Format for sd_sd2m_l∗.dat Data Files

The data are listed as one line per star, with each line containing the following quantities:

- **ra1 dec1:** right ascension and declination (J2000.0) in decimal degrees, as measured by SDSS

- **run:** SDSS observing night identifier

- **iso:** *isolated* source flag; set to 1 if this object is a single CHILD of its PARENT

- **rext:** the value of the r band ISM extinction from the SFD maps

- **u g r i z:** SDSS photometry (not corrected for the ISM extinction)

- **uerr gerr rerr ierr zerr:** SDSS photometric errors

- **bmod:** the best-fit SED model from the Covey et al. (2007) Table 1 (an SDSS-2MASS high galactic latitude sample parametrized by the $g - i$ color into 228 steps along the main stellar locus); *the fit is based on SDSS photometry only*

- **bar:** the best-fit r band extinction

- **bchi2:** the best-fit χ^2 (per degree of freedom)

- **a, b, c:** the best-fit parameters for ellipsoidal approximation to the χ^2 surface (see below)

- **ellchi, elldf:** total χ^2 and χ^2 per degree of freedom for best-fit ellipsoidal approximation to the true χ^2 surface

- **gi:** the $g - i$ color for the best-fit SED

- **dist:** distance (pc) computed using the above $g - i$ color, extinction-corrected r band magnitude, and expressions for $Mr(g - i, [Fe/H])$ from Ivezić et al. (2008), with $[Fe/H] = -0.4$. These expressions are valid *only* for main sequence stars. For example, giants will have badly underestimated distances (and they can be seen as such in **bar** vs. **dist** plots made for small sky regions).

- **ra2 dec2:** 2MASS position

- **delta:** distance between SDSS and 2MASS positions (arcsec)

- **j h k:** 2MASS photometry. Original 2MASS values are placed on AB scale following Finlator et al. (2000): $J_{AB} = J_{2MASS} + 0.89$, $H_{AB} = H_{2MASS} + 1.37$, $K_{AB} = K_{2MASS} + 1.84$. Note that colors tabulated in Covey et al. use original 2MASS magnitudes (on Vega scale).

- **jerr herr kerr:** 2MASS photometric errors

- **bmod2:** the best-fit model from the Covey et al. Table 1 *for the fit based on SDSS and 2MASS photometry*

- **bar2:** the best-fit r band extinction

- **bchi22:** the best-fit χ^2 (per degree of freedom)

- **a2, b2, c2, ellchi2, elldf2, gi2, dist2:** analogous to (a, b, c, ellchi, elldf, gi, dist), except here for the SDSS-2MASS based best fit

The best-fit SED and A_r are found by searching for the minimum χ^2 among 228 Covey et al. SEDs and 500 values of A_r (0–10 range with 0.02 mag steps). Once the minimum χ^2 is located, χ^2_{min}, an ellipse is fit to the section of the χ^2 surface defined by $\chi^2 < \chi^2_{min} + 6.17$ (i.e., within 2σ deviation for 2 degrees of freedom):

$$\chi^2(m, A_r) = a(m - m^*)^2 + b(m - m^*)(A_r - A_r^*) + c(A_r - A_r^*)^2 \tag{1}$$

were m is the model index, and m^* and A_r^* are the values corresponding to χ^2_{min}. Using the best-fit parameters a, b and c, the (marginalized) model and A_r errors can be computed from

$$\sigma_m = \left(a - \frac{b^2}{4c}\right)^{-\frac{1}{2}} \tag{2}$$

$$\sigma_A = \left(c - \frac{b^2}{4a}\right)^{-\frac{1}{2}} \tag{3}$$

The χ^2 surface for stars with $\chi^2_{min} > 200$ is not fit with an ellipse and such stars are instead marked as bad fits (can be recognized by $\chi^2_{min} > 200$, error code for other parameters is 9999).