Blue Tilts and Other Properties of Halo Globular Clusters in Nearby Galaxies - Cosmological or Observational Bias?

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Abstract

Old metal-poor globular clusters are seen in large numbers in the halos of all nearby galaxies. Cosmological simulations suggest that these clusters, which appear as the blue peak in the typical bimodal color distribution of globular cluster systems, are among the first objects to form at high redshift. Until recently these primordial clusters were assumed to be `universal' because the properties of blue globular clusters found in all types and sizes of galaxies appeared to be identical. A series of new ACS-based studies, using the ACS Virgo Cluster Survey (GO-9401) data and other samples (GO-9427, GO/DD-9714), suggest that there is a mass-metallicity relation in the blue halo globular clusters. The brighter blue clusters trend to redder colors in this `blue-tilt' phenomenon. This seems to suggest that larger globular clusters have self enriched either because they were formed in large gas clouds, or because in the past they had significant dark matter halos that have subsequently been stripped. These ACS studies also find that the mean metallicity of the halo clusters increases with the mean mass of the host galaxy. It has been argued that this is evidence of self enrichment in large halos and points towards an in situ model of galaxy formation. We suggest that both these correlations are caused by subtle systematic observational effects that have been overlooked in previous studies. We propose to undertake a systematic analysis of the globular cluster systems of the 145 galaxies observed by the ACS Virgo and Fornax cluster surveys (GO-9401, GO-10217), and the mosaic of M104 (GO/DD-9714) in order to answer the crucial question, `Just how universal are the properties of the metal-poor halo globular clusters?'. These ACS observations are likely to remain the largest globular cluster datasets for the foreseeable future. Our independent analysis of these extended datasets will provide an important check on the results found for globular cluster systems and their implications on galaxy formation and evolution.

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Dataset Summary:

Instrument	No. of Datasets	Retrieval Method	Retrieval Plan
ACS	456	DISK	We will download the 456 ACS images all 100 GO-9401, 44 GO-10217, and 1 GO/DD-9714 galaxies from the archive at STScI at the beginning of the project.