MULTI-COLOR SURFACE PHOTOMETRY OF NEARBY GALAXIES

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1. Introduction

Near-infrared (NIR) emission in galaxies is mainly radiated by old population low temperature stars, which construct the basic stellar structure and keep the trails of past galaxy evolution. On the other hand, optical observations show recent star formation activity, especially in spiral galaxies. Therefore multi-color observations from optical to near-infrared wavelengths are very important to understand the past and recent star-formation history. Nearby large galaxies are well studied not only in optical but also in mid- and far-infrared by IRAS, CO and HI radio observations. However, the study in the near-infrared is still limited because large format arrays are not common. Here we show a wide-field, near-infrared imaging of nearby elliptical and spiral galaxies and discuss their star-formation history.

2. Observations and Results

Target galaxies were selected in terms of size (larger than $5'$ in diameter), inclination (more edge-on than 65°), and morphological types (from E to Sc). In JHK' bands, the observations were made with the Kiso Observatory Near-Infrared Camera (Yanagisawa *et al.* 1996) attached to the prime focus (F/3.1) of the 105cm Schmidt telescope (Ichikawa *et al.* 1996). The camera is equipped with a 1040 × 1040 PtSi near-infrared array (supplied by Mitsubishi Electric Co.) with a field of view of $18.4' \times 18.4'$. The pixel size of 17 μm × 17 μm corresponds to $1.1'' \times 1.1''$. Although the low quantum efficiency is a disadvantage of the PtSi array, its good uniformity, stability of performance, and lack of memory effect allow us to conduct accurate surface photometry. Optical BVR_cI_c observations were made with

B.J. McLean et al. (eds.), New Horizons from Multi-Wavelength Sky Surveys, 285–286.

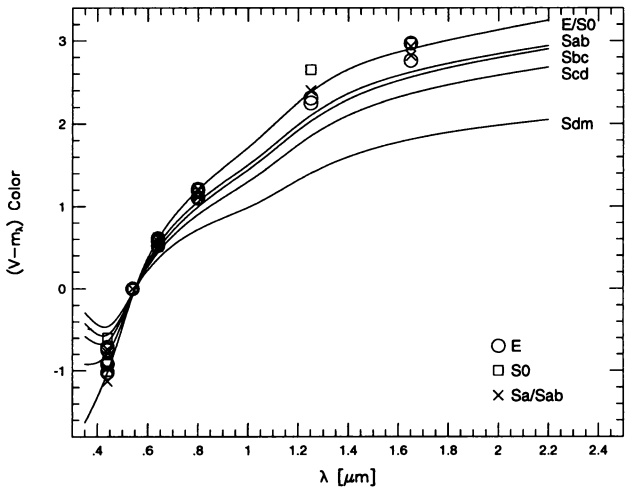

Figure 1.

the same Schmidt telescope and a CCD camera equipped with a TI 1000 × 1018 array having a field of view of 12.5′ × 12.5′. The large field of view is very important for accurate sky subtraction especially for NIR, where sky background overwhelmed the galaxy emission. Small errors in sky background estimates tend to lead not only wrong magnitude colors but also wrong scale lengths of the bulge and the disk.

3. Comparison with Models

A preliminary result for elliptical and early spirals is shown in Figure 1 which compares the total magnitude of the galaxies with the evolutionary model from Yoshii and Takahara (1988). The deviation of some galaxies from the model is significant in the B band. The model was generally constructed by comparing aperture photometry and spectroscopic data observed in the galaxy center region, where the bulge and galactic center emission dominate. The disk and bulge components should be separately discussed in galaxy evolution models because their history is supposed to be different. These detailed discussions will be made elsewhere.

References

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Yoshii, Y. and Takahara, F. 1988, Astrophys.J. 326, 1