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A Semi-Analytic Approach to Understanding the Bimodality of GCs in the Milky Way & M31

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Abstract. One of the most important results in the study of Globular Clusters (GC) has been the discovery of bimodality in the broad-band colors of many systems. Observations of the Milky Way, M31 and Centaurus A strongly suggest this is a bi-modality in metallicity. One method of constraining, and perhaps better understanding the observed bimodality of GCs is to use semi-analytic models (SAMs) to test both the galaxy and GC formation scenarios. We present the results of a study to test whether SAMs can accurately reproduce the physical characteristics of both the parent galaxy (including luminosity, mass and metallicity) and GC populations. The focus of the work is to test whether the SAMs are capable of reproducing the observed properties of spiral galaxies, in particular the Milky Way and M31, and what, if any, constraints this may place on the formation scenarios of GCs. Among the results are indications that bimodality may be directly connected with reionization at z $\sim$ 7–8.

Keywords. Galaxy: globular clusters, galaxies: star clusters, cosomology: theory

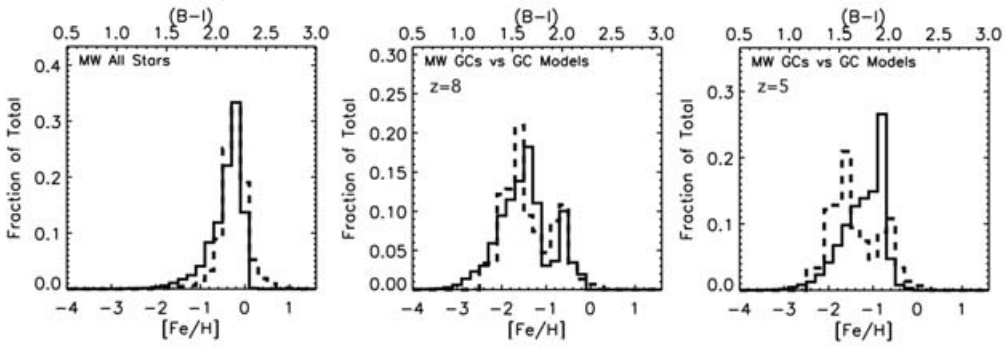

Figure 1: Predicted metallicity distributions for a single realization of a MW sized halo. Field stars+bulge (*left*, solid line), GCs (*middle*, *right* solid lines) compared with observations of the MW (dashed lines). The model GCs are comprised of a quiescent (metal-poor) population which begin forming at the same time as the host galaxy and a burst population (metal-rich) formed during major mergers. Truncation of the quiescently formed GC population is shown at z = 8 (middle panel) and z = 5 (right panel). The disk+bulge properties are invariant to changes in the quiescent GC formation.

• The truncation of quiescent GC formation at z $\sim$ 8 is consistent with recent results for the epoch of reionization (WMAP).
• The models, for the first time, are able to match not just GC bimodality, but disk+bulge metallicity, total mass and luminosity of the simulated host galaxy to the MW and M31.
• The results (not shown) also support the idea that tidally stripped dwarfs could be the progenitors of the most massive/luminous GCs in the MW and M31.