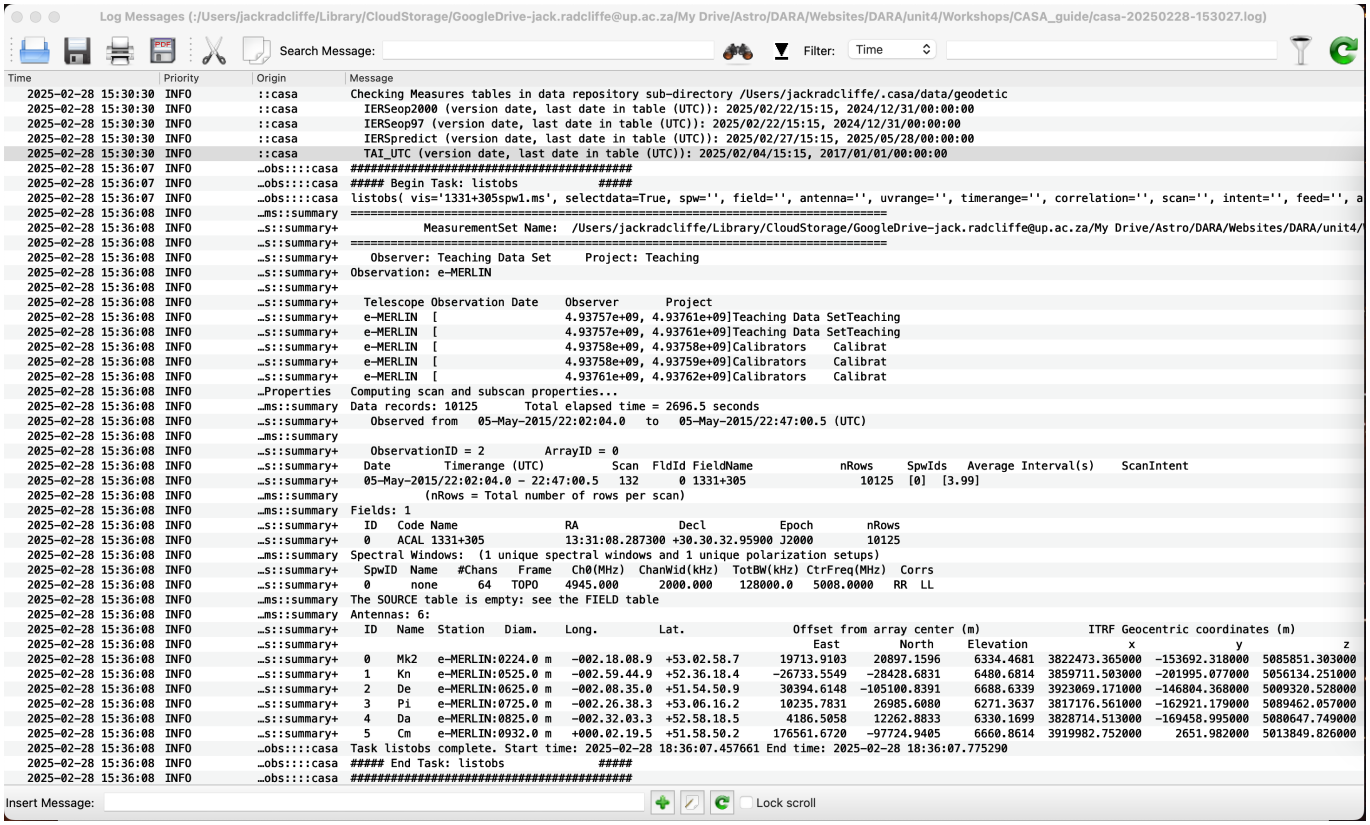

Figure 3: Displaying visibility dataset listing in the logger.

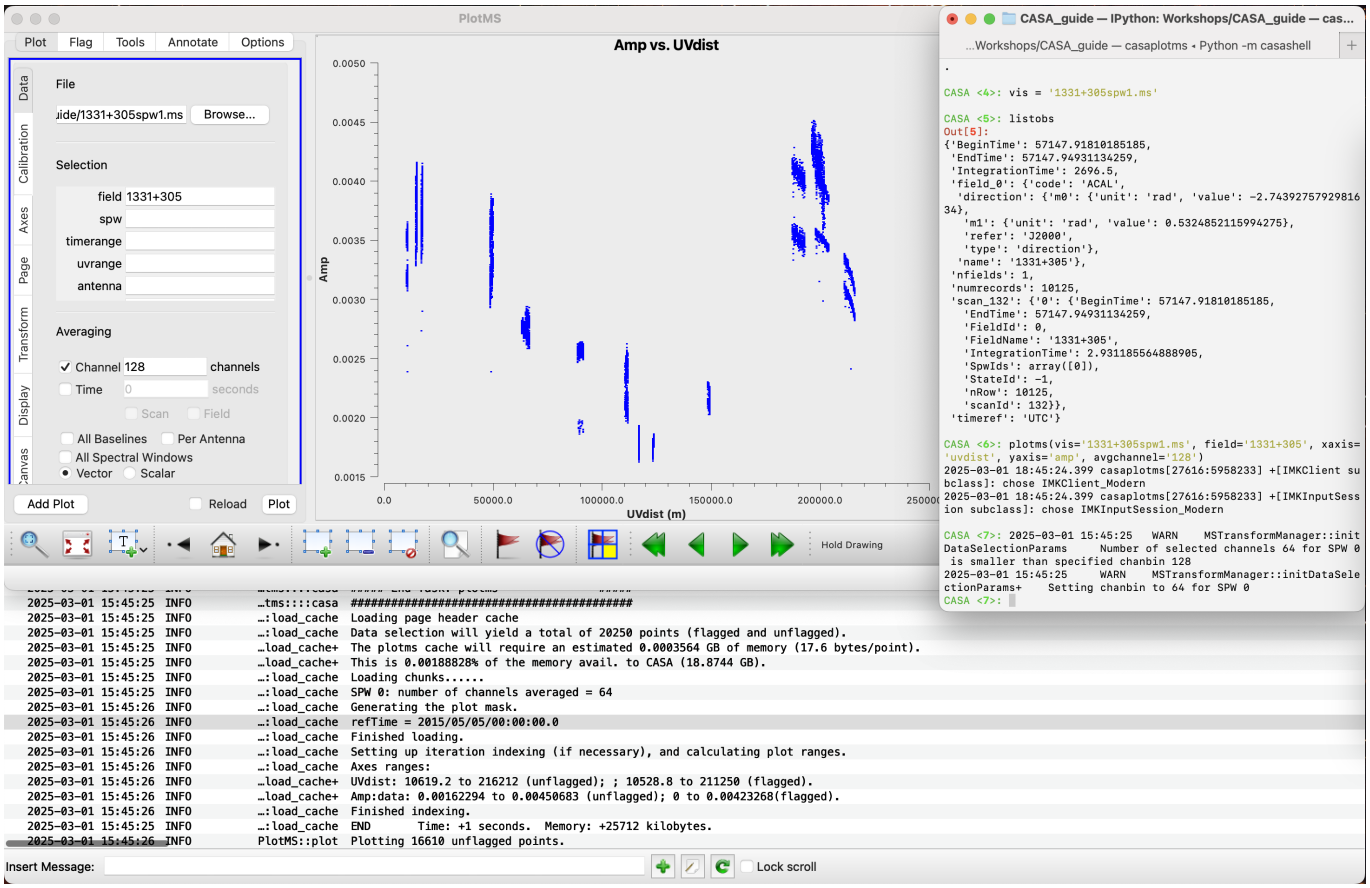

Figure 4: Starting the plotms window.

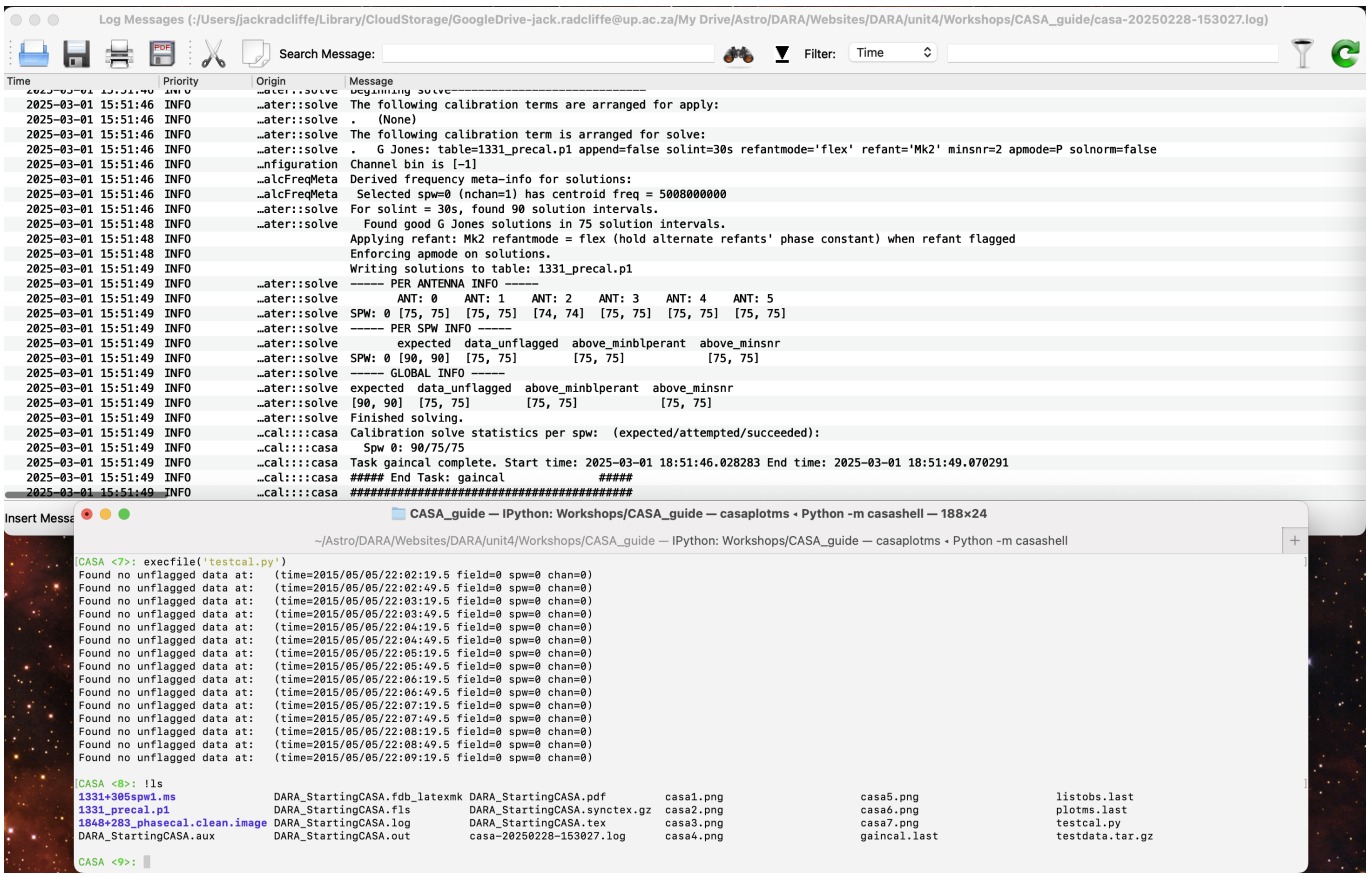

Figure 5: Running a script.

```
plotms(vis='1331_precal.p1',xaxis='time',yaxis='phase',
antenna='1,2,3,4,5',gridrows=2,gridcols=3,iteraxis='antenna')
```

Fig. 6 shows what you should see and illustrates one of the ways to fiddle with the plot.

4 Viewing and making images

If you list your directory (`!ls`) you will see an image named `1848+283_phasecal.clean.image`. CASA has in-built methods of looking at these images. These methods differ depending on your operating system.

If you are using Linux test the `viewer` using the following command:

```
viewer('1848+283_phasecal.clean.image')
```

If you have time, explore some of the other controls such as zoom regions etc. and check out what you can do with the top-row tabs, e.g. you could load the same image but as contours.

If you are using MacOS test the `casagui` using the following command:

```
from casagui.apps import run_iclean
run_iclean(vis='1331+305spw1.ms',imagename='test',specmode='mfs', niter=1,
           cell='0.05arcsec',imsize=[1024,1024],deconvolver='clark')
```

and your browser should open as shown in Fig. 8. Click the red cross to exit and everything should work. Note that you should have CARTA installed also, this can be used to look at the images.

5 Problems?

If any of the windows failed to appear or you could not make commands work, please consult the tutors. Please include as much detail as possible of what you were doing (e.g. the commands used, a directory listing) and any messages in the logger and terminal.

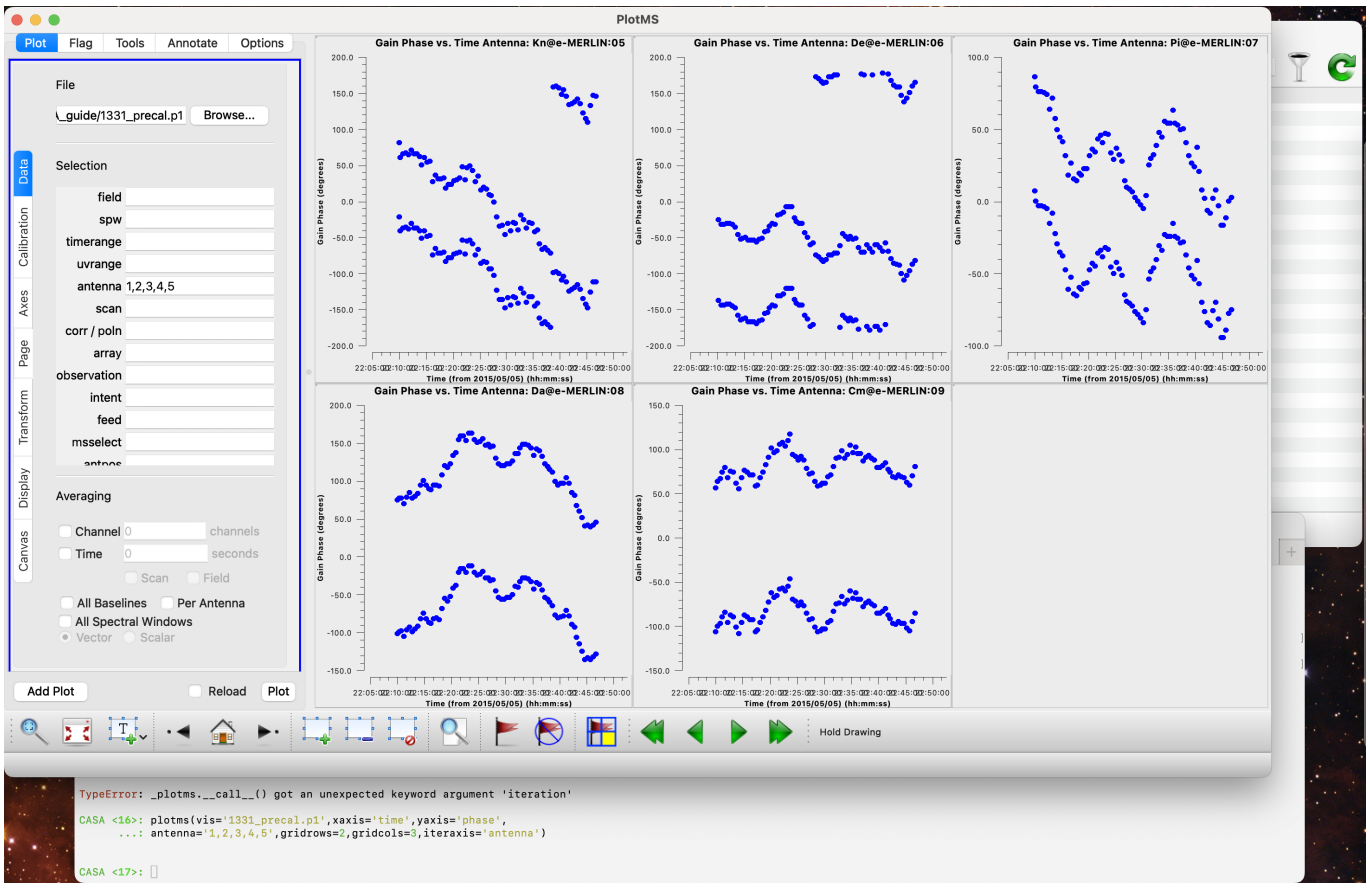

Figure 6: Plotting a calibration table and zooming in.

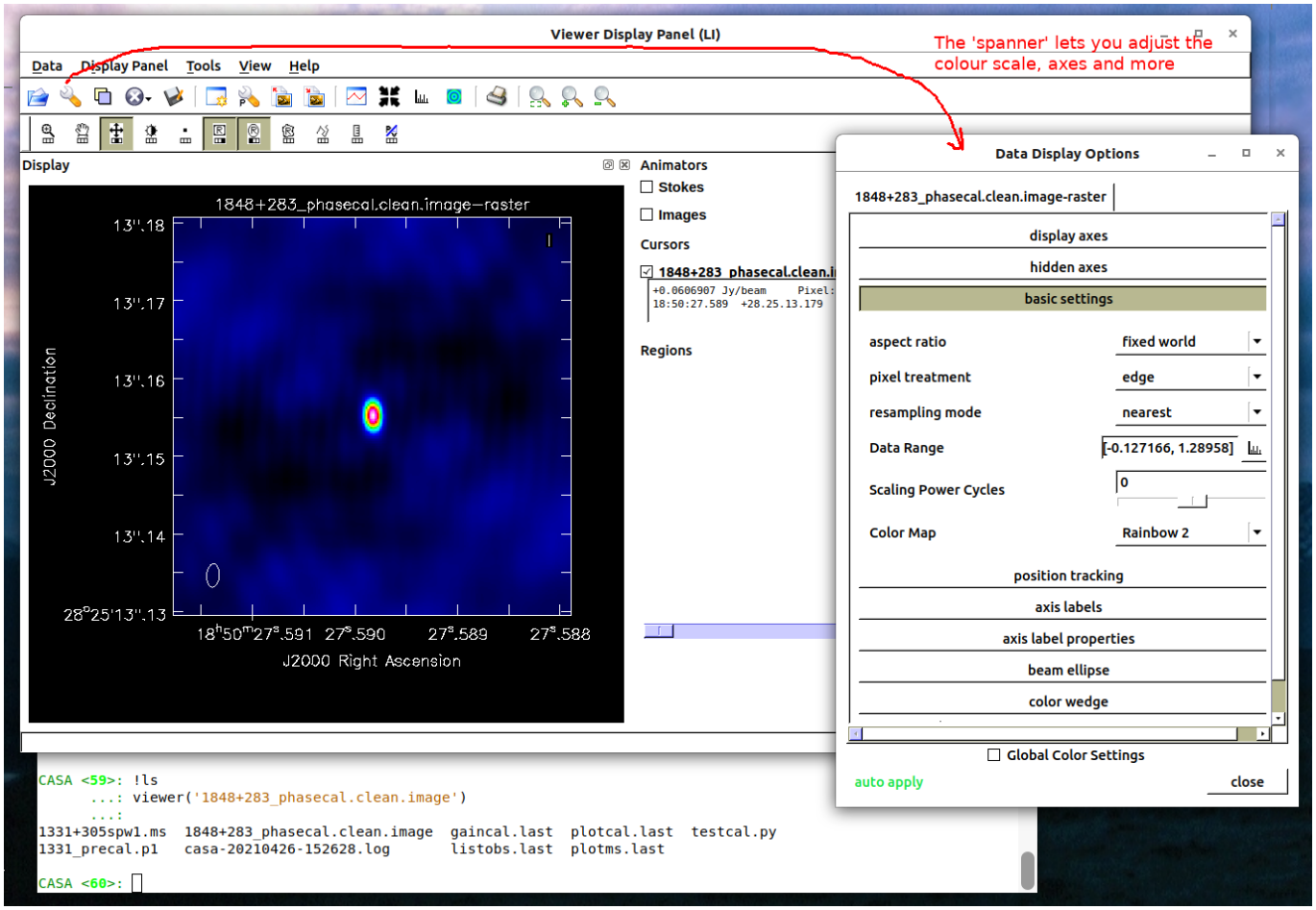

Figure 7: Using the viewer on Linux systems.

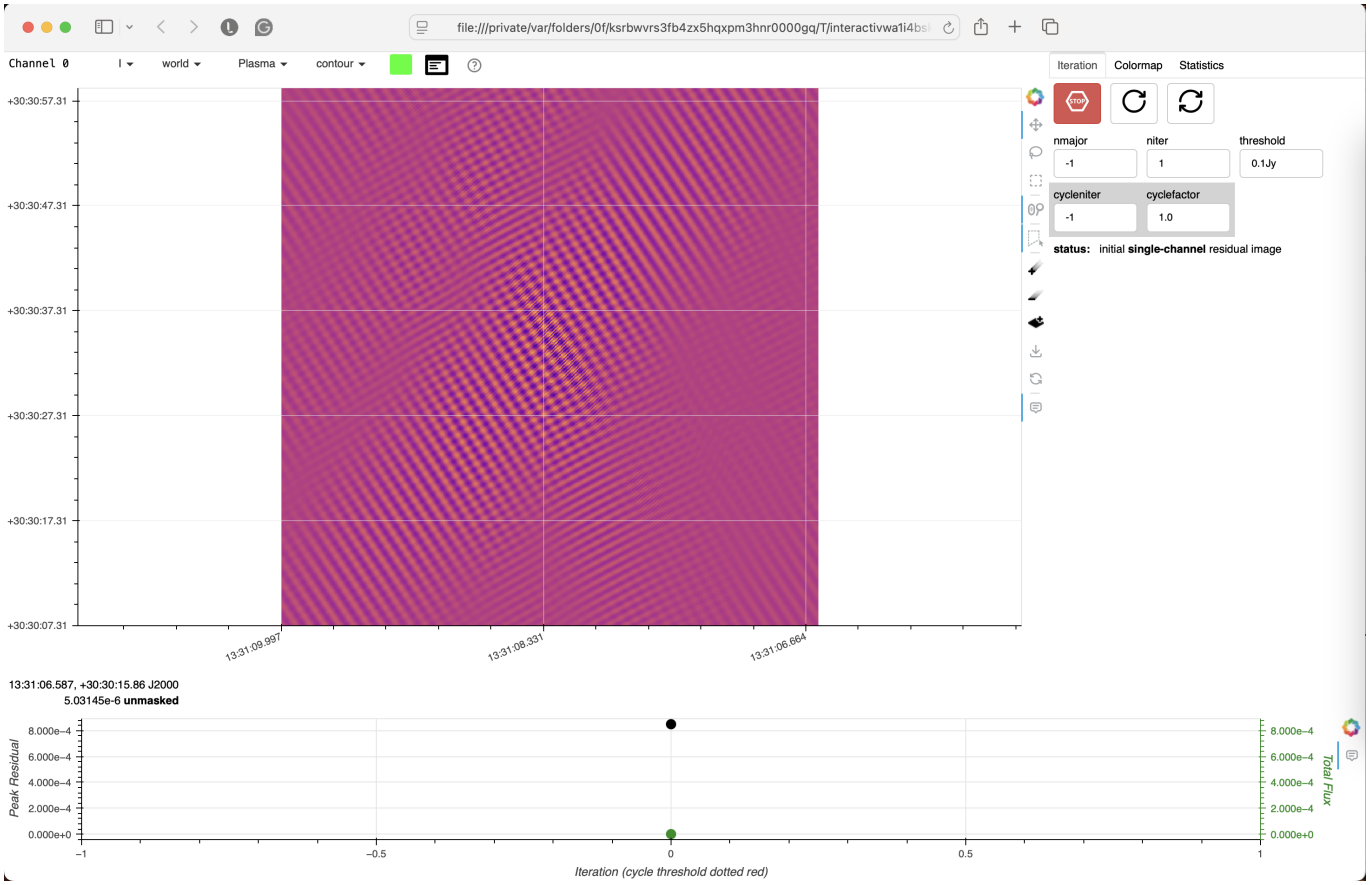

Figure 8: Using the casagui on MacOS systems.