The UV luminosity density of the local Universe from an HI-selected sample

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Abstract

We present the FUV & NUV luminosity density of the local Universe derived from GALEX observations of an HI-selected sample of galaxies based on data from the Survey of Ultraviolet emission of Neutral Gas Galaxies (SUNGG). The star formation rate density is derived and compared to the recent Hα estimate based on the parent sample. The UV luminosity density as a function of various integrated galaxy properties are presented.

This research was supported by a NASA GALEX Guest Investigator grant GALEXGI04-0105-0009 and NASA LTSA grant NAG5-13083 to G. R. Meurer.

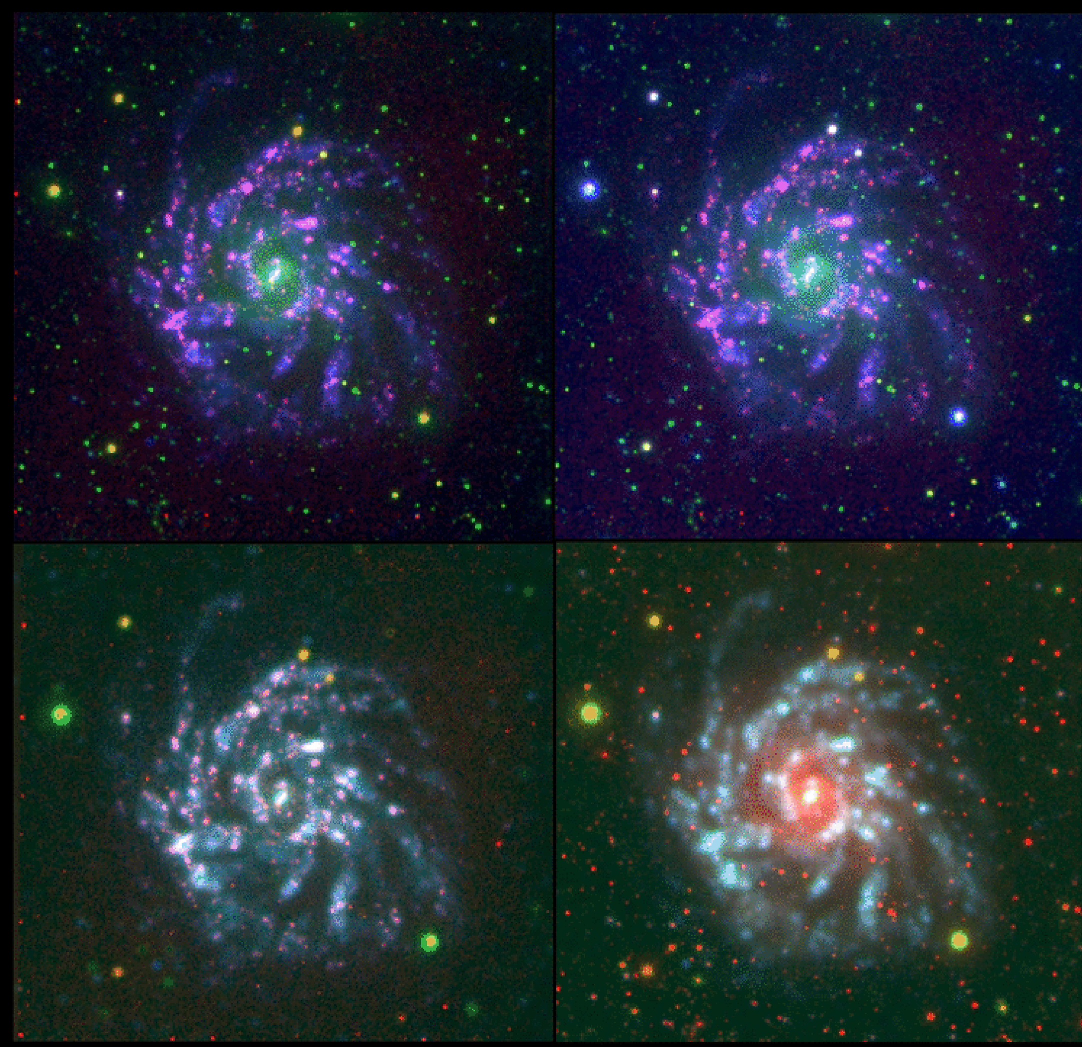

FIGURE 1: Examples of 3-color SINGG-SUNGG images of the galaxy NGC7424. Clockwise from top left: Red=Ha, Green=R-band, Blue=FUV; Red=Ha, Green=R-band, Blue=NUV; Red=Ha, Green=NUV, Blue=FUV; Red=R-band, Green=NUV, Blue=FUV

Introduction to SUNGG

SUNGG is the UV sister survey of an Hα survey, SINGG (Meurer et al. 2005, see also posters 179.18 & 179.14 for more details). Both surveys are based on an HI-selected sample of galaxies. SUNGG is surveyed in the far-ultraviolet (FUV at 1515Å) and near-ultraviolet (NUV at 2273Å) by the GALEX* telescope. Currently, 69 objects have been observed for SUNGG wavelengths, while, an additional 11 have been observed solely in the NUV wavelength. Figure 1 shows examples of 3-color SINGG-SUNGG images of NGC7424. More information about SINGG & SUNGG can be found at **<http://sungg.pha.jhu.edu>**.

* GALEX is operated for NASA by the California Institute of Technology under NASA contract NAS5-98034.

FUV & NUV luminosity densities

We derived the FUV and NUV luminosity density in a similar fashion to Hanish et al. (2006). Also, see poster 179.14 for more information about the methodology.

→ Before internal dust corrections, we found the FUV and NUV luminosity densities to be 5.22 (+0.51/-0.60) x 10^{37} erg $Å^{-1}$ s^{-1} Mpc^{-3} and 3.45 (+0.30/-0.36) x 10^{37} erg $Å^{-1}$ s^{-1} Mpc^{-3}, respectively, where the uncertainties are random uncertainties.

→ Using the internal dust calibration by Seibert et al. (2005), we found the dust-corrected FUV and NUV luminosity densities to be 2.91 (+0.72/-0.49 *random*)(+0.13/-0.38 *systematic*) x 10^{38} erg $Å^{-1}$ s^{-1} Mpc^{-3} and 1.26 (+0.25/-0.27 *random*)(+0.09/-0.25 *systematic*) x 10^{38} erg $Å^{-1}$ s^{-1} Mpc^{-3}, respectively.

Figure 2 shows the fraction of total UV luminosity densities (l) as a function of HI mass (M_{HI}), NUV effective radius (R_e(NUV)), FUV absolute magnitude and the FUV-NUV slope (β). As can be seen from this figure there is not much difference between the FUV and NUV fractional luminosity density distributions.

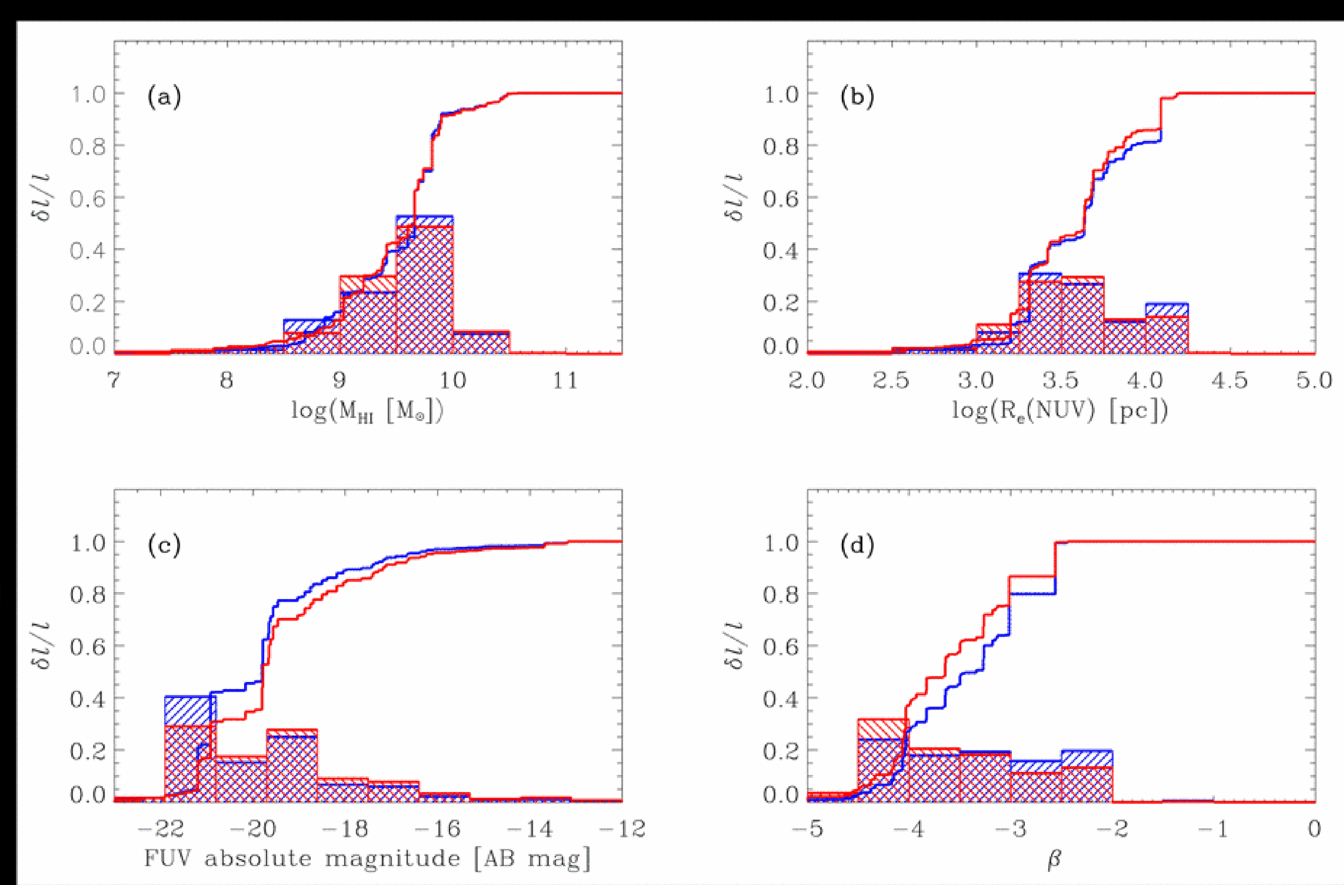

FIGURE 2: Fraction of FUV(red) & NUV(blue) luminosity density as a function of (a) HI mass, (b) NUV effective radius, (c) FUV absolute magnitude and (d) FUV-NUV slope

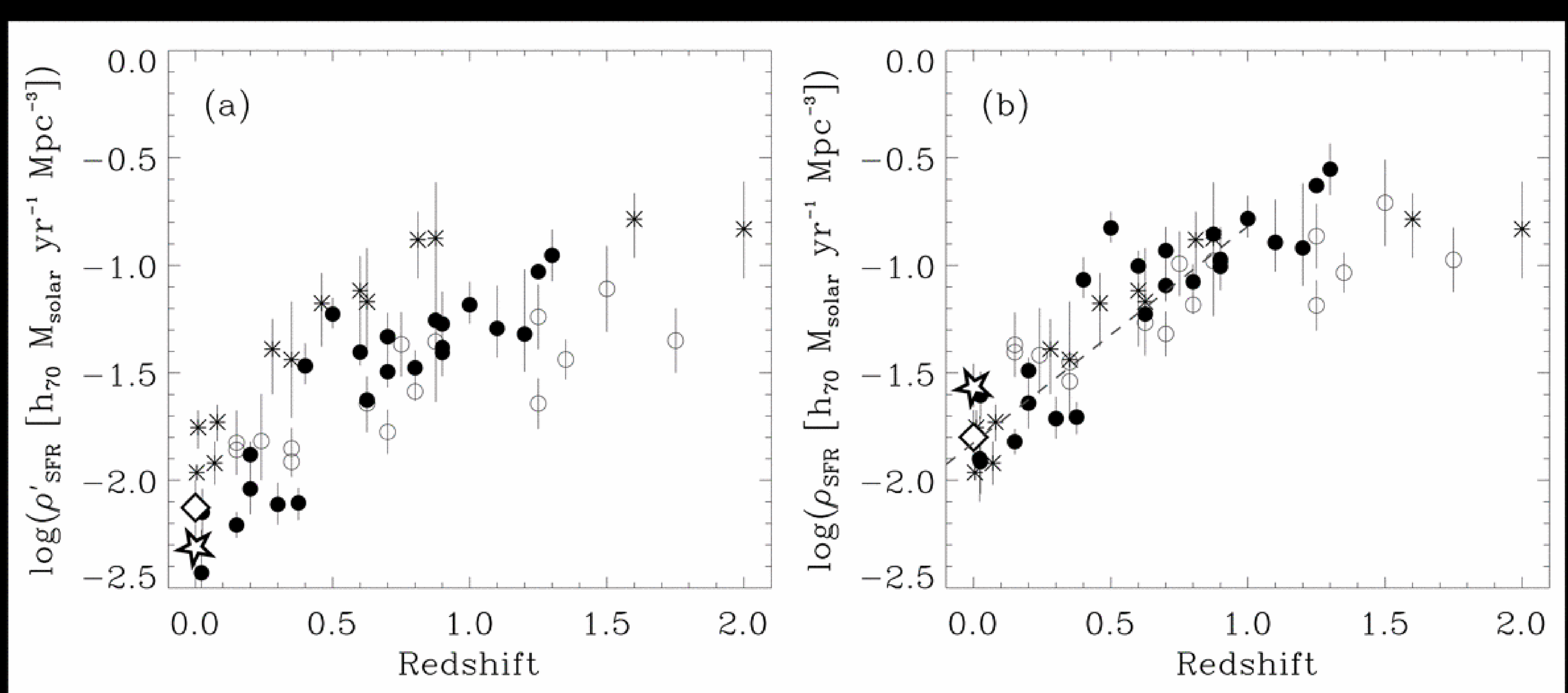

FIGURE 3: Star formation rate densities as a function of redshift. Plot (a) shows the star formation rate density without internal dust correction and plot (b) shows the star formation rate density with internal dust correction. The star in both plots at z=0 is the SUNGG value, while, the SINGG value is shown by the diamond. The other values were obtained from Hopkins (2004). The open circles, solid circles and asterisks show values from other UV surveys, other emission line (mostly Hα) surveys and IR/sub-mm surveys respectively.

Star formation rate densities

For comparison purposes, the star formation rate densities (ρ_{SFR}) of SUNGG have also been derived in the same way as Hanish et al. (2006; poster 179.14).

→Before internal dust corrections, we found that log (ρ_{SFR}) = -2.31 (+0.11/-0.09) $M_\odot$ $year^{-1}$ Mpc^{-3}.

→Using the internal dust calibrations by Seibert et al. (2005), we found that log (ρ_{SFR}) = -1.57 (+0.11/-0.09) $M_\odot$ $year^{-1}$ Mpc^{-3}.

Figure 3 shows log (ρ_{SFR}) as a function of redshift compared to other derived log (ρ_{SFR}). The value derived by SUNGG is represented by a star. The difference between the SUNGG & SINGG (diamond) values can be attributed to the different dust correction used in each case. The slope observed (from z~0 to 1) suggests that star formation at the present epoch is quieter compared to earlier times when interactions are more prevalent. Theories of downsizing are also supported from this slope.

Summary

We found the FUV and NUV luminosity densities to be 2.91 (+0.72/-0.49 random) (+0.13/-0.38 systematic) x 10^{38} erg $Å^{-1}$ s^{-1} Mpc^{-3} and 1.26 (+0.25/-0.27 random) (+0.09/-0.25 systematic) x 10^{38} erg $Å^{-1}$ s^{-1} Mpc^{-3} after correcting for internal dust extinction. There also didn't appear to be much difference between the FUV and NUV fractions of total luminosity density as a function of different galaxy properties. The star formation rate density derived from SUNGG, log (ρ_{SFR}), was found to be -1.57 (+0.11/-0.09) $M_\odot$ $year^{-1}$ Mpc^{-3}.

References

Hanish, D.J., *et al.* 2006, *submitted to ApJ*
Hopkins, A.M. 2004, ApJ, 615, 209
Meurer, G.R. *et al.* 2005, *submitted to ApJ*
Seibert, M. *et al.* 2005, ApJ, 619, L55