**(Hopefully) Everything you need to know to run Keri’s H2 protoplanetary disk models:**

**Files/packages you will need:**

Languages/packages:  
IDL, python  
IDL packages – astron, coyote  
Python packages – matplotlib, numpy

Files:  
disk\_profile\_v2.pro  
grid\_disks\_v2.pro  
grid\_from\_radius.pro  
h2models\_v\_cosdata\_chisqr\_v2.pro  
keri.py

What do each of the files do?

**disk\_profile\_v2.pro** – The main program. The first half of the program is defined functions called upon later in the body of the program. The main program will call on grid\_disks\_v2.pro to describe the physical H2 disk, and the rest of the program determines the statistical population levels of H2 and how they respond to the input LyA radiation field. Outputs include: Flux per H2 emission line; disk parameter defined for the run; number density of H2 in the atmosphere created; optical depth of H2 in the atmosphere… NOTE: This can take a long time to run, but it has sped up to about 1 model per second. I do a lot of matrix math to help keep this program fast, so if you have any questions about what is happening, let me know.

**grid\_disks\_v2.pro** – Sets up the physical disk model, including laying out the density of H2 at a defined scale height above the disk midplane and the temperature distribution as a function of disk radius of H2

**grid\_from\_radius.pro** – Defines the disk grid created to analytically determine/extrapolate H2 density/temperature/flux through the disk. Because the entire model run can be very long, this is set to log scale to limit the grid size to ~ 100, instead of > 1000 grid points per phi (angular) point in the disk.

**h2models\_v\_cosdata\_chisqr\_v2.pro** – This is my program that calculates how well the modeled emission lines fit to the data (in velocity space!). It calculates a reduced chi-squared statistic per model. I chose to compare all emission lines considered from a given H2 progression simultaneously, to best determine the flux field of a single progression over the disk radius. You can choose to do this analysis differently: for my Comps II, I fit each individual emission line separately; you can choose to fit all emission lines, regardless of progression, simultaneously. Just know that the more you stop down your degrees of freedom, the worse the fits will be. If you decide to run a rough parameter grid for the models and then make the grid finer, given which models seems to fit best to the data, you may make this work, though.

**keri.py** – A simple representation of what the H2 density structure in the disk looks like. I added arrows and text for my paper, to show how the radiative transfer works, so you can take that out and just play around with the parameters in the program, just to get an intuition of how changing certain parameters will affect the disk structure (PROBABLY IMPORTANT FOR COMPS II).