

The Local Group census: IC-10

Shelley A. Wright, Robert Greimel, Daniel J. Lennon, and
Romano L.M. Corradi

*The Isaac Newton Group of Telescopes, Apartado de Correos 321,
E-38700, Santa Cruz de La Palma, Canary Islands, España*

Nicholas A. Walton

Institute of Astronomy, Madingley Road, Cambridge, CB3 0HA, UK

Abstract. We have begun a census of various stellar groups in Local Group Galaxies, using the Wide Field Camera on the Isaac Newton Telescope on La Palma. Here we present a preliminary color-magnitude diagram for the dwarf irregular galaxy IC-10. At present time, metallicity of IC-10 is measured to be $Z = 0.005$ (Garnett 1990). Comparison with recent literature values of reddening and distance suggest that IC-10's distance is ~ 1 Mpc. Our comprehensive wide-field survey encompasses both broad (g' , r' , i') and narrow-band (O III, He II, H α , S II, Strömgen γ) observations to look for emission-line objects, including Wolf-Rayet stars and Luminous Blue Variables. The analysis also yields the coordinates of massive stars to an accuracy sufficient for follow-up multi-object spectroscopic observations.

Local Group census and preliminary results for IC-10

The Local Group Census (LGC) is conducted at the Isaac Newton Group of Telescopes, La Palma, with the wide field camera (WFC) on the 2.5m Isaac Newton Telescope. The WFC is a prime focus optical mosaic camera with four EEV 2k \times 4k CCDs, yielding a collective field of view of 34' \times 34'.

Galaxies within $\lesssim 1.5$ Mpc from the Local Group (LG) barycenter are defined as LG members. LGC will target 26 galaxies of the 35 most probable LG members based upon their visibility from La Palma. Our LG census will search for all strong emission-line populations, *e.g.*, Wolf-Rayet's, luminous blue variables, planetary nebulae (Magrini *et al.* 2002), and H II regions.

IC-10 was selected as a test case for massive stars, as it is one of the most active star forming galaxies in the LG. Hodge & Lee (1990) identified 144 H II regions, which later led Massey *et al.* (1992) to probe the rich massive star population. A survey of WR stars (Massey & Armandroff 1995) showed that IC-10 has twice the galaxy wide surface density of massive stars than any other LG galaxy.

Crowded field stellar photometry was performed with Stetson's (2001) version of DAOPHOT-II (Stetson 1987), ALLSTAR, ALLFRAME (Stetson 1994), and DAOGROW (Stetson 1990) packages. Instrumental magnitudes are presented, since IC-10 observations were taken under non-photometric conditions. Magnitudes shown were semi-calibrated by comparing our CMDs with previously

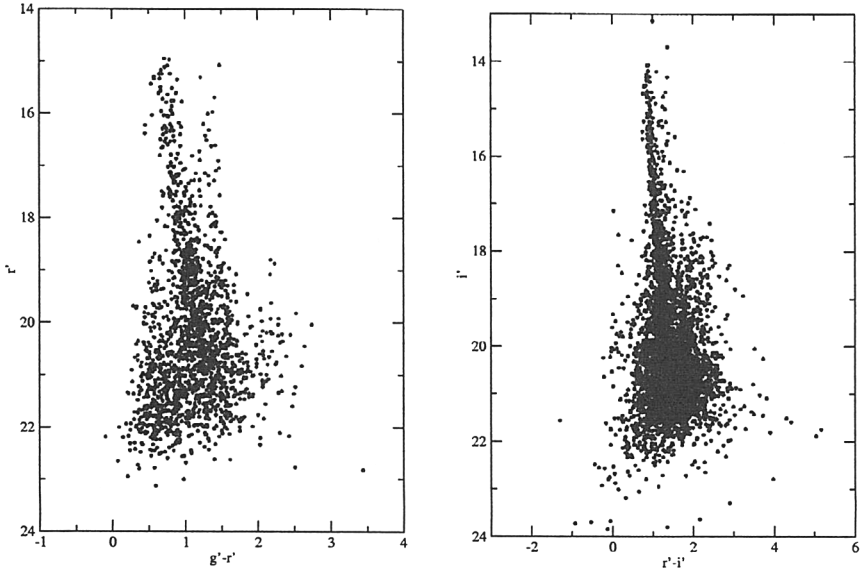


Figure 1. CMDs of the central 47 arcminutes² of IC-10. (Left): $g'-r'$ vs. r' . (Right): $r'-i'$ vs. i' .

published CMDs (Sakai *et al.* 1999; Massey & Armandroff 1995), taking account of transformations between differing filter systems (Fukugita *et al.* 1996).

Astrometry on images will be performed with IRAF and WCS tools using the USNO-A2.0 catalogue. We will particularly be targeting OB stellar populations within IC-10, using a multi-object spectrograph (*e.g.*, GMOS-N on Gemini). We have taken a series of photometric observations of open clusters with our g' , r' , i' filters to obtain a more accurate calibration of SLOAN spectral types. Procedures developed for this program will be easily generalized for crowded field photometry on other LG members.

References

- Fukugita, M., Ichikawa, T., Gunn, J.E., *et al.* 1996, AJ 111, 1748
 Garnett, D.R. 1990, ApJ 363, 142
 Hodge, P., Lee, M.G. 1990, PASP 102, 26
 Magrini, L., Corradi, R.L.M., Walton, N.A., *et al.* 2002, A&A 386, 869
 Massey, P., Armandroff, T.E., Conti, P.S. 1992, AJ 103, 1159
 Massey, P., Armandroff, T.E. 1995, AJ 109, 2470
 Sakai, S., Madore, B.F., Freedman, W.L. 1999, ApJ 511, 671
 Stetson, P.B. 1987, PASP 99, 191
 Stetson, P.S. 1990, PASP 102, 932
 Stetson, P.B. 1994, PASP 106, 250