

## The Study of the characteristics of the CMDs of M13 with the BVR CCD photometry

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The BVR CCD photometry was performed for the globular cluster M13 down to  $V \sim 19$  over the region from the center to the west  $13'$  and the characteristics of CMD of M13 were investigated. The major photometric error for crowded field is due to the variation in the background sky, so the median filtering method is combined with the direct sky method for the correction of the sky variation.

The characteristics of the CMDs of M13 obtained in the present study are as follows: Firstly, the distribution of the stars on CMD is exactly consistent with the mean lines of Sandage(1970) along the RGB, HB, and AGB. Secondly, the gaps on RGB and BHB are clearly seen for the stars in the outer region( $r > 100''$ ). Thirdly, the UV-bright stars are more concentrated at the inner than the outer.

The gaps and bumps appearing in each branch on the CMD are examined in the aspect of stellar evolution. It is stressed in particular that the appearance of gap can be related to the nonuniform evolution of stars in the relevant branch but also to the observational completeness and a systematic photometric uncertainty.

## Problems in Estimating Distances to Galaxies Using Variable Stars: The Pegasus Dwarf Galaxy

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Cepheid variables are known to be one of the most reliable distance indicators for nearby galaxies. However one has to be careful in using Cepheid candidates discovered in one-band photometry for estimating the distances to galaxies. In this study we present an example showing how much wrong the distance estimate using Cepheid candidates can be.

Hoessel et al (1990, AJ, 100, 1151) searched for variable stars in the Pegasus dwarf galaxy (DDO 216) from CCD observations obtained using the Thuan-Gunn  $r$  filter at 1.5m to 5m telescopes for five years. They found 31 variable stars. They argued from the shapes of the light curves that seven of the variable stars are very likely Cepheids and three of them are probable Cepheids. They estimated the distance to the Pegasus dwarf galaxy using these Cepheid variable candidates, obtaining a value of  $1750 \pm 160$  kpc ( $(m - M)_0 = 26.22 \pm 0.2$  mag).

On the other hand. We have estimated the distance to this galaxy using the tip of the red giant branch (TRGB) method (Lee, Freedman, & Madore 1993, ApJ, 417, 553) from the VI CCD photometry obtained using the Palomar 1.5m telescope. We obtained a value for the distance of  $1060 \pm 50$  kpc ( $(m - M)_0 = 25.13 \pm 0.11$  mag). This value is significantly smaller