Highlights of Spanish Astrophysics VI, Proceedings of the IX Scientific Meeting of the Spanish Astronomical Society held on September 13 - 17, 2010, in Madrid, Spain. M. R. Zapatero Osorio et al. (eds.)

The morphology and masses of EROs in the Groth Strip

A. Hempel[1,2], D. Cristóbal-Hornillos[3], M. Prieto[1,2], I. Trujillo [1,2], M. Balcells[1,2], C. López-Sanjuan[5], D. Abreu[1,2], M. C. Eliche-Moral[4], and L. Domínguez Palmero[1]

[1] Instituto de Astrofísica de Canrias, La Laguna, Spain
[2] Universidad de La Laguna, La Laguna, Spain
[3] Centro de Estudios de Fisica del Cosmos de Aragon (ceFca), Spain
[4] Dept. de Astrofisica y Ciencia de la Atmósfera, Universidad Complutense de Madrid, Spain
[5] Laboratoire d'Astrophysique de Marseille, Marseille, France

Abstract

We investigate the morphologies, masses and possible correlations between these two properties for 108 extremely red galaxies (EROs) found in the Groth strip. The photometric data include $U, B, F606W, F814W, J$, and K_s bands. The EROs were selected on the basis of their extremely red colour, $F814W$-$K_s \geq 4$ and $K_s \leq 21.0$. Morphologies are based on a by eye classification and we distinguish between 3 basic classes: compact objects, targets with a disc and/or a bulge component, and irregular or merger candidates. An additional group consists of the few objects which could not be classified. The majority of our targets has either a very compact morphology (37 ± 6 %), or show more or less distinct disc components (39 ± 6 %). 13 ± 3 % are merger or irregulars and a small number of objects (approximately 10 %) could not be classified. As found in previous studies, most the EROs in our sample have redshifts between $z = 1$ and $z = 2$; however, compact EROs in our sample are found at redshifts as low as $z = 0.4$ and as high as $z = 2.8$; the latter qualify as well as distant red objects (DRGs). Disky EROs are also found up to $z = 2.8$; however those with a bulge-like nucleus are only seen at $z < 1.5$. For each of these EROs we determined the stellar mass and mean population age by fitting synthetic spectra (Bruzual 2007, IAU Symp., 241, 125) to the photometric spectral energy distributions, via χ^2 minimisation. Mass estimates were obtained by assuming an exponentially declining star formation rate with a wide set of parameters, e.g. decay time, redshift of last star formation, metallicity, and optical depth. Total stellar masses for our sample are in the range $9.1 < \log(M_\star/\mathrm{M}_\odot) < 11.6$. We cannot detect significant differences between the stellar mass distribution of the morphological classe, i.e. the median stellar mass seems independent of morphology. However, above $\log(M_\star/\mathrm{M}_\odot) > 11.0$ galaxies dominantly show compact morphologies. We do not observe a strong evolution within $1 < z < 2$ for 10^{11} $\mathrm{M}_\odot$ mass objects, neither among the compact class nor for EROs with a starforming component. Similar results have been found by Conselice et al. (2008, MNRAS, 383, 1366) for massive EROs with $M_\star > 10^{11}$ $\mathrm{M}_\odot$ detected in the DEEP2/Palomar fields. The EROs within their $K < 19.7$ selection have the same upper range of masses at $z \approx 0.8$–2.0, indicating little mass growth for this population at this K-band limit. We also detect a substantial fraction of EROs with total stellar masses below 10^{11} $\mathrm{M}_\odot$, while Conselice et al. state that almost all of their EROs at $K < 19.7$ have masses above this limit.

Acknowledgments

This work was supported by the Consolider-Ingenio 2010 Programm grant (CSD2006-00070): First science with the GTC.