The Progenitors of Today's Ultra-massive Galaxies Across Cosmic Time

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Abstract

Using the UltraVISTA catalogs, we investigate the evolution in the 11.4 Gyr since z=3 of the progenitors of local ultra-massive galaxies ($M_{\rm star}$=6×10^{11} M$_\odot$; UMGs), providing a complete and consistent picture of how the most massive galaxies at z=0 have assembled. By selecting the progenitors with a semi-empirical approach using abundance matching, we infer a growth in stellar mass of a factor of ∼3.5 since z=3. At z<1, the progenitors constitute a homogeneous population of only quiescent galaxies with old stellar populations. At z>1, the contribution from star-forming galaxies progressively increases, with the progenitors at 2<z<3 being dominated by massive ($M_{\rm star}$∼2×10^{11} M$_\odot$), dusty ($A_{\rm V}$∼1–2.2 mag), star-forming (SFR∼100–400 M$_\odot$ yr^{-1}) galaxies, but also including quiescent (i.e., post-starburst) galaxies. Most of the quenching of the star-forming progenitors happened between z=2.75 and z=1.25, in good agreement with fossil records of z=0 UMGs. The progenitors of local UMGs, including the star-forming ones, never lived on the blue cloud since z=3. We propose an alternative path for the formation of local UMGs that refines previously proposed pictures and that is fully consistent with our findings. Preliminary results on the structural evolution and the environment of the progenitors of local UMGs will be also presented.