

HIGH LIGHTS OF BATC SURVEY — FIRST TWO YEARS

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Beijing-Arizona-Taiwan-Connecticut (BATC) CCD color survey uses Beijing Astronomical Observatory 60/90cm f/3 Schmidt Telescope with 2kx2k CCD and 15 median band filters to map the Spectral Energy Distribution (SED) of all objects in 500 selected fields down to $V=20$ mag. The survey aims to address various problems in astrophysics from galactic structure to extragalactic astrophysics and cosmology (Chen 1994).

The survey started two years ago. The basic frame of the survey including instrument, data acquisition system, archive data system, and various steps of data reduction has been established. The method of using SED, image structure and astrometric information combined with the stellar track calculation, the stellar population synthesis and the model SED template bank (theoretical and observational) to separate star/galaxy, to classify the SED of the stellar objects, to select abnormal SED sources (QSO, AGN, CV etc), to discover moving and variable objects and to determine the redshift of galaxies is being developed (Proceedings of Workshop on BAO Schmidt CCD Astronomy, 1996).

To show the features of the survey, I introduce here the work on 2 BATC fields: the open cluster M67 field as an example of spectrophotometry of stellar sources (Fan et al. 1996) and the field of nearby galaxy N5907 as an example of the deep surface photometry (Shang et al. 1996).

The studies of M67 field provide good evidences that we can obtain spectrophotometry from the ultraviolet to 1000nm down to an intrinsic accuracy of better than 0.02 mag. for all objects in the nearly 1 square degree field of the CCD, using Oke-Gunn primary standard stars. The CMD shows not only the morphology consistent with previous ones, but define better than most the gap in the main sequence. The stellar track and atmosphere model fits the CMD very well for an age of 4 Gyr and $[Fe/H] = -0.10$, yielding a reddening of $E(B-V)$ between 0.015 and 0.052 mag and a distance modulus $(m - M)_0 = 9.47 \pm 0.16$ mag. As our data combines deep images, accurate photometry and wide field coverage more than previous survey, we are able to observe both direct and implied evidences of substantial dynamical evolution issues pertaining to this old galactic cluster, such as the mass dependent spatial distribution of "single" stars, binaries and blue stragglers; the two dimensional shape of M67 elongated along an angle of 15° relative to the galactic plane; the volume dependent luminosity function rising from the main sequence turnoff and then flatten out at fainter absolute magnitudes; the leveling off for lower mass stars from mass function, which may due to the evaporation of stars through dynamical evolution of this old cluster.

An automatic SED classification technique has been

applied to this and other fields. The classification is accurate to the subtype of spectral and luminosity class and has been confirmed by a sample of 80 stellar objects observed with slit spectra. The abnormal SED objects are such selected. Some bright ones were observed spectroscopically and identified as QSO and metal poor HII galaxy.

The edge-on galaxy NGC5907 field provides a good example of using our system to reach accurate deep surface photometry of galaxy. The intermediate bands of the filters are designed to locate at the wavelength regions free from strong sky emission lines. This results in fainter sky background (the dark sky at 600nm at BAO Xianlong station is about one magnitude fainter than KPNO). Our dome-diffuser flatfield system can correct flatfield better than 0.1 % either in pixel to pixel fluctuation or in large scale structure (Chen et al. 1996). NGC5907 were observed with filter of 666nm for 28 hours. we found a faint elliptical ring surrounding the NGC5907 in the way that the center of the NGC5907 is located at the focus of the elliptical ring. The surface brightness distribution is steeper at faint end than that of Sackett et al. (1994). This means that the faint luminous halo may not trace the dark matter around spiral galaxy NGC5907 argued by Sackett et al. (Shang et al. 1996). Any error in flatfield correction and estimation of sky brightness could change the profile at faint end.

REFERENCES

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