

Catalog of Ultra Diffuse Galaxies in the Coma Cluster

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Ultra Diffuse Galaxy(UDG) is a new category of galaxy population proposed by [1]. They are low surface brightness galaxies (LSBs) with a large spatial extents. [1] adopted the selection criteria that the central surface brightness in g-band is fainter than 24 mag/arcsec² and the effective radius (half-light radius) is larger than 1.5 kpc. They reported 48 UDGs in the Coma cluster. If we assume a typical mass-to-luminosity ratio of galaxies, UDGs in cluster environment cannot maintain their large extensions by their self-gravity alone. Thus, they are expected to have a lot of dark matter. The nature of UDGs (e.g., their formation mechanism) is still full of mysteries.

We analyzed wide survey data of the Coma cluster in R-band obtained with the Subaru Prime Focus Camera(Suprime-Cam) in the public archive data of SMOKA [2]. UDGs were detected with high S/N in the Suprime-Cam data [2]. As the spatial resolution is much higher in data used in [2] than that of [1], we can resolve UDGs near brighter neighbors. We also detected the region near the cluster center where background lights and the bright tails of galaxies affect. Though the observed band is different, [2] detected 854 UDGs in the Coma cluster. We also revisited the other data of our own (e.g., [3]) that overlap the survey region. Our previous studies didn't pay special attention to this galaxy population, as their foci were on the statistical nature of the galaxies in the cluster (e.g., luminosity function) not on individual galaxy types. We obtained color information of a subset of the UDGs from the previous studies.

After [2], we continued the study and reported the UDG catalog as [4] with several new results. The radial density profile of UDGs is comparable to that of high surface-brightness members in general, but a sign of excess of UDGs exists at 1.0–1.7 Mpc from the center (Figure 1). We also found that the major axes of UDGs tend to align to the radial direction toward the galaxy center, which is statistically significant. The Coma cluster is elongated along the large-scale filament toward the southwest, and the radial alignment of UDGs are significantly high around the direction (Figure 2).

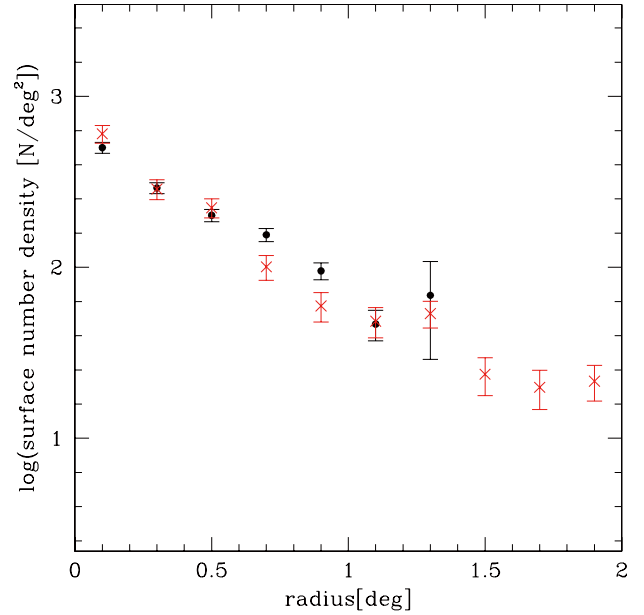


Figure 1: The radial profile of the galaxy number density of UDGs (black dots), and member galaxies from SDSS DR7 (red Xs; shifted by +0.5 dex for comparison.) The overdensity of UDGs around 0.6–1.0 degree (1.0–1.7 Mpc) is recognized.

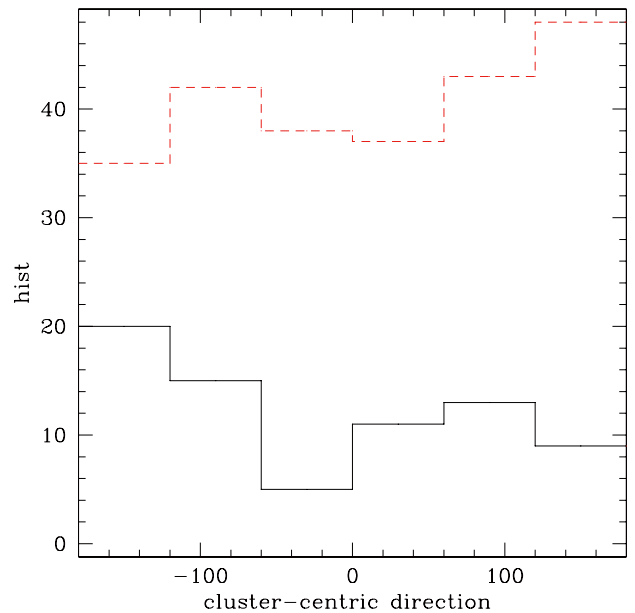


Figure 2: Histograms of the azimuthal angle of UDG positions from the cluster center. UDGs elongated along the radial direction toward the cluster center are shown in black, and others are in red. The number of the elongated UDGs are significantly large around -150(southwest) direction.

References

- [1] van Dokkum, P., et al.: 2015, *ApJL*, **798**, L45.
- [2] Koda, J., et al.: 2015, *ApJL*, **807**, L2.
- [3] Yamanoi, H., et al.: 2012, *AJ*, **144**, 40.
- [4] Yagi, M., et al.: 2016, *ApJS*, **225**, 11.