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Galaxy population study of the 26 most massive galaxy clusters within the SPT footprint

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Abstract. We present optical properties of the 26 most massive galaxy clusters in the South Pole Telescope 2500 sq-deg footprint. We find a general consistency between our results and results found in the literature on samples built with different selection techniques. Most interesting, we find a preference for an evolution in the slope of the Schechter function, α, with its value increasing at higher redshift.

Keywords. cluster of galaxies - galaxies: evolution - galaxies: formation

1. Introduction

The South Pole Telescope team has constructed a catalog of hundreds of galaxy clusters using the Sunyaev-Zel'dovich effect on the cosmic microwave background (Bleem *et al.* 2014). Two characteristics of the sample are that the selection function is nearly redshift independent and mass limited, making the SPT cluster sample ideal for evolutionary studies of the galaxy population. We construct the luminosity function (LF), the radial profile (RP) and the Halo Occupation number (HON), for the red and the total galaxy populations for the 26 most massive systems (Williamson *et al.* 2011), and quantified the evolution of these optical properties in a wide redshift range.

2. Results

We fit an NFW profile to the RP to find the galaxy concentration c_g. We observe that red galaxies seems to hint to a c_g evolution, with red galaxies more concentrated at lower redshift, but with a low significance. When all galaxies are used, c_g seems independent of redshift, with a value of ~ 2.3. To study the LF we fit for the Schechter function parameters ϕ^*, m^* and α. We find that ϕ^* evolves as $E^2(z)$, consistently with the self-similar expectation, while m^* evolves as predicted for a passively evolving population (Bruzual & Charlot 2003). On the other hand, α seems to evolve from $\sim -0.9/-0.7$ at redshift 1 to $\sim -1.15/-0.98$ at redshift zero for the total/red population, at 2.3σ level. We find the HON versus mass consistent with previous studies (Lin *et al.* 2004), and the slope of the HON versus redshift consistent with zero, within 1σ.

References

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