JWST Proposal Planning Workshop, ETC Hands-On Activity
AAS 235, January 3rd, 2020, 10:45-12:15

"Copy and Modify" workflow

- I will choose to Work Anonymously because I don't care about saving these workbooks. If you would like to save these workbooks, make sure you Log In.
- Proceed to the Available Workbooks page.
- You can keep track of calculations for multiple projects using different workbooks. There are also options for creating example workbooks.
- Create a Sample or Example Science Program Workbook.
- Note the options on the far right to Copy and Delete.
- Make a copy of the example workbook. Note the name.
- Now delete the copy of the example workbook. Click OK on the pop-up.
- Create a blank workbook and Load it.
- In this new workbook, create a NIRCam SW Imaging calculation. Calculations of any type will return quickly in an unaltered workbook (no changes to a calculation or the scenes/sources).
- Highlight the calculation in yellow by clicking on it.
- Go to the Edit menu and select the Copy option. Note the different color around the checkbox.
- Now highlight the copied calculation and delete it. You can either use the Delete Calculation or Delete Marked Calculations option. The latter can be used to delete multiple calculations if the box next to the name is checked. Be careful: Delete Calculation operates on the currently highlighted calculation.
- Create another copy of calculation one; note that the number is now 3 even though calculation 2 was deleted.
- In calculation 3, change the filter on the Instrument Setup tab and recalculate.
- Now make a copy of calculation 3.
- Change the magnitude of the source on the Scene tab. This re-runs all the calculations because they use the same scene and source.
- Now go to the Scenes and Sources tab.
- Click on the scene: this highlights it in yellow and the available sources within that scene in green.

- Click on the source: now both are highlighted in yellow and green candy cane stripes. You can now edit the source. Note that the Source Editor provides all the same options as the Scene tab in the Calculation Editor pane.
- In the Edit menu, you can copy the scene and the source.
    - Copying the scene retains any sources within the original scene.
    - Copying the source creates a new source that is not contained within a scene.
- Let's copy the existing scene source, then add source 2 to the scene and remove source 1.
- Change something about the source, perhaps something on the Renorm tab. Click Save.
- Discuss the purple star. Click the star next to Scene 2.
- Go to the Calculations tab and create a new NIRCam SW Imaging calculation. Highlight the new calculation and note that on the Scene tab the "Scene for calculation" is now Scene 2.

User-supplied spectrum

- Lay out requirements:
    - Must be a file w/ *.dat*, *.txt*, or *.fits* extension
    - Only two columns allowed:
        - First column is wavelength in microns
        - Second column is flux density in mJy
    - The ETC will happily accept files with two columns in the wrong units and assume they are the correct units
    - Comments can be provided with "#" at the front of them
- Open text editor.
- First line: "# This is a poorly sampled spectrum"
- Second line: "1.0 2.3"
- Third line: "2.0 3.1"
- Fourth line: "3.0 3.3"
- Fifth line: "4.0 2.5"
- Sixth line: "5.0 1.8"
- Save the file as "test_spec.txt".
- In the ETC workbook, go to the Upload Spectra tab.
- Click the Choose File button and select the file.
- Click the Upload button.
- Note the pop-up asking if the units are correct.

- The file is now in the list and can be used for defining a source. Notes can be added by selecting the file and typing in the "Edit Notes" box.
- Spectra cannot be deleted once uploaded, but they can be overwritten. They will be included if you share the workbook with someone else.
- Now move to the Scenes and Sources tab.
- Create a new scene, "Upload Scene", and a new source, "Upload Star". Add the new source to the new scene.
- Click the purple star next to the Upload Scene.
- Select the uploaded spectrum on the Continuum tab.
- Select "Do not renormalize" on the Renorm tab.
- Create a MIRI imaging calculation.
- Now create a NIRCam SW Imaging calculation. Note that it returns immediately with a red X. Check out the Errors tab in the Reports pane. The default filter, F070W, does not overlap with the source spectrum so cannot be used. Changing the filter to F090W eliminates this issue. Make sure your spectrum covers the full wavelength range of the mode and setup you are planning to use!

Creating complex sources

- Create a new scene, "Galaxy Scene," and a new source, "Galaxy".
- Change the Continuum to "Galaxy spectra…" and choose NGC 4552. Set the redshift to z=2.
- Renormalize to ABmag=20 in NIRISS F200W.
- On the Shape tab, choose "Extended" and "Sersic (Effective Radius)".
- Set the semi-major axis to 0.5", the semi-minor axis to 0.25", and the Sersic index to 4. Click Save.
- There are 2 normalization choices for the spatial profile: Integrated Flux and Surface Brightness. The choice depends on how you would like to specify the flux density from the source.
- Leave Integrated Flux selected and go to the Renorm tab: values are in mJy.
- If Surface Brightness is selected, with square arcseconds, the Renorm tab values are now in mJy per sq. arcsec. The same is true for steradians.
- Uploaded spectra can be in units of mJy/sr or mJy/sq. arcsec, but surface brightness units must be properly specified when creating the source.

Batch Expansion

- Create a new workbook.
- Create a MIRI MRS calculation.
- Move to the Expand menu at the top of the page.
- Note the 5 options available. The top 2 options are available for all calculations. The bottom 3 are unique to MIRI MRS calculations.
- For the MRS, there are 12 combinations of Channels and Wavelength Ranges. Expanding over Channels will create 3 new calculations for the same Wavelength Range (either Short, Medium, or Long). Expanding over Wavelength Ranges will create 2 new calculations for the same Channel (1, 2, 3, or 4). If you want to find out more about the MIRI MRS, please attend the IFU Splinter Session on Sunday at 9:30-11:30 AM in room 307 B.
- Let's select the option to expand over both Channels and Wavelength Ranges, creating calculations for all 12 combinations, covering 5-28 microns.
- All calculations will use the same source; have the same parameters for the Background, Detector Setup, and Strategy; and have valid values for the Wavelength of Slice so that you don't have to change them on your own. Note that in the past you would have had to create each of these calculations individually and update the Wavelength of Slice for each calculation.
- When the calculations complete, use the check icon to select all calculations and view the SNR plot.
- Now create a NIRCam SW Imaging calculation. Go to the Expand menu and choose the Expand over Filters option. Note the wavelength values for all the calculations.
- Now use the check icon to delete all calculations.
- Create a MIRI Imaging calculation. Go to the Detector Setup tab and change the number of groups to 10. Click Calculate.
- Expand over groups starting from 10, in steps of 10, for 10 iterations.
- Make sure the original calculation is still selected and expand over integrations starting from 1, in steps of 1, for 10 iterations.
- Check all calculations and view the SNR (time) plot. Note the two different curves. The lower curve is increased integrations, while the higher curve is increased groups. This is a demonstration of how increasing the number of groups, rather than the number of integrations, increases the SNR at a faster rate.

Warnings and Errors

- Let's explore some common warnings and errors in the ETC.
- Create a new scene and source, and place the source within the scene. Renormalize the source to 10 mJy. Click the purple star next to this scene.
- Create a MIRI Imaging calculation.
- Note the orange exclamation point. Go to the Warnings tab in the Reports pane to see that there was partial saturation.
- Now move to the Reports tab and find the "Maximum Number of Groups Before Saturation" quantity. This is the lowest value in the Groups Before Saturation image in the Images pane.
- Now change the source brightness to 50 mJy. Go back to the Warnings tab and see that full saturation is now occurring. Some pixels are black in the Groups Before Saturation image. These same pixels are red in the Saturation image.
- Now go to the Strategy tab for this calculation.
- Change the Aperture Radius to 0.5" and leave the Sky Annulus values unchanged. A red X will appear.
- Go to the Errors tab in the Reports pane to see that the error is that the aperture radius extends into the background region.
- Change the background region to 0.55" to 0.6" and renormalize the source to 0.1".
- There is still a warning even though saturation is no longer occurring. It is recommended that the background region be larger than the extraction region for statistical reasons.
- Now create a NIRISS TA calculation.
- Note that the Warning is for an SNR<30. NIRCam and NIRISS recommend TA observations achieve an SNR of 30; MIRI and NIRSpec recommend 20. Inadequate SNR may cause TA to fail.
- Now create a MIRI MRS calculation.
- There are 2 extraction strategies for MRS and NIRSpec IFU calculations: Nod In Scene and Nod Off Scene (show on Strategy tab when completed).
- The default is Nod In Scene. Change this to Nod Off Scene and note the red boxes and text.
- The ETC can only keep track of the Wavelength of Slice for one strategy, so switching to a new strategy resets this value to a default of 1 micron, even if it is not valid for the observing mode.

- This value can be changed by hand to a valid entry on the Strategy tab (valid range is provided in parentheses) or by going to the Instrument Setup tab and clicking the “fix it for me” button.

Sharing workbooks

- Return to the Available Workbooks page.
- Select one of the workbooks created during this activity by clicking on it. It should now be highlighted in yellow.
- On the bottom half of the page is the list of users with access to the workbook.
- Workbooks can only be shared with users who have MyST accounts.
- Share the workbook with etc.master7@gmail.com by typing this email address into the User Email box and clicking the Add User by Email button.
- The different permissions are:
    - *Read*: Read-only access, the user cannot make changes to the workbook but can view its contents.
    - *Write*: The user can make changes to the workbook.
    - *Grant*: The user can share the workbook with others.
    - *Revoke*: The user can remove access of the workbook from others.
- Uncheck the box for Read privileges from the user you just shared the workbook with. They disappear from the list.
- Now try to remove Grant or Revoke access from yourself. Note the pop-up that asks if you really want to do this. Revoking any access from yourself is not recommended.

Thank you for participating in the hands-on activity! We will now move to the open question period. I will be available at the booth throughout the week in case you have additional questions.