SED (Spectral Energy Density) models in the Catalogs Simulation Framework

The package sims_sed_library provides simulated spectral energy distributions (SEDs) for objects in the LSST database. After running

```
source loadLSST.sh
setup sims_sed_library -t sims
```

to set up the stack, the user can find the directory containing this library in the environment variable $SIMS_SED_LIBRARY_DIR. This directory is divided into several sub-directories containing SED models for different classes of objects. We briefly summarize the contents of each of these directories here.

To see a discussion of system throughputs and response curve models, see this page.

agnSED/

The agnSED/ folder contains the SED for our AGN model.

cepheid_lc/

The cepheid_lc/ folder contains models for the variability of Cepheid variables. These files show the change in magnitude in each of LSST's six filters (the second through seventh columns of the file) as a function of phase (the first column of the file). These files are used by the method applyCepheid in Variability.py in sims_photUtils

eb_lc/

The eb_lc/ folder contains models for the variability of eclipsing binary stars. See the discussion of cepheid_lc/ above. These files are used by the method applyEb in Variability.py in sims_photUtils

flatSED/

The flatSED/ folder contains an SED for which the flux as a function of frequency is linear.

galaxySED/

The galaxySED folder contains models for galaxy bulges and disks. SEDs in the galaxySED folder come from the Bruzual & Charlot models with the Chabrier (2003) IMF and are calculated based upon 4 different star formation histories:

- Burst: An extended period of time during which star formation occurs and then stops afterwards.
- Constant: Star formation at a constant rate throughout the galaxy's lifetime
- Exp: Exponentially declining star formation with an e-folding time of 1Gyr
- Instant: One single, instantaneous burst of star formation

With each of these star formation histories the ages of the galaxies come in 40 different age steps between 1.585 Myr and 12.5 Gyr. Furthermore at each age they are available at 6 different metallicities which use the Padova 1994 isochrones from Z=0.0001 - 0.05 where solar Z is set at Z = 0.02.

mflare/

The mflare/ folder contains files that encode the variability of flaring M dwarf stars. In this case, unlike the files in cepheid_lc/ and eb_lc/ above, the first column is an absolute time axis in days (rather than in the phase of some period). The second through seventh columns are still changes in magnitude for each of LSST six filters. These files are used by the method applyMflare in Variability.py in sims_photUtils

microlens/bh_binary_source/

The microlens/bh_binary_source/ folder contains files like lc_14_25_75_8000_0_.6_32 which are light curves for magnification due to microlensing by black holes. The first column of the file is the time in years. The second column is the multiplicative factor by which flux is increased. The third, fourth, and fifth columns are not used. These files are used by the method applyBHMicrolens in Variability.py in sims_photUtils.

rrly_lc/

The rrly_lc/ folder contains two sub-folder: RRab/ and RRc/. These each contain light curves for the variability of RR Lyrae stars. As with cepheid_lc/, these files contain data specifying how much the star's magnitude increases or decreases in each of LSST's six filters as a function of periodic phase. These files are used by the method applyRRly in Variability.py in sims_photUtils

ssmSED/

The ssmSED/ folder contains SED models for solar system objects.

starSED/

The starSED/ folder contains SED models for stars. These SEDs are further divided into sub-directories as follows

gizis_SED/

The .dat versions are the originals from John Gizis in Mar 2011. K. Krughoff modified these on Mar 28 2011 as follows:

- Converted wavelength from angstrom to nanometers
- Interpolated and rebinned to 1nm from 300nm to 1200nm inclusive
- In the cases of RedE1 and RedE2 converted from lambda*f(lambda) to f(lambda)
- Normalized spectra to unity at 500nm wavelength bin.

The interpolated spectra are in *_interp.dat

kurucz/

The kurucz/ sub-folder contains models from the Kurucz 1993 stellar atmospheres atlas. The files have names like:

km30_5250.fits_g00_5270.gz

The naming convention is as follows:

- The letter and number after the 'k' denote the logarithmic metallicity relative to solar. km30 means that log(Z/Z_solar) = -3.0. kp25 means that log (Z/Z_solar) = +2.5
- The next number is the effective temperature of the lower Kurucz model used to interpolate the effective temperature (we desired models that sampled T on a finer grid than provided by Kurucz). In the model above, the effective temperature is 5270 K, and it was interpolated from a model at 5250K and a model at 5500K.
- The number after the g denotes the log of the surface gravity (g00 means log(g) = 0, g15 means log(g)=1.5)
- The final number is the effective temperature of the model

mlt/

The mlt/ sub-folder contains SED models for MLT dwarfs.

wDs/

The wDs/ sub-folder contains SED models for white dwarfs. These models come from Bergeron. The files have names like:

bergeron_6000_65.dat_6100

As with the Kurucz models, the last number is the effective temperature. The first number is the lower of the two effective temperatures used to interpolate the model. The middle number is the log of the surface gravity. For example, the model named above has an effective temperature of 6100 K, a log(g) of 6.5 and it was interpolated from two models, the coolest of which had an effective temperature of 6000 K.

Helium white dwarfs are denoted as bergeron_He_####_##.dat_####

Return to the main catalog simulations documentation page