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

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Abstract. Some recent observations seem to disagree with hierarchical theories of galaxy formation on the role of major mergers in a late build-up 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 $0.3 < z < 1.5$. We have used an initial sample of ~1800 sources with $K_s < 20.5$ mag over an area $\sim 155 \, arcmin^2$ on the Groth Strip, combining data from the Rainbow Extragalactic Database and the GOYA Survey. Red galaxy classes that can be directly associated to intermediate stages of major mergers and to their final products have been defined. 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 points to: 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 $z \sim 1.5$); 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 build-up 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 Eliche-Moral *et al.* (2010a) model (see also Eliche-Moral *et al.* 2010b). This study is published in Prieto *et al.* (2012).

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References

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