

The starburst galaxy IC 10

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Abstract. The heavily-reddened Local Group galaxy IC 10 has been studied at narrow-band emission-line wavelengths and in U , B , V , and I with the APO 3.5m telescope. The four-color data are being used to measure and map the foreground and internal reddening. The color-magnitude diagram clearly isolates the main sequence from the red supergiants and from the abundant foreground stars. The absolute magnitudes of the main sequence stars, together with the anomalously-abundant WR stars reported by Massey & Armandroff, indicate that the galaxy is currently undergoing a fairly extensive burst of star-formation.

1. Introduction

A member of the Local Group of galaxies, IC 10 has only recently been the subject of extensive study because of its low galactic latitude (-3°). It was first identified as a possible galaxy in 1935 (Mayall 1935) and was confirmed as a small irregular galaxy in the 1960's with additional observations. The metallicity of IC 10 is between 1/6 and 1/4 that of the Sun (Lequeux *et al.* 1979). Estimates of its distance have varied by an order of magnitude, although recent measurements have indicated a value of approximately 0.83 Mpc (Saha *et al.* 1996). IC 10 contains a remarkable number of massive stars for a galaxy its size — at least twice the density of such stars seen in any other Local Group galaxy (Massey & Armandroff 1995), a fact which led those authors to classify it as a *starburst galaxy*, the only one in the Local Group. Because of its proximity, IC 10 presents a unique opportunity to examine the starburst phenomenon in more detail than is possible in more distant galaxies. We have undertaken a program of multi-wavelength observations of IC 10 in order to study large-scale star formation and related phenomena.

2. Observations

Beginning in the summer of 1997, we have been using the Apache Point Observatory (APO) 3.5m telescope to obtain U , B , V , I and narrow-band images of IC 10. We present here some of the project's first results. The primary imager on the APO 3.5m, SPICAM, has a $4'.5 \times 4'.5$ field of view, and consequently most of our observations of IC 10 have been divided between two overlapping regions, Field 1 (the eastern region) and Field 2 (the western region).

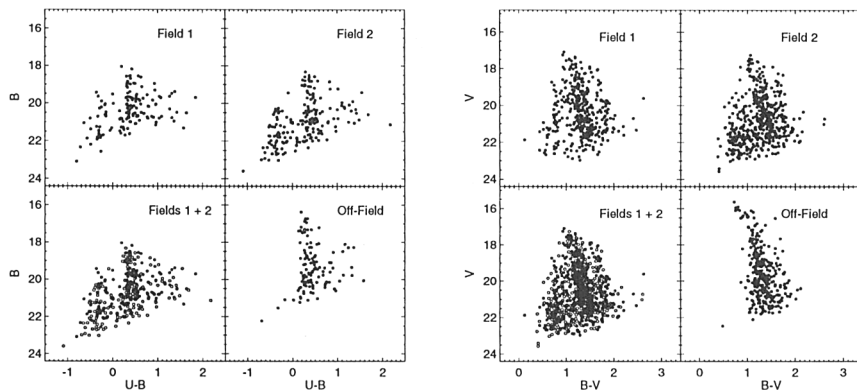


Figure 1. B vs. $U-B$ and V vs. $B-V$ color-magnitude diagrams of the field of IC 10. Note the clear separation between the tip of the IC 10 main sequence (to the lower left) and the plumes of foreground stars in the center. The Off-Field images were taken 10' north of the center of the galaxy.

3. Preliminary Analysis

Using DOPHOT (Schechter *et al.* 1993) we have produced color-magnitude diagrams based on our data. Figure 1 shows B vs. $U-B$ and V vs. $B-V$ color-magnitude diagrams, generated from images obtained on 19 October 1997. The exposure times were 1800s, 1800s, and 900s for U , B , and V (respectively), on Fields 1 and 2. The Off-Field (a field 10' north) images had exposure times 1/3 as long as the corresponding images of IC 10.

We are currently addressing one of the main problems connected with work on IC 10 — measuring and correcting for line-of-sight reddening. Where possible, we plan to use color-color diagrams, $H\beta/H\alpha$ ratios, and $H\alpha$ /radio continuum ratios to obtain separate measurements of the extinction as a function of position across the field. Once we have dealt with the issue of reddening, we plan to use our color-magnitude diagrams to probe the star formation rate and history of IC 10.

References

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