[S01-1] An Observational Study of the M31 Globular Cluster System

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We present a photometric and spectroscopic study of the globular cluster system (GCS) in M31. We have performed a new systematic survey of globular clusters (GCs) in ~ 3°×3° area centered on M31 using KPNO 0.9 m/Washington CMT1 CCD images and WIYN 3.5 m/Hydra multifiber spectrograph spectra. We have found 620 new GCs and candidates (126 genuine GCs, 263 probable GCs, and 231 possible GCs), confirming also 544 previously known GCs. The colors of the newly found GCs are similar to those of the previously known GCs but the new GCs are mostly fainter than the old ones. The luminosity function of the GCs in the halo of M31 is found to have slightly fainter peak value than the previously known values, which is because our search goes deeper than the previous surveys. The spectroscopic metallicity distribution of the combined sample of our genuine GCs and previously known GCs is best described by three component Gaussian fitting. Some properties of M31 GCS are in contrast to the GCS of the Milky Way, implying different formation processes of the GCSs of the two galaxies.

[S01-2] A New Perspective on the Color Distributions of Globular Cluster Systems in Early-type Galaxies

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An outstanding conundrum in extragalactic astronomy is the curious bimodality in color distribution of globular clusters in large early-type galaxies. The phenomenon is widely believed as evidence of two or more distinct cluster sub-systems within individual galaxies. Here we find, however, that the relationship between intrinsic metallicity and its proxy, color, of old clusters has a critical point, around which color is a factor of three more sensitive to metallicity. This condition causes a purely unimodal metallicity spread to be projected onto a color distribution with a deep concavity in the middle, which appears the sum of two Gaussian distributions. An old cluster system with a metallicity spread is therefore a sufficient condition for the color bimodality. We also show that the "projection effect" explains the relevant observations in a simple and cohesive way. The results oppose the traditional view of a complex structure of extragalactic cluster systems.