Strange hosts of blue compact galaxies

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1 Introduction

Luminous Blue Compact Galaxies (BCGs) have low metallicities, high gas consumption rates and are frequently involved in mergers. These are properties characteristic of young galaxies in the hierachical formation scenario. Local BCGs can therefore be used as a complement to high redshift studies provided that the evolution of BCGs can be understood in more detail and be applied to early galaxy formation. Although much is known about the central starburst, few studies discuss the relation between the starburst and the progenitor, or the "host galaxy" of the starburst. Here we report of an effort to derive information about the host from the colours of the faint halo.

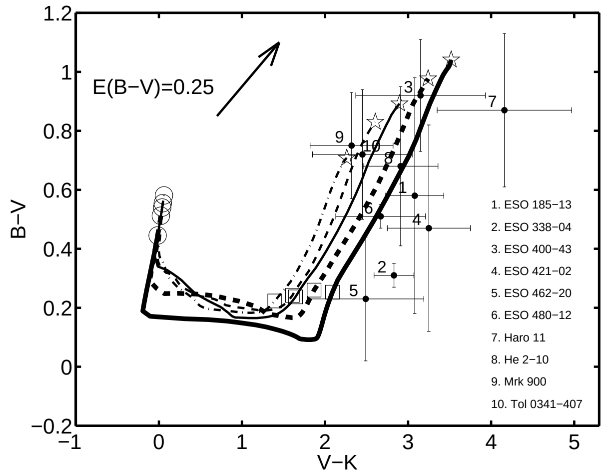

Fig. 1. Halo colours (corrected for galactic extinction but not for internal extinction; 1σ error bars) of 10 BCGs versus PÉGASE.2 evolutionary tracks. The evolutionary sequences include nebular emission and assume an exponentially decreasing star formation rate with an e-folding decay rate of 1 Gyr. The different lines correspond to constant metallicities of Z=0.001 (thin dash-dotted), 0.004 (thin dashed), 0.008 (thin solid), 0.020 (thick dashed), 0.040 (thick solid). Markers indicate ages of 0 yr (circle), 1 Gyr (square) and 14 Gyr (pentagram). The reddening vector is marked with an arrow.

2 The data

We obtained surface photometry at ESO (IRAC2, FORS1 and SOFI) and NOT (ALFOSC and NOTCAM) in BVRIJHKs of 10 BCGs, mostly of high luminosity and low oxygen abundances, typically around 10–15% solar. The main objective was to constrain halo ages and metallicities from the colours, using spectral evolutionary models. Fig. 1 shows the observed B-V vs. V-K colours in comparison with evolutionary tracks from PÉGASE.2 [1].

We conclude that 1) The halos are older than 1Gyr and 2) the colours of more than half of the objects are not consistent with a metal poor stellar population. But what is most remarkable is that, although the scatter is large, about half of the objects show colours significantly redder than the most metal rich tracks. This conclusion is also confirmed by the spectral evolutionary model of Zackrisson et al. [2].

3 Possible causes of the red excess

Problems with the instrumentation or reductions: The data have been obtained with three different near-IR cameras and with different observers. Comparisons with published data and careful checks of the background subtraction have been performed.

Nebular emission: The V-K colour of ionized gas of low metallicity is approximately 0 so an increased contribution from a nebular component would tend to make V-K bluer, i.e. in the opposite direction of the trend observed.

Hot dust: Emission from hot circumstellar dust should only appear in K. This would cause a red excess also in H-K that we do not observe. From our ISO observations of Haro 11 we have a direct check of the emission in the halo in the 4-12 μm bands. There is no signal at the level we need to explain the excess in this galaxy.

Dust extinction: As seen in Fig. 1, a normal reddening correction is running more or less in parallel with the evolutionary tracks and is thus incapable of causing the excess. From ISOPHOT data we can exclude cold dust in the halos of many of our BCGs.

Abnormal IMF: In order to increase the contribution of cool stars in the model stellar population we have tested a power-law IMF with a slope of 3.35, i.e. much steeper than the Salpeter. This diminished the excess with only 0.1 magnitudes. One possibility is that we have an excess of low mass stars, resulting from dynamical mass segregation coupled to the merger event.

References

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