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The near-infrared luminosity function of cluster galaxies beyond redshift one

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Abstract

Aims. We determined the K_s band luminosity function (LF), and inferred the corresponding stellar mass function, of cluster galaxies at redshift $z \simeq 1.2$, using near-infrared images of three X-ray luminous clusters at $z = 1.11, 1.24, 1.27$.

Methods. The composite LF was derived down to $M^* + 4$, by means of statistical background subtraction, and is well described by a Schechter function with $K_s^* = 20.5^{+0.4}_{-1}$ and $\alpha = -1.0^{+0.2}_{-0.3}$. Using available X-ray mass profiles we determined the *M/L* ratios of these three clusters, which tend to be lower than those measured in the local universe. Finally, from the K_s band composite LF we derived the stellar mass function of cluster galaxies.

Results. With these data, no significant difference can be seen between the cluster galaxies LF and the LF of field galaxies at similar redshift. We also found no significant evolution out to $z \simeq 1.2$ in the bright (< $M^* + 4$) part of the LF probed in this study, apart from a brightening of $\simeq 1.3$ mag of the characteristic magnitude of the high redshift LF. We confirm, and extend to higher redshift, the result from previous work that the redshift evolution of the characteristic magnitude M^* is consistent with passive evolution of a stellar population formed at $z > 2$.

Conclusions. The results obtained in this work support and extend previous findings that most of the stars in bright galaxies were formed at high redshift, and that $K_{\rm s}$-bright ($M > 10^{11}~M_{\odot}$) galaxies were already in place at $z \simeq 1.2$, at least in the central regions of X-ray luminous clusters. Together with recent results on the field galaxy stellar mass function, this implies that most of the stellar mass is already assembled in massive galaxies by $z \simeq 1$, both in low and high density environments.

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Redshift of Galaxies. When we look at a galaxy, we expect to see a spectrum similar to the stars inside of it. The stars have dark absorption lines corresponding to the elements in their atmospheres. A supercluster is a large grouping of clusters. The Red galaxies near the centre are part of the Virgo Supercluster, also known as the Local Supercluster. The dark blue points at the right are the Pisces-Perseus Supercluster. The light blue (cyan) points at at 15 h are part of the Hercules Supercluster. Astronomers who compare nearby galaxies to distant galaxies must account for this change in apparent magnitude in addition to the decrease in brightness due to distance via what we call K corrections. In the "nearby" universe, the Local Group and nearest big galaxy clusters, the same is true. But when we study objects at redshifts beyond a few percent, we discover that the method DOES matter. as a function of the other quantities. Q: The planet Jupiter is known to have an equatorial. radius of R = 71,500 km. The luminosity distance, on the other hand, is defined by the relationship between the amount of energy the object radiates L and the flux of energy f we observe through some specified area. Q: Write a formula which yields DL. In theory galaxies AND clusters should have been 'smaller', but there's no such thing as a standard cluster. Galazy mass has certainly grown, but we find way to few 'mergers' for that (persistent!) assumption to be correct. Various surveys find different things, and Xray luminoscity (XLF) is a key function. A quote from NASA At the high end of the luminosity function, there was the hint of a trend towards fewer high-luminosity (more massive) clusters at redshifts greater than 0.3. This is the opposite of what we expected based on the simplest cosmological models, which predict that there should be more high luminosity clusters at earlier times in the XLF. Related Questions. More Answers Below.