

ExoVista Tutorial Task List

Prerequisites:

- For this tutorial, you should have installed ExoVista and wget.
- This tutorial is intended to be done in a command line environment, e.g. Terminal in Mac or Linux, or Command Prompt in Windows.
- You should begin this tutorial in the main ExoVista/ directory.
- You can learn more about ExoVista's formats and features in the User Guide.

Task 1: Create a single planetary system scene using ExoVista with the `ExoVistaSystem.py` script.

1. Open the `solar_system.dat` input file in your preferred text editor. Note the three sections for star, planet, and disk properties.
2. This input file is designed to recreate our Solar system. We want to change it to create a distinctly different system, and to avoid filename conflicts.
 - a. In the Star section, change the value for ID to 998.
 - b. Change the value for TYC2 to SUNv2.
 - c. In the Planets section (note that the planets are listed in order of orbital distance), change the eccentricity for Earth to `0.500`.
 - d. Change the inclination of Mars to `181.85061` (making it retrograde).
 - e. Change the radius of Venus to `11.209` (making it equal to Jupiter). Do **not** change its mass.
3. Use ExoVista to create a scene for this new solar system, using the script for single systems. (This will take several minutes.) Command:

```
python ExoVistaSystem.py solar_system.dat
```

4. Look at the `ExoVista/output/` subdirectory. There should be a new FITS file there beginning with "998"
 - a. If this failed due to problems with the input file, a working build of the new input file has been provided, named `solar_system_tutorial.dat`. You may rerun the above command with this file:

```
python ExoVistaSystem.py solar_system_tutorial.dat
```

5. Visualize the output file with the provided "readfits" script. Command:

```
python readfits.py
```

- a. Enter option 0. (This will work with the new file you created, or with the provided example file if running ExoVista was unsuccessful.)
- b. In addition to the plots, note the statement about transits and eclipses on the command line.

Task 2: Create a universe of planetary systems using ExoVista with the `ExoVista.py` script.

1. Open the `ExoVista.py` script. We will make two changes to speed up the code execution.
 - a. In the line that begins “`settings = Settings.Settings...`” change the `timemax` parameter to `1.0`. (This will shorten the orbital integration baseline.)
 - b. In the same function, add the new parameter `diskoff=True`. (This will skip the calculation of the disk flux.)
2. Run ExoVista to generate a batch of planetary systems. (This should take between half a minute and a few minutes, depending on the random draw of planets.) Command:

```
python ExoVista.py
```

3. Look at the `ExoVista/output/` subdirectory. There should be seven new FITS files labeled 0 through 7 (excluding 1, which is automatically cut because the star is off the model grid).
4. You may visualize these files using `readfits`, the same as before. (Note that the disk will be absent.)

Task 3: Downloading existing data products from EMAC.

Note: the server has been unreliable of late. If it does not return usable files (or any files), try again later.

Note: the interface on the server is planned to have an overhaul in the near future.

1. Go to <https://tools.emac.gsfc.nasa.gov/exovista/>
2. Recommended: read the instructions on the webpage.
3. Download a target list file.
 - a. Select the first “`target_database.csv`” file in the list.
 - b. Click “Download Selected File” in the sidebar.
 - c. Move the downloaded file to your `ExoVista/output/` directory.
 - d. You may inspect this file in Excel or a similar editor and filter on different types of planets.
4. Download a wget list to download multiple FITS files.
 - a. Select the first five FITS files on the list, labeled 1000 through 1009. Do **not** select an entire folder.
 - b. Click “Download wget List” in the sidebar. This will download a text file called “`selected-files`”
 - c. Move the downloaded file to your `ExoVista/output/` directory.
5. Alternatively, copy the filenames from the far-right column of the target list file to a text file to generate a wget list with the same format.
6. Download a batch of FITS files.
 - a. Go back to your Terminal or Command Prompt.
 - b. Navigate to `ExoVista/output/`

- c. Run wget to download the files. Command:

```
wget --input selected-files
```

- 7. You may visualize these files using readits, the same as before.
 - a. Note: the outputs for these files will be slightly different because they were created with ExoVista 1. Most notably, they will not include transit times.