

Modeling the Color Magnitude Relation for Galaxy Clusters

N. Jiménez,^{1,2} S. A. Cora,^{1,2} A. Smith Castelli,^{1,2} and L. P. Bassino,^{1,2}

¹*Facultad de Ciencias Astronómicas y Geofísicas (FCAG) de la Universidad Nacional de La Plata (UNLP), Argentina.*

²*Instituto de Astrofísica de La Plata (CCT La Plata, CONICET)*

Abstract.

We investigate the origin of the colour-magnitude relation (CMR) observed in cluster galaxies by using a combination of a cosmological N -body simulation of a cluster of galaxies and a semi-analytic model of galaxy formation. The departure of galaxies in the bright end of the CMR with respect to the trend denoted by less luminous galaxies could be explained by the influence of minor mergers.

We consider a simulated galaxy cluster with virial mass $\approx 1.3 \times 10^{15} h^{-1} M_{\odot}$, (Dolag et al. 2005). The semi-analytic model of galaxy formation used (Lagos, Cora & Padilla 2008) considers gas cooling, star formation, galaxy mergers, disc instabilities, metal enrichment and feedback from supernovae and active galactic nuclei. We compare the photometric properties of simulated early-type galaxies (those with a bulge component comprising 80 per cent of the total stellar mass) with those of the early-type galaxies in the central region of the Antlia cluster (Smith Castelli et al. 2008), using the Washington photometric system. We find good agreement between the general trend of simulated and observed CMR. However, the more massive galaxies ($-22. < M_{T_1} < -19.$) depart from the fit to observed data, displaying an almost constant colour ($C - T_1 \approx 1.7$), as detected in other clusters.

We select galaxies in six magnitude bins within the range $-22. < M_{T_1} < -16.$ and analyse the evolution of their content of cold gas and the average number of minor mergers suffered by these galaxies. We find an increase of the latter quantity at low redshift for the more luminous galaxies. These galaxies are also characterized by a low content of cold gas which dramatically decreases since $z \approx 2$. The combination of these two effects would yield to an increase of the luminosity without strongly affecting the galaxy colour. We will deepen the investigation on the origin of the CMR bright end with the aim of disentangling the role played by dry mergers in determining the properties of the more massive galaxies.

References

- Lagos, C., Cora S. A., & Padilla N. D. 2008, MNRAS, 388, 587
Dolag, K., Vazza, F., Brunetti, G., & Tormen, G. 2005, MNRAS, 364, 753
Smith Castelli, A., Bassino, L., Richtler, T., et al. 2008, MNRAS, 386, 2311