The intriguing life of massive galaxies
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Sizes of Passively Evolving Galaxies at $z \sim 2$ in CLASH

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Abstract. We select ten passively evolving and massive galaxies at redshift $z \sim 2$ from the Cluster Lensing And Supernova survey with Hubble (CLASH). We derive the stellar properties of these galaxies using the multiwavelength *HST* WFC3 and ACS data, together with Spitzer IRAC observations. We also analyze the optical rest-frame morphology of these high redshift objects by using the GALFIT package (Peng *et al.* 2002). The observed near-IR images, obtained with the *HST*/WFC3 camera with high spatial resolution and amplified by the foreground clusters, provide us with a good chance to study the structures of such systems. Six out of ten galaxies have on average a four times smaller effective radius, in agreement with previous works at redshift $z \sim 2$.

Keywords. galaxies: evolution, galaxies: formation, galaxies: high-redshift

1. Introduction and Result

The sizes of passively evolving and massive galaxies at redshift $z \sim 2$ have been found to be ~ 4 smaller than low redshift early-type galaxies of similar stellar mass. The lack of compact massive galaxies at low redshift implies that considerable size evolution must happen between $z = 2$ and $z = 0$. There are two main size evolution mechanisms: (1) dry minor merger (Naab *et al.* 2009); (2) "puff-up" due to gas mass loss (Fan *et al.* 2008, 2010). Recent studies found that the observed size evoultion needed by compact massive galaxies at redshift $z \geqslant 2$ can not be explained well by the present models.

Here we selected ten passively evolving and massive galaxies from the Cluster Lensing And Supernova survey with Hubble (CLASH, Postman *et al.* 2012). The photometric redshift and stellar properties have been derived based on the *HST* ACS and WFC3 observations wih 16 UV-to-NIR filters in total. Spitzer IRAC data, if available, have been also used. With the GALFIT package, we analyze the surface brightness profiles using a Sersic model. We find that galaxy sizes span a wide range: from ~ 2 times larger to ~ 6 times smaller than the local analogs of similar stellar mass. The large size scatter at redshift $z \sim 2$ will give some indications for the size evolution models.

References

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