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Searching for Ultra-diffuse galaxies in the low-density environment around NGC 3115

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Abstract. Ultra-diffuse galaxies (UDGs) are extremely low luminosity galaxies and some of them seem to have a lack of dark matter. Therefore, they can offer important clues to better understand galaxy formation and evolution. Little is known about UDGs in less dense environments, as most of the known UDGs have been found in very dense regions, in the outskirts of massive galaxies in galaxy clusters. In this work, we present the properties of UDGs candidates identified through visual inspection around the low-density environment of NGC 3115, the closest S0 galaxy from the Milky Way. We have measured the structural parameters of 41 UDGs candidates using images obtained with the Dark Energy Camera at the Blanco Telescope. Such structural parameters will be used to characterise and select the best UDG candidates, that will have their properties traced for future follow-up campaigns.

Keywords. Ultra-diffuse galaxies, Galaxy evolution

1. Introduction

Ultra-diffuse galaxies (UDGs) are extremely low luminosity galaxies but large in their size. They seem to be an extreme type of Low Surface Brightness dwarf galaxies (LSBd). Since most of the known UDGs have been found in very dense environments, we know more about their properties than about the ones in less dense environments UDGs. Therefore, to understand and determine the properties of these galaxies might offer important clues about galaxy formation and evolution. Previous works show that field UDGs share some properties with the ones found in groups (Jiang *et al.* 2019), namely, that the field galaxies seem to form through secular mechanisms, and others works indicate that UDGs in the field are predominantly blue and star-forming (Prole *et al.* 2019). In this work, we will present the structural parameters of UDGs identified through visual inspection around the low-density environment of NGC 3115, the closest S0 galaxy from Milky-Way. These parameters will be used to trace their properties in future work.

2. Method

Structural parameters of UDG candidates were measured using images obtained with the Dark Energy Camera at the Blanco Telescope. The images were inspected visually using the Ultra-Diffuse Object Candidates Search Tool developed by W. Schoenell. The tool generates four image files: a FITS file of the stamp for each band; an image of linear render with scales as the background of the stamp with a Gaussian kernel applied; two images that have SExtractor detection masked out; and an image with the colour combination of $g-r$ filter. SExtractor was used to mask other objects in the field. To measure

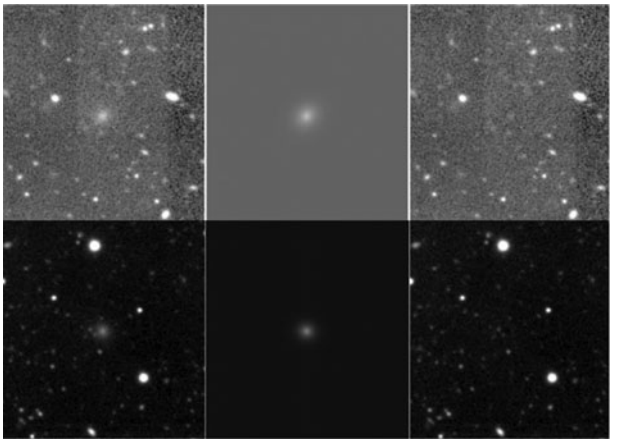

Figure 1. Example of models obtained using IMFIT, the original stamp on the left panel, the model in the middle panel and the residual on the right panel.

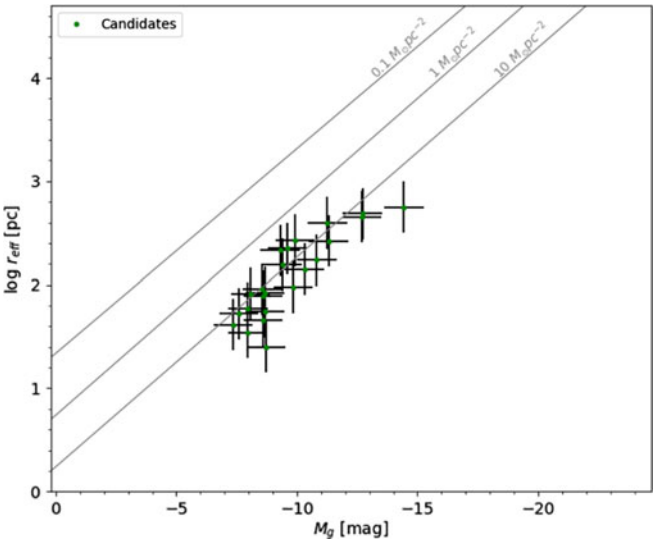

Figure 2. The effective radius versus absolute magnitude in g band of the candidates.

the structural parameters, we used IMFIT to fit an exponential function and a Sérsic function with an uniform background sky (Fig. 1). After the structural parameters of each candidate were obtained, the absolute magnitude in the g band of the candidates and their effective radius were measured.

3. Results and Discussion

To determine which of the candidates were more likely to be an UDG, we compared the absolute g band magnitude and their effective radius of our candidates with the ones of the UDGs presented in (Eigenthaler *et al.* 2019). The plot of effective radius versus absolute g band magnitude of our candidates are presented in Fig. 2. Based on this figure, we found around 10 plausible UDGs/LSBd candidates. In the future, we will use the structural parameters obtained in this work to select the best candidates for follow-up campaigns to confirm their UDG nature and characterise their properties.

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