Catalogue of UV sources in the Galaxy

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Context

The Galaxy Evolution Explorer (GALEX) has produced the largest photometric catalogue of ultraviolet (UV) sources. As such, it has defined the new standard bands for UV photometry: the near UV band (NUV) and the far UV band (FUV). However, due to brightness limits, the GALEX mission has avoided the Galactic plane which is crucial for astrophysical research and future space missions.

Aims

The International Ultraviolet Explorer (IUE) satellite obtained 63,755 large aperture ($10 \times 20''$) spectra in the low dispersion mode ($\lambda/\delta\lambda \sim 300$) during its 18 years lifetime. We have derived the photometry in the GALEX bands for stellar sources in the IUE Archive to extend the GALEX data base with obsevations including the Galactic plane.

Methods

Good quality spectra (spectra with less of a 10% of bad pixels, average flux three times bigger than the average flux error and LW spectra with S/N $>$ 10 in $1975 - 2375$Å range) have been selected for the IUE classes of stellar sources.
The GALEX FUV and NUV magnitudes and errors have been computed usin the GALEX transmission curves, as well as the conversion equations between flux and magnitudes provided by the mission (galexgi.gsfc.nasa.gov):

$$\mathrm{FUV} = -2.5\times\log\left(\frac{\mathrm{Flux\quad FUV}}{1.40\times10^{-15}\,\mathrm{erg\,s^{-1}cm^{-2-1}}}\right)+18.82$$

$$\mathrm{NUV} = -2.5\times\log\left(\frac{\mathrm{Flux\quad NUV}}{2.06\times10^{-16}\,\mathrm{erg\,s^{-1}cm^{-2-1}}}\right)+20.08$$

To evaluate the NUV synthetic magnitude we have determined whether the source was variable or not. In case there is no evidence of variability, the SW and LW spectra were joined into a single spectrum; the matching wavelength is set at 1975Å.
In case there are multiple observations and the source is found not to vary, synthetic magnitudes are computed from the average flux.

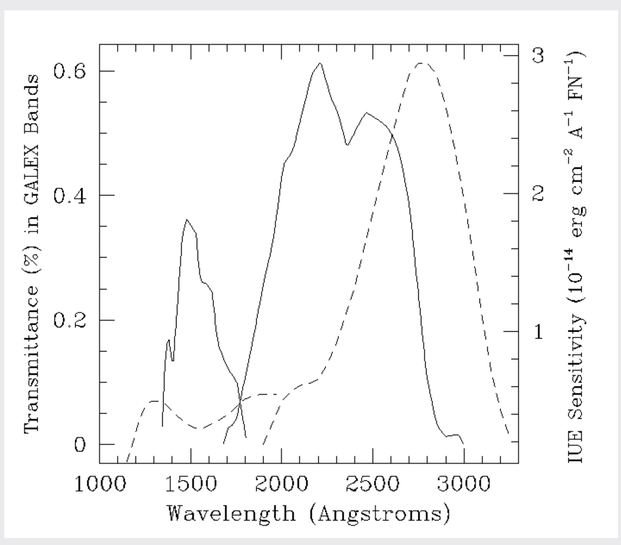

Figure 1: GALEX transmission curves (solid) compared with IUE sensitivity curves (dashed) for the SWP and LWR cameras from Bohlin et al. (1980).

Results

Consistency between GALEX and IUE synthetic photometries has been tested using White Dwarfs (WD) contained in both samples. The IUE sample of non variable stars provides good synthetic photometry for 103 WDs. 43 of these WDs have a counterpart in the GALEX GR5 AIS survey (Bianchi et al. 2011) within a search radius of $3''$. As shown in fig.2, the non-linear response performance of GALEX inferred from this data agrees with the results from GALEX calibration. Following Camarota & Holberg (2014) we have fitted the samples to a quadratic function using the least-squares method ($M_{GAL} = c_0 + c_1 M_{IUE} + c_2 M_{IUE}^2$), obtaining a very good agreement with CH's fits in the FUV photometry and a significant discrepancy in the NUV band (that we ascribe to a possible typographic error in the parameter in CH's table 2).

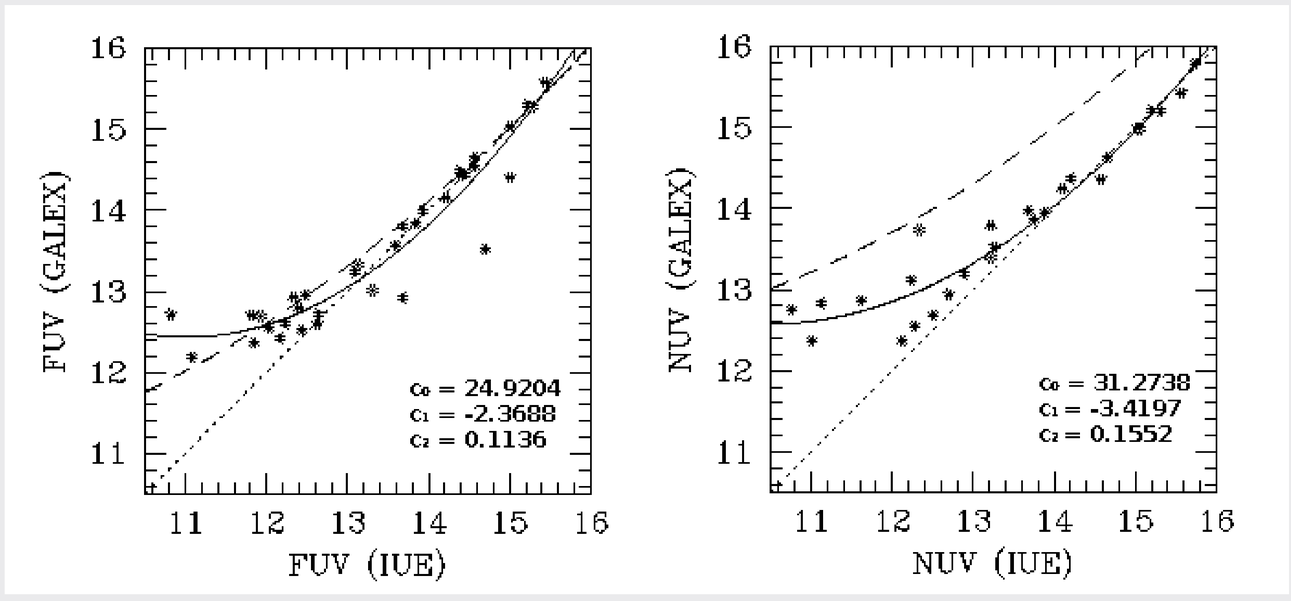

Figure 2: IUE syntetic photometry versus GALEX photometry for the WDs sample. The dotted line represents the 1:1 correspondence, the solid line the quadratic fit and the dashed line CH's fit.

The photometric data base is made available to the community through the services of the Centre de Données Stellaires at Strasbourg (CDS). The catalogue contains FUV magnitudes for 1,628 sources, ranging from FUV = 1.81 to FUV = 18.65mag. In the NUV band, the catalogue includes observations for 999 stars ranging from NUV = 3.34 to NUV = 17.74mag. UV photometry for 1,490 sources not included in the GALEX AIS GR5 catalogue is provided. Most of them are hot (O-A spectral type) stars. The sources in the catalogue are distributed over the full sky, including the Galactic plane (see fig.3).

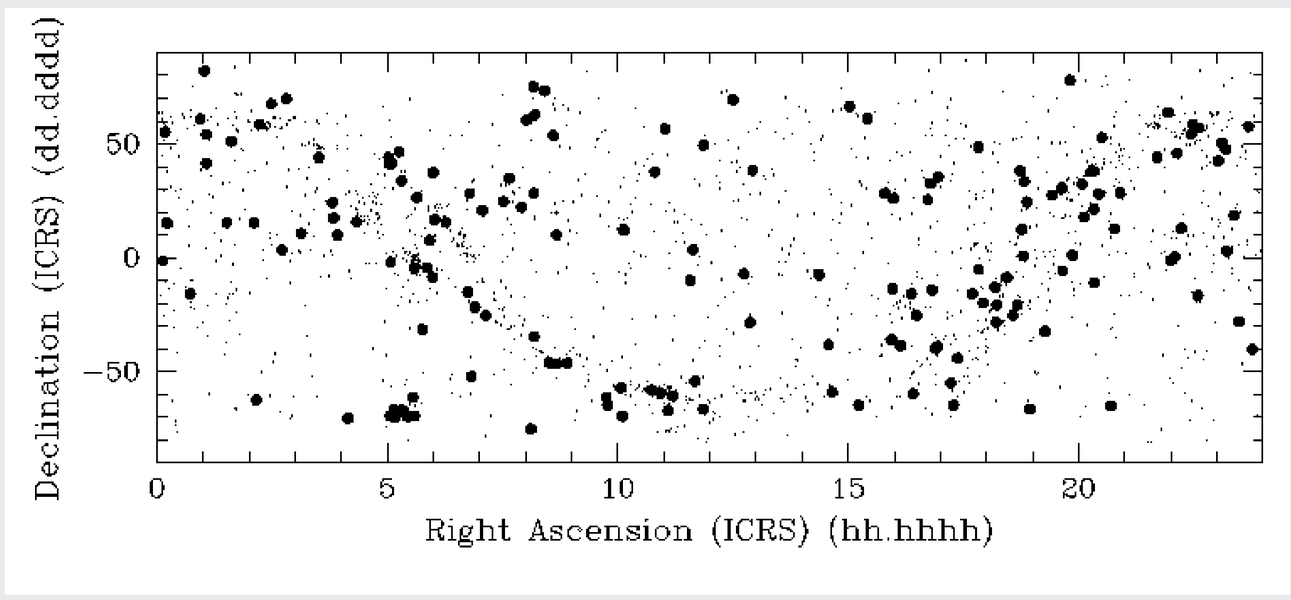

Figure 3: Distribution in the sky of the sources in the catalogue. Variable sources are represented by filled circles.

References

Bianchi, L., Herald, J., Efremova, B. et al., 2011, ApSS, 335, 161
Bohlin, R.C., Holm, A.V., Savage, D.V. et al., 1980, A&A, 85, 1
Camarota, L., Holberg, J.B., 2014, MNRAS, 438, 3111