GALAXY FORMATION IN A UNIVERSE DOMINATED BY COLD DARK MATTER

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ABSTRACT

The mass spectrum of bound baryonic systems (galaxies and globular clusters) is computed as a function of redshift in an Einstein-de Sitter ($\Omega=1$) universe dominated by weakly interacting, cold dark matter. Baryons are assumed to fall into primordial density peaks in the cold particle distribution when the mass in the peaks exceeds the baryon Jeans mass. The distribution of peaks is computed using Gaussian statistics. As the universe expands the baryonic mass attached to a given peak increases because of infall (treated in a spherical approximation), and new peaks of lower amplitude become nonlinear. Globular clusters form first (by $z\sim 40$ if the galaxies represent a biased mass distribution). The remaining gas may be reheated to ~ 10000 K if a few percent of globular cluster (or Pop. III) stars are very massive. Reheating increases the baryon Jeans mass and delays galaxy formation until $z \lesssim 10$. The present method reproduces the shape (but not the amplitude) of the Schechter galaxy mass function when merging of substructure is included in an approximate fashion.

J. Kormendy and G. R. Knapp (eds.), Dark Matter in the Universe, 360.