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Theoretical isochrones in several photometric systems

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Abstract. We present a database of theoretical isochrones in several photometric systems, including Johnson-Cousins-Glass, HST/WFPC2, HST/NICMOS, Washington, and ESO Imaging Survey systems (this latter consisting on the WFI, EMMI, and SOFI filter sets). Bolometric corrections are derived from a extended and updated library of stellar intrinsic spectra. Several sets of Padova isochrones are converted into the different photometric systems, thus providing a useful database for many astrophysical applications. All data files are made available in electronic form at `http://pleiadi.pd.astro.it`.

Key words. stars: evolution – stars: fundamental parameters

We started a large project aiming to provide updated theoretical isochrones for a wide variety of photometric systems (Girardi et al. 2002). In order to derive the tables of bolometric corrections, we perform synthetic photometry on a spectral library covering a very wide range of the $\log T_{\rm eff}$ – $\log g$ – [M/H] space:

– The basic spectra are from Kurucz ATLAS9 non-overshooting models (Castelli et al. 1997; Bessel et al. 1998), complemented with:
– Blackbody spectra for $T_{\rm eff} > 50\,000$ K;
– Fluks et al. (1994) empirical M-giant spectra, extended with synthetic ones in the IR and UV, and modified shortward of 4000 Å so as to produce reasonable $T_{\rm eff}$–$U-B$ and $T_{\rm eff}$–$B-V$ relations for cool giants;
– Allard et al. (2000) DUSTY99 synthetic spectra for M, L and T dwarfs.

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For the moment, the following photometric systems have been considered:

- Johnson-Cousins-Glass *UBVRIJHK*, using filter response curves from Bessell & Brett (1988) and Bessell (1990);
- ESO Imaging Survey filters: WFI *UBVRIZ* + SOFI *JHK* + EMMI *Bw,Vw,R,Rw,Iw*;
- HST/WFPC2, for most broad-band filters;
- HST/NICMOS, for F110W, F160W, and F205W;
- Washington CMT_1T_2;

whereas others are in preparation:

- Sloan Digital Sky Survey *u'g'r'i'z'*;
- Thuan-Gunn *uvgr*;
- Hipparcos-Tycho, MACHO, etc.

When relevant (e.g. for HST/WFPC2 + NICMOS), magnitudes are provided in all VEGA, AB and STmag systems.

The entire set of Padova isochrones is converted into magnitudes and colours using these bolometric correction tables. Isochrones derive from the usual tracks computed with convective core overshooting and solar-scaled chemical compositions (Bertelli et al. 1994 and references therein; Bressan et al. 1993; Fagotto et al. 1994a,b; Girardi et al. 1996; Girardi et al. 2000), and also for α-enhanced (Salasnich et al. 2000), zero-metallicity (Marigo et al. 2001), and improved TP-AGB tracks (Marigo & Girardi 2001).

The complete database is available on web[1], and it contains:

- Tables of bolometric corrections for each metallicity and filter, and as a function of stellar $T_{\rm eff}$ and $\log g$. Metallicities are [M/H] = −2.0, −1.5, −1.0, −0.5, 0, +0.5.
- Tables of isochrones: they include all metallicities, cases, and photometric systems above indicated.
- Tables of integrated magnitudes and colours of single-burst stellar populations, in each pass-band, as a function of age.

[1] `http://pleiadi.pd.astro.it`

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