The low surface brightness haloes of massive galaxies in ultradeep imaging and their relative importance

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Abstract

The most massive galaxies of the Universe remain as mysterious objects, in particular as their size evolution with redshift has been the subject of debate because of the impact of surface brightness dimming at high-z. To investigate this issue, we have undertaken a study of the morphologies of the six most massive galaxies at z≤1 which lie in the Hubble Ultra Deep Field 2012 (HUDF12) WFC3/NIR imaging and its optical ACS counterpart. This is the deepest ever view of the Universe, allowing the exploration of surface brightness profiles down to $\mu \simeq 31\,\mathrm{mag\,arcsec^{-2}}$ ($\sim 29\,\mathrm{mag\,arcsec^{-2}}$ restframe). This surface brightness depth translates into >25 effective radii, or ∼100 kpc for some of these objects. Once we have finally access to this previously missed low surface brightness component, our galaxy sample display similar masses and sizes than previous determinations in shallower surveys. Regardless of the large spatial extent of these haloes, their total contribution to the galaxy light and mass is reduced (∼ 20% beyond 10 kpc). I will review these results in the context of massive galaxies' inside-out growth, showing also some preliminary results about the size-mass relation of massive galaxies in ultradeep H- and K-band imaging at $2.5 < z < 4.5$, where cosmological dimming could really bias these measurements. A comprehensive understanding of massive galaxy sizes throughout redshift (and our observational limits) could constrain ΛCDM predictions, and these faint haloes provide evidence about the mass assembly for these extreme objects.