GAMA photometry and the CSED

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Talk summary

- Introduction to CSED (Hill et al 2010a)
- GAMA photometric pipeline (Hill et al 2010b, in prep)
- Early CSED results using GAMA data (Driver, Robotham et al 2010, in prep)
Luminosity function of galaxies

\[ \phi(M) = 0.4 \ln 10 \phi^* \frac{\left(10^{0.4(M_*-M)}\right)^{\alpha+1}}{e^{10^{0.4(M_*-M)}}} \]
$g < 19.61$ mag
$\phi(h^3 \text{ Mpc}^{-3} (0.5 \text{ mag}^{-1}))$

$Y < 17.38 \text{ mag}$

$M_{V_{\text{mag}}} - 5 \log h (\text{mag})$
$J < 16.89 \text{ mag}$

$\phi(h^3 \text{ Mpc}^{-3} (0.5 \text{ mag})^{-1})$

- Eke et al (2005)
- Cole et al (2001)

$M_{I_{200}} - 5 \log h$ (mag)
Total luminosity density of galaxies

$\nu f(v)$ vs wavelength in the UV to NIR
Dust correction and model fitting

- Effects of dust change with wavelength
- Correct for dust, compare to IMF+SFH models
Brief GAMA summary

• Multi-wavelength spectroscopic survey of 144 sq deg, with photometric coverage from UV to radio.
• 3 years of observations using AAT, producing spectra for >100 thousand sources
• Complete SDSS coverage, mostly complete UKIDSS and GALEX coverage.
Why do we need to redo the existing photometry?

- Inconsistencies in aperture size calculations
- Inconsistencies in deblending choices
- Inconsistencies in magnitude systems (AB or Vega)
- Elliptical apertures

urK colour images of 5 GAMA galaxies (taken from the GAMA mosaics)
The GAMA imaging pipeline

• Download all SDSS and UKIDSS images inside GAMA.
• Renormalise all images to a standard zeropoint and onto the AB magnitude system. $Zpt(AB) = 30\text{mag}$.
• Degrade images to 2" seeing where necessary
• Use SWARP – Emmanuel Bertin's mosaicing program – to produce mosaics of the GAMA regions.
The r band weight map of a 25sq deg subset of the GAMA9 region (approx a half of the GAMA 9 mosaic)
The GAMA photometric catalogues

• Run Sextractor in dual-image mode to produce source catalogues that have ugrizYJHK magnitudes, from apertures defined internally, or using the r or K band mosaics.
• Recombine with the GAMA source catalogue
• + Sersic magnitudes (see Lee Kelvin’s poster)
An improvement?
LFs created using different photometric methods

• $r$ band LFs showing faint end upturn?
• Consistent discrepancy between Kron and Petrosian magnitudes
• Total magnitude samples have higher alpha parameter
• Sersic sample overdense at bright end
Sersic-Petrosian offset with $n$
GAMA CSED creation - coverage

Sky coverage of 11 UV-NIR bands used to create the GAMA CSED

Courtesy Simon Driver
Early LFs using GAMA photometry

11 band luminosity functions to z < 0.1 over the common GAMA regions (115.14sq deg) to r<19.4 corrected for colour bias and incompleteness.

Created from a combination of Sersic r band photometry and r-defined Kron aperture colours

Courtesy Simon Driver
Early GAMA CSED model fits


The result when converted to a Wilkins, Hopkins & Trentham (2008) IMF

Courtesy Steve Wilkins
Conclusions

• Calculating the CSED is subject to a number of systematic biases.
• The GAMA imaging pipeline circumvents many of them.
• GAMA has produced consistent elliptical aperture photometry for ugrizYJH and K filters. Elliptical GALEX photometry is also available.
• This data is already available to GAMA team members, and will be released to the public in the future.
• Work is underway to find a combination of SFH and IMF that fit the GAMA CSED observations.