Astrophysics > Cosmology and Extragalactic Astrophysics

An expanded merger-tree description of cluster evolution

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We model the formation and evolution of galaxy clusters in the framework of an extended dark matter halo merger-tree algorithm that includes baryons and incorporates basic physical considerations. Our modified treatment is employed to calculate the probability density functions of the halo concentration parameter, intracluster gas temperature, and the integrated Comptonization parameter for different cluster masses and observation redshifts. Scaling relations between cluster mass and these observables are deduced that are somewhat different than previous results. Modeling uncertainties in the predicted probability density functions are estimated. Our treatment and the insight gained from the results presented in this paper can simplify the comparison of theoretical predictions with results from ongoing and future cluster surveys.

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