STARBURST CYCLE IN DISTANT CLUSTERS

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A major puzzle in observational cosmology is the physical origin of a significant excess population of blue galaxies in the cores of distant rich galaxy clusters. This 'Butcher-Oemler' effect is now known to be a widespread starburst-related phenomenon. We test whether various spectral and photometrically-defined galaxy classes might represent different stages within a single cycle of star-formation. We compare the numbers of galaxies in various categories for three $z = 0.31$ clusters, AC103, AC114, and AC118, with evolutionary models generated according to the Bruzual & Charlot (1993) isochrone spectral synthesis code, assuming that some fraction of the model cluster population is viewed either before or during a secondary burst of star formation. We find good agreement between the model predictions and the number density of spectroscopically-confirmed members in the $H\delta$ versus $B-R$ plane for a cluster population in which 30 per cent of the member galaxies have undergone secondary bursts of star formation within the last ~ 2 Gyr prior to observation. As an additional check, we analyse a larger K_n–limited sample from newly-acquired infrared images and find good agreement between the models and the data in the $U-I$ versus $I-K_n$ plane for the same active cluster fraction. We conclude that the unusual galaxy population in distant clusters can be explained by a single cycle in which about 30 per cent of the cluster population experienced a secondary burst of star-formation within the last ~ 2 Gyr.

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