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[Large-scale structure formation for power spectra with broken scale invariance] Large-scale structure formation for power spectra with broken scale invariance [R. Kates, V. Müller, S. Gottlöber, J.P. Mücket, J. Retzlaff] R. Kates, V. Müller, S. Gottlöber, J.P. Mücket, J. Retzlaff Astrophysikalisches Institut Potsdam, Germany Accepted Received ; in original form 1995 1995

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abstract

We have simulated the formation of large-scale structure arising from COBE-normalized spectra computed by convolving a primordial double-inflation perturbation spectrum with the CDM transfer function. Due to the broken scale invariance ('BSI') characterizing the primordial perturbation spectrum, this model has less small-scale power than the (COBE-normalized) standard CDM model. The particle-mesh code (with 512^3 cells and 256^3 particles) includes a model for thermodynamic evolution of baryons in addition to the usual gravitational dynamics of dark matter. It provides an estimate of the local gas temperature. In particular, our galaxy-finding procedure seeks peaks in the distribution of gas that has cooled. It exploits the fact that "cold" particles trace visible matter better than average and thus provides a natural biasing mechanism. The basic picture of large-scale structure formation in the BSI model is the familiar hierarchical clustering scenario. We obtain particle in cell statistics, the galaxy correlation function, the cluster abundance and the cluster-cluster correlation function and statistics for large and small scale velocity fields. We also report here on a semi-quantitative study of the distribution of gas in different temperature ranges. Based on confrontation with observations and comparison with standard CDM, we conclude that the BSI scenario could represent a promising modification of the CDM picture capable of describing many details of large-scale structure formation.