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Evolutionary paths among different red galaxy types at 0.3<z<1.5 and the buildup of massive E-S0's

J. Gallego[1], M. Prieto, M.C. Eliche-Moral, M. Balcells, D. Cristóbal-Hornillos, P. Erwin, D. Abreu, L. Domínguez-Palmero, A. Hempel, C. López-Sanjuan, R. Guzmán, P.G. Pérez-González, G. Barro, and J. Zamorano

[1]Departamento de Astrofísica, Universidad Complutense de Madrid, E-28040 Madrid, Spain

Abstract

Some recent observations seem to disagree with hierarchical theories of galaxy formation on the role of major mergers in a late buildup of massive early-type galaxies. We re-address this question by analysing the morphology, structural distortion level, and star formation enhancement of a sample of massive galaxies ($M_* > 5 \times 10^{10} M_\odot$) lying on the Red Sequence and its surroundings at $0.3 < z < 1.5$. For the first time, we report observationally the existence of a dominant evolutionary path among massive red galaxies at $0.6 < z < 1.5$, consisting in the conversion of irregular disks into irregular spheroids, and of these ones into regular spheroids. This result indicates that: 1) the massive red regular galaxies at low redshifts derive from the irregular ones populating the Red Sequence and its neighbourhood at earlier epochs up to $z \sim 1.5$; 2) the progenitors of the bulk of present-day massive red regular galaxies have been blue disks that have migrated to the Red Sequence majoritarily through major mergers at $0.6 < z < 1.2$ (these mergers thus starting at $z \sim 1.5$); and 3) the formation of E-S0's that end up with $M_* > 10^{11} M_\odot$ at $z = 0$ through gas-rich major mergers has frozen since $z \sim 0.6$. Our results support that major mergers have played the dominant role in the definitive buildup of present-day E-S0's with $M_* > 10^{11} M_\odot$ at $0.6 < z < 1.2$, in good agreement with the hierarchical scenario proposed in the model by Eliche-Moral et al. (2010, A&A, 519, A55; 2012). This study is published in Prieto et al. (2012, MNRAS in press, arXiv:1209.4086).

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