Stellar Atmospheres in Cloudy

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Stellar Atmospheres in Cloudy (1)

Cloudy allows you to incorporate a set of spectral energy distributions (SEDs), interpolate between the models, and use the result as input for your simulations.

- This was originally set up for grids of stellar SEDs, such as the Kurucz ATLAS models.

- The grid can have up to 4 dimensions, typically including T_{eff} and log(g), but possibly also metallicity, mass loss rate, or other parameters.

- Several popular grids are available for download from the Cloudy web site (see next slide).

- After downloading, the ascii file needs to be uncompressed and compiled into binary form for efficient use.

- The binary SED module is in principle platform dependent, but should in practice work on all modern Intel/AMD compatible hardware.

- The binary SED module is already binned on the Cloudy frequency mesh. So if you alter the Cloudy frequency mesh, you need to recompile the binary SED module if you want to use it.

Stellar Atmospheres in Cloudy (2)

Available at: http://wiki.nublado.org/wiki/StellarAtmospheres

You don't need to download all the files! Simply choose what you need, or skip all of them if you don't need them. Adding files later is also easy.

If you use one of these grids in a publication, cite the original author!

Stellar Atmospheres in Cloudy (3)

- Available are Kurucz grids (LTE, plane-parallel), Tlusty O & B stars grids (non-LTE, plane-parallel), various grids of PN central star SEDs by Thomas Rauch (non-LTE, plane-parallel), and two small grids of non-LTE wind-blanketed models (CoStar and WMbasic).

- You can also include grids of other types of SEDs this way! Most notably this is the case for stellar population synthesis models such as Starburst99 models. Such grids typically have either one dimension (age only) or two dimensions (age and metallicity).

- You can create your own atmosphere grids. The syntax of the file is pretty simple and is described in appendix B of Hazy 1. But beware that all the individual SEDs need to be on the same frequency mesh!

- This is convenient if you want to interpolate between various SEDs. Once the ascii file is created and compiled, the interpolation will be done automatically.

- The command **table star available** will list all the grids you have installed (this only includes standard grids from the Cloudy site).

- The command **table star <grid> list** will list all the models included in a single grid.

Stellar Atmospheres in Cloudy (4)

- The binary atmosphere files need to be stored in the data directory.

- The **table star available** command will show the syntax to use in your sim.

- If you want to keep the standard data directory clean, you can use a custom search path to add local data directories. See:

  https://nublado.org/wiki/EditPath

  for more detail.

- **In C19 things will change!** The behavior of the search path will change, allowing SED grids to be stored in the local data directory. Interpolation will be done directly on the ascii file and the binary SED modules will be abandoned. Compiling ascii file is still possible (albeit optional) to speed up reading very large grids. The compiled files do not depend on the frequency mesh any longer.