

## Near infrared photometry of the young open cluster NGC 1960

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**Abstract.** We present the preliminary results of observations of NGC 1960 which was observed from the Mt Abu Infrared Observatory, using the NICMOS3 infrared array mounted on the 1.2 m Cassegrain focus telescope. The observations were made in February 2000. The data reduction has been performed using IRAF. The distance has been estimated to be 1000 pc.

*Keywords :* Young galactic clusters, Near infrared photometry, NICMOS3

### 1. Introduction

NGC 1960 (M 36) is a young open cluster located at  $\alpha_{2000} = 5^h36^m6^s$ ,  $\delta_{2000} = 34^{\circ}8'$  and with an approximate diameter  $d = 10'$  according to the Lyngå (1987) catalogue. Morphologically, NGC 1960 is dominated by a number of bright ( $V < 11^m$ ) stars, whereas the total stellar density is only marginally enhanced compared to the surrounding field. Johnson and Morgan (1953) performed photoelectric  $UBV$  photometry of 50 stars in this cluster region while photographic  $UBV$  photometry within the cluster region was published by Barkhatova et al. (1985). Recently, optical CCD photometry has been done by Sanner et al. (2000). The proper motions have been presented by Meurers (1958), Chian and Zhu (1966) and Sanner et al. (2000). As this is a moderately young cluster, near infrared photometry is needed to understand the nature of the stellar population in this cluster which is affected by gas and dust in the optical wavebands.

### 2. Observations

Observations were made on 5, 6 and 7 February 2000 at the Mt. Abu Infrared Observatory, using the NICMOS3 infrared array mounted on the 1.2 m Cassegrain focus telescope. Observations were made in the  $J(1.2 \mu\text{m})$ ,  $H(1.65 \mu\text{m})$  and  $K'(2.2 \mu\text{m})$  passbands using the co-add technique to improve the signal to noise ratio. The raw frames were flat-fielded, sky subtracted and corrected for bad pixels. The reduction was done using IRAF and standard stars were also observed to convert instrumental to standard magnitudes.

The standard main sequence was constructed using the data from the Infrared Catalog (Gezari et al. 1993) and the Bright Star Catalog (Hoffleit 1982).

### 3. Results

The complete data of the standardised magnitudes of the cluster region of NGC 1960 will be published elsewhere.

The data was corrected for the effect of interstellar reddening using the relations given by Bessell and Brett (1988) where  $A_J = 0.96E(B - V)$ ,  $A_H = 0.80E(B - V)$ ;  $A_K = 0.12E(B - V)$ ,  $E(J - H) = 0.37E(B - V)$ ,  $E(H - K) = 0.19E(B - V)$  and  $E(B - V) = 0.25$  is the mean reddening for the cluster taken from Sanner et al. (2000).

Cluster membership was established through the proper motion data and also through the evolutionary track technique. The evolutionary track diagram (Walker 1965) involves plotting all the observed stars in a  $m_J$  versus  $M_J$  plane along with a straight line representing the adopted distance modulus. In this diagram, it is assumed that an unresolved binary could cause a maximum deviation from this line by  $0.75^m$  for equal components. It is further assumed that the observational scatter could cause a vertical displacement of not more than  $0.5^m$  for stars appearing below the main sequence. All stars lying within these two boundaries can be treated as likely members and thus cluster membership was established.

The distance modulus was determined to be  $10^m \pm 0.1^m$  which corresponds to a distance of about 1000 pc using the sliding fit method of the standard main sequence. This slightly differs from 1300 pc as reported by Sanner et al. (2000).

The intrinsic color-magnitude diagram is shown in figure 1. The proper motion members are represented by filled circles, evolutionary track members by open circles and the solid line represents the standard main sequence. It clearly shows a number of massive stars along with some less massive stars with significant scatter which may be due to intrinsic dispersion.

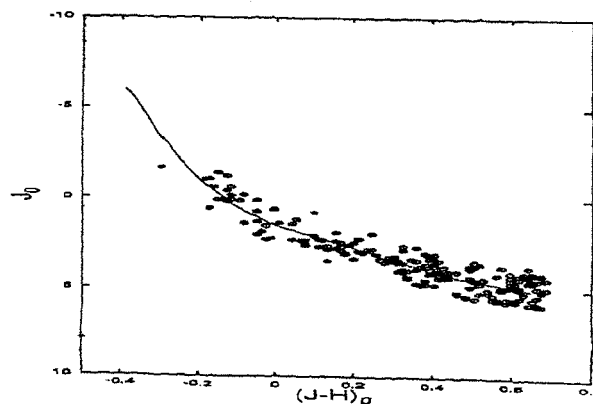


Figure 1. Color-magnitude diagram for NGC 1960 cluster members.

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