Uncovering Early Galaxy Evolution in the ALMA and JWST Era
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Diving deeper into jellyfish: The rich population of jellyfish galaxies in Abell 901/2

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Abstract. Jellyfish galaxies are the most extreme examples of ram pressure stripping (RPS). They represent an important path in the morphological change and quenching in galaxy clusters, however they are still not well characterised morphologically and finding them is a complex task based mainly on visual inspection. We present a study on the properties of a large sample of jellyfish candidates in the multi-cluster system A901/2. We find evidence that the multi-cluster is triggering RPS events in preferential regions in the system and that these galaxies have enhanced specific star formation rates. We also use the software Morfometryka in order to analyse the unique morphometric features in jellyfish galaxies providing a better comprehension of their physical state and future. This can help unravel the physical processes behind such extreme morphologies as well as possibly automatising the search for jellyfish galaxy candidates in large surveys in the next era of instruments.

Keywords. galaxies: evolution, galaxies: structure, galaxies: clusters: general, galaxies: intergalactic medium

1. Introduction

Galaxies in dense environments suffer a variety of environmental processes that accelerate their evolution. One of these mechanisms is the ram pressure stripping (RPS) and it plays a major role in the change in morphology and star formation properties of gas rich galaxies. This phenomenon occurs when a galaxy rich in gas falls into a dense environment and the interstellar medium suffers a hydrodynamic friction with the intracluster medium (Gunn & Gott (1972)), as a result it loses its cold gas in the form of tails rich in star formation. The most extreme cases of galaxies undergoing RPS are known as jellyfish galaxies. To understand how the RPS influences the evolution of galaxies in dense environments we are studying how the morphology of jellyfish galaxies is being transformed. We assess their morphometric properties with the software Morfometryka (Ferrari *et al.* (2015)).

2. Overview

As part of the OMEGA survey, we have selected a sample of 70 jellyfish galaxy candidates – the largest sample found in a single system up to date – with morphological evidences of ram pressure stripping and Hα emission in the multi-cluster system A901/2 at z$\sim$0.165. In Roman-Oliveira *et al.* (2019) we analyse their spatial distribution, velocities and their very high specific star formation rates.

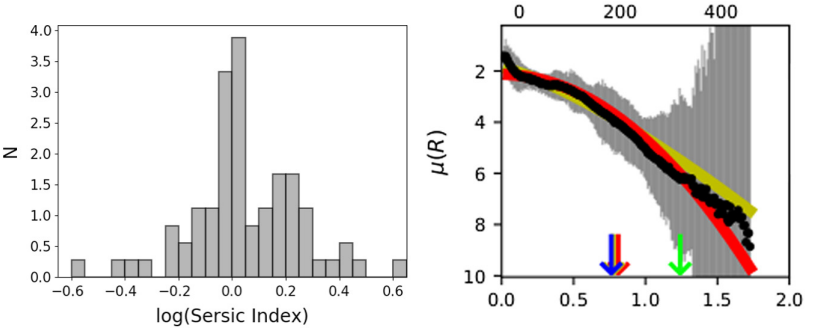

Figure 1. Left panel: The logarithmic distribution of the Sersic Index. Right panel: Brightness profile. Radius is measured in pixels (top) and in terms of the Petrosian radius (bottom), the red line is the 2D Sérsic fit.

2.1. *The multi-cluster environment*

In Ruggiero *et al.* (2019) we found that this unusually rich population of jellyfish galaxies can be explained as the result of an enhancement of the RPS on the boundaries of the four merging halos in the system. Therefore, merging systems like the A901/2 might be the best laboratories for finding and studying jellyfish galaxies and RPS effects.

2.2. *Morphological hints*

The morphology properties of jellyfish galaxies can be helpful to provide some insight on the next steps of their evolution. By performing a single Sérsic fit analysis on our sample we find a bimodal distribution as shown in the left panel of Figure 1. This could be hinting the existence of two populations of jellyfish galaxies. We are currently investigating if this is the case and what could be causing this division, e.g. the inclinations of which the galaxies are infalling.

Another interesting feature is that approximately half of the sample shows an unusual low Sérsic index, like shown in the right panel of Figure 1. Such a low concentration is unusual and often only found in dwarf galaxies.

3. Implications

We present a rich population of jellyfish galaxies in the A901/2 that shows very enhanced star formation. This large number of cases seems to be the result of a trigger in the RPS events caused by the merging multi-cluster environment. As for their morphology, we find hints for two populations of jellyfish galaxies based on their Sérsic index fit. We also find low concentrated brightness profiles in some jellyfish galaxies that resemble the morphological features of dwarf galaxies. We are now currently analysing how these properties influence the next evolutionary step of jellyfish galaxies.

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