R02a Mapping large scale structures and projection corrected environmental dependence of star forming activities at $z \sim 0.4$ and 1.5

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Galaxies are distributed inhomogeneously on small scales in the Universe and thus define large-scale structures (LSS). Understanding the evolution of cluster galaxies is to determine how galaxies change their properties as a result of the hierarchical growth of LSS. The difficulty resides in the need for accurate redshift measurements to determine the precise environment of the galaxy. We demonstrate a method to estimate accurate redshifts of star-forming galaxies by measuring the flux ratio of the same emission line observed through two adjacent narrow-band filters taken with Hyper Suprime-Cam on the Subaru Telescope. We obtain redshifts for [OII] and Hα emitters at $z \sim 1.5$ and 0.4 respectively. We find that the projected celestial distribution does not precisely trace the real distribution of galaxies, indicating the importance of the 3D view of structures. We then investigated the environmental dependence of galaxy properties with local density and some well-defined populations of galaxies. At low redshift, clusters identified with red sequence galaxies are older, more developed and cluster-specific quenching processes reduce their star forming activity. However, at high redshift, clusters are young and have not evolved well yet. We also find that "close companion galaxies" are inducing star formation (SF) activity. Moreover, there is a significant positive correlation between SF rate and overdensity at $z \sim 1.5$ and 0.4 particularly in high density regions which is weak or absent locally in star forming galaxies. These trends are associated with the existence of a population of bright, massive blue galaxies in dense regions.