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Stellar populations in the Local Group starburst galaxy IC10

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Abstract. We present preliminary results of a photometric investigation on IC10 using data collected with ACS@HSTS and WFPC2@HST. We estimate the distance using the Tip of the Red Giant Branch (TRGB). According to current estimates, IC10 seems to be a member of the M31 group. By assuming the same distance for the two different pointings, the reddening shows a significant decrease when moving from the center toward the external regions. Moreover, we show that stellar isochrones at fixed metal content, distance and reddening account for both Main Sequence (MS) and evolved stellar components.

Key words. Galaxies: dwarf - Galaxies: Local Group - Galaxies: individual (IC10)

1. Introduction

IC10 is a dwarf irregular galaxy of the Local Group and it is the unique analogue in the nearby Universe for starburst galaxies. Current distance and reddening estimates for IC10 are still affected by large uncertainties (Hunter 2001). This means that we do not know yet whether IC10 is a member of M31 group. Moreover, by using optical space and Near-Infrared ground-based data, Vacca et al (2007) found a puzzling feature concerning its stellar content. The fit of the young MS and of the evolved Red Giant (RG) stars would require, at fixed metal abundance ($Z = 0.008$) and distance modulus ($\mu = 24.5$), two different reddening values, namely $E(B-V) = 0.95$ for MS and $E(B-V) = 0.60$ for RG stars.

2. Data sets and discussion

The data sets include two different archival ACS@HST and two WFPC2@HST pointings. The WFPC2 pointings are located across the center of the galaxy (F555W, F814W; 10×1400 sec each), and 3′ from the center in the NE direction (F555W, F814W; 24×500 sec each). The ACS pointings are located across the center of the galaxy (F606W, F814W;

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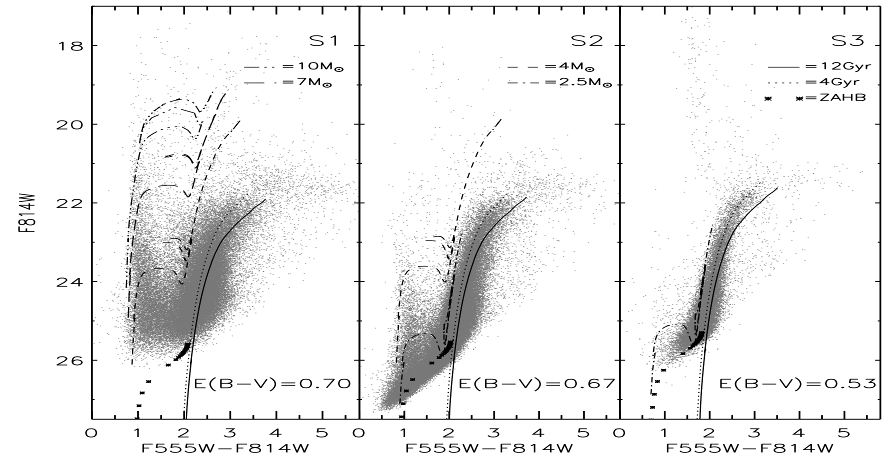

Fig. 1. CMDs of the 3 fields with superimposed different theoretical isochrones and evolutionary tracks by Cordier et al. (2007), assuming $Z = 0.008$, $\mu = 24.67$ and different reddening values.

6×360 sec each), and 2′ from the center in the NW direction (F555W, 32×620 sec; F814W, 16×595 sec). The data have been reduced using the DAOPHOT/ALLFRAME package (Stetson 1994). All the data were transformed to the same photometric system (ACS: F555W, F814W) and calibrated to the VEGAMAG system following Sirianni et al. (2005). To study the radial gradients of different populations, we divided the sample in 3 different subsamples: S1 covers the burst region, S2 covers the non-burst region of the external ACS field and S3 covers the entire external WFPC2 pointing. In order to determine the distance modulus, we estimated the F814W apparent magnitude of the TRGB (m^{Tip}) from the observed luminosity function of the central field, adopting a reddening of $E(B-V) = 0.70$. Using the F814W predicted absolute magnitude of the TRGB (M^{Tip}) of the scaled solar isochrones by Cordier et al. (2007) as a function of metallicity, we determined the M^{Tip} of IC10 assuming a fixed metal content of [Fe/H] = −0.35, $Z = 0.008$ (Vacca et al 2007). We obtained $\mu = 24.67$, in good agreement with the literature; this suggests that IC10 should be a member of M31 ($\mu = 24.4 \pm 0.1$ van den Bergh 2000). From the comparison between the CMDs and the isochrones, assuming fixed distance and metallicity, we obtained the reddening of the external regions. In particular: S2: $E(B-V) = 0.67$; S3: $E(B-V) = 0.53$. We found that the reddening decreases when moving from the centre to the outskirt of the galaxy. Moreover, Fig. 1 shows that S1, located across the galaxy center, presents a significant fraction of young MS stars. The number of these objects decreases when moving towards the outskirts of the galaxy. In particular, in S3 the MS stars are only marginally present. However, this Figure shows that current theoretical predictions, at fixed metal content ($Z = 0.008$), distance modulus ($\mu = 24.67$) and reddening (three different values) accounts for both young MS and evolved RG stars.

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