JOURNAL OF THE KOREAN ASTRONOMICAL SOCIETY
29: S179 ~ S180, 1996

ON THE REDDENING LAW AND DISTANCE OF THE GALACTIC GIANT HII REGION NGC 3603

A. K. PANDEY[1] AND K. OGURA[2]
[1]U. P. State Observatory, Manora Peak, Naini Tal, 263 129, India
[2]Kokugakuin University, Higashi, Shibuya-Ku, Tokyo 150, Japan

ABSTRACT

The aim of the paper is to analyse the extinction law in the giant H II region NGC 3603. The ratio R is found to be greater than 5.0. In front of the cluster the reddening law is found to be normal. We have obtained a distance of ~ 5.3 Kpc which is significantly smaller than those adopted so far.

Key Words : H II region, Extinction law

I. INTRODUCTION

NGC 3603 is the most massive visible giant H II region (GHR) in our galaxy. Chini & Krügel (1983) found evidences for a higher value of R (ratio of total to selective extinction) in many H II regions. The value of R is an important quantity that must be known accurately to determine the stellar distances. The main purpose of this paper is to present CCD UBVRI and H_α photometry of the cluster and to analyse extinction law in this region.

II. RESULTS

The observations of NGC 3603 were carried out in the continuum, U,B,V,R,I bands and in H_α using a RCA CCD chip having a size of 320×512 pixels, at the f/16 Cassegrain focus of the 1.0 metre telescope of the SAAO, on the night of April 3, 1994. The photometry of the stars was performed using the DAOPHOT profile fitting software (Stetson 1987).

The (U-B, B-V) diagram (Fig. 1) shows that field stars are well separated from the cluster stars which are distributed along a line of slope roughly similar to that of reddening line. The radial variation of reddening in the cluster field is shown in Fig. 2. The remarkable features of the diagram are the variation in reddening with maximum at radius ~ 20″ and 70″. This feature was not observed by Melnick et al. (1989).

It has been shown by Chini & Wargau (1990) that two - colour - diagrams (TCDs) of the form (V-X) vs. (B-V), where X denotes one of the broad band filters (R,I,J,H,K,L) between 0.7 and 3.7 μm, provide an effective method of separating the influence of the normal extinction produced by the interstellar medium from an abnormal extinction arising within a dense region. The TCDs can distinguish between foreground stars (reddened by normal dust) and embedded stars (affected in addition by a special reddening law). Fig. 3 shows the V-I/B-V and V-R/B-V TCDs. An inspection of TCDs shows three distinct group of objects : i) Stars (open circles) follow the dashed line. These are foregound stars reddened by normal interstellar dust. ii) Stars (filled circles), which fall consistently below the dashed line in both the TCDs; their locations can also be represented by a straight line having a tilt against the normal reddening line. iii) Objects (open dimonds) located further left to the lines in both the TCDs indicate stars having IR - excess. The common point of intersection between normal and anomalous reddening is estimated at (B-V)inst ~ 0.85. To derive the value of $R_{cluster}$ (total to selective extinction in the cluster region) we used the approximate relation,

$$R_{cluster} = \frac{m_{cluster}}{m_{normal}} \times R_{normal},$$

where $m_{cluster}$ and m_{normal} are the slopes of the lines followed by cluster stars and normal stars respectively. The value of $R_{cluster}$ comes out to be ~ 5.3 .

The differential extinction method (Turner 1976) is also applied to derive the value of R. In order to discriminate the field stars from the cluster members, we used a type of colour - magnitude diagram in which extinction free magnitude P= V- R(B-V) is plotted against a reddening - free colour Q = (U-B) - 0.72(B-V). The resultant variable - extinction diagram is shown in Fig. 4. We used the ZAMS - fitting version of the method. Although the scatter is relatively large, the stars follow a line having a slpoe of ~ 5.9. The figure indicates that the reddening law inside the cluster NGC 3603 is quite anomalous. Since TCDs indicate that the reddening law in front of the cluster is normal, the distance modulus can be described as;

distance modulus= 17.3- 3.1 × 1.2= 13.6,

which corresponds to a distance of 5.3 Kpc. This distance is significantly smaller than those adopted so far.

ACKNOWLEDGEMENTS

A.K.P. is thankful to the organisers for providing grants to attend the meeting and to the Department of Science and Technology (India) for providing financial assistance under the grant No. SP/S2/O-07/93.

REFERENCES

Chini R., & Krügel E., 1983, A&A, 117, 289.

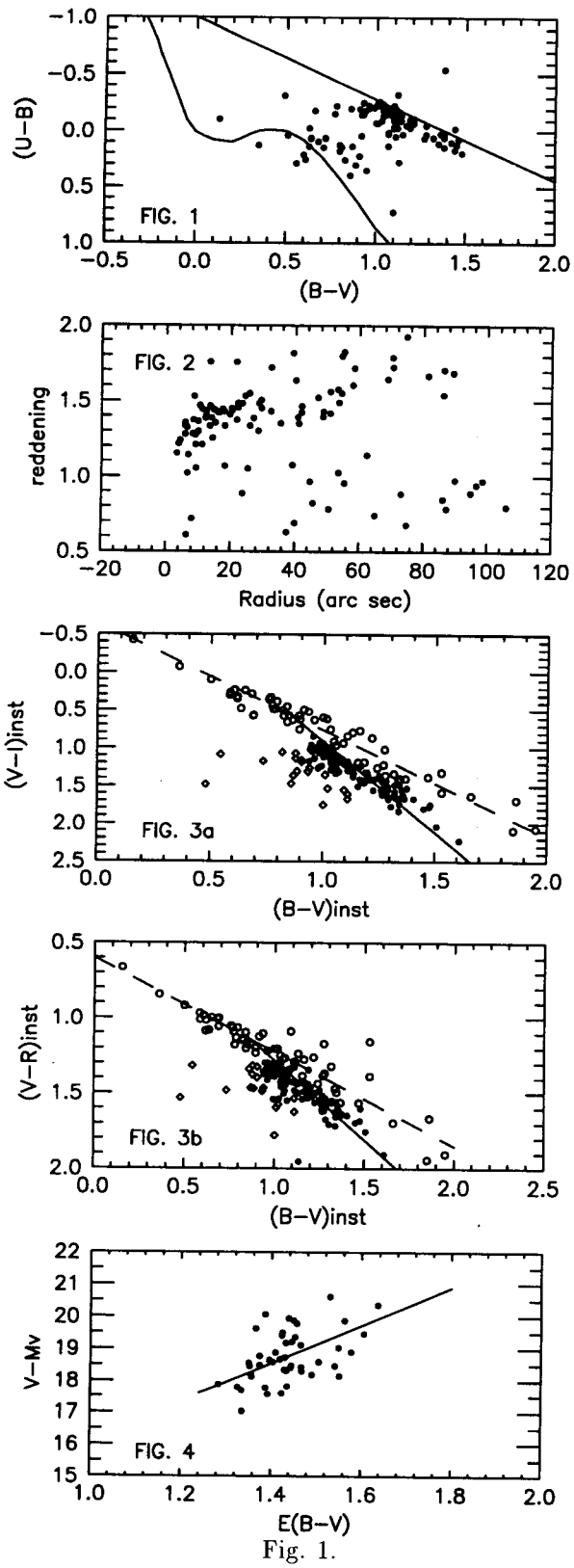

Fig. 1.

Chini R., & Wargau W. F., 1990, A&A, 227, 1990.
Melnick J., Tapia M., & Terlevich R., 1989, A&A, 213, 89.
Stetson P.B., 1987, PASP, 187, 191.
Turner D. G., 1976, AJ, 81, 97.