Post-starburst galaxies and the origin of the galaxy bimodality

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Abstract

Despite decades of study, we still do not fully understand why massive galaxies abruptly switch off their star formation in the distant Universe. It is also unclear if the same processes are responsible for the *morphological* transformation of galaxies, to produce the Hubble Sequence we observe today. The rare class of post-starburst ("E+A") galaxies provides a unique opportunity to study the transition phase, but until recently only a handful had been identified at high redshift ($z > 1$). Using a new PCA technique, we have recently identified over 500 post-starburst galaxies in the UKIDSS UDS field. We find that their space density is sufficient to provide a major growth channel for massive quiescent galaxies during this crucial epoch. We also find that post-starburst galaxies are surprisingly compact and spheroidal, with a distribution of Sérsic indices that are indistinguishable from the old quiescent population. We conclude that the morphological transformation of these massive galaxies occurred during the same event that quenched their star formation. Our findings provide strong evidence for the scenario in which a significant fraction of compact spheroids are formed from gas-rich mergers, leading to a major burst of star formation that is subsequently abruptly terminated.