

OSIRIS TF Survey of the galaxy cluster ZwCl 0024.0+1652.

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Abstract

Cluster cores are dominated by quiescent early-type galaxies, whereas the field is dominated by star-forming late-type galaxies. Galaxy properties, notably the star formation ability, are altered as they fall into overdense regions. The critical issues to understand this evolution are how the truncation of star formation is connected to the morphological transformation and what physical mechanism is responsible for these changes. The GaLAXy Cluster Evolution Survey (GLACE) is conducting a thorough study on the variation of galaxy properties (star formation, AGN activity and morphology) as a function of environment in a representative and uniquely well-studied sample of clusters. GLACE is a deep panoramic survey of emission line galaxies (ELG), mapping a set of optical lines ([OII], [OIII], H β and H α /[NII] when possible) in several galaxy clusters at $z \sim 0.40, 0.63$ and 0.86 . Using the Tunable Filters (TF) of the OSIRIS instrument at the 10.4 m GTC telescope, the GLACE survey applies the technique of TF tomography: for each line, a set of images are taken through the OSIRIS TF, each image tuned at a different wavelength (equally spaced), so that a rest frame velocity range of several thousands km s^{-1} centred at the mean cluster redshift is scanned for the full TF field of view of 8 arcmin in diameter. Here we present results on the H α /[NII] mapping of the intermediate redshift cluster ZwCl 0024.0+1652 at $z = 0.395$. Two pointings, covering $\sim 2 \times r_{\text{vir}}$ have been performed. The ELG sample contains 174 unique cluster sources down to a star formation rate (SFR) $\lesssim 1 M_{\odot} \text{ yr}^{-1}$. The AGN population is discriminated using different diagnostics and found to be $> 30\%$ of the ELGs. The median SFR of the star-forming population is $1.47 M_{\odot} \text{ yr}^{-1}$. We have studied the spatial distribution of ELG, confirming the existence of two components in the redshift space. Finally, we have exploited the outstanding spectral resolution of the TF, attempting to estimate the cluster mass from ELG dynamics, finding $M_{200} = (4.1 \pm 0.2) \times 10^{14} M_{\odot} h^{-1}$, well aligned with previous weak-lensing estimates.