

Abstract Submitted
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Fractal Analysis in a One-dimensional Universe YUI SHIOZAWA, BRUCE MILLER, Texas Christian University — While the universe we observe today exhibits local, filament-like, structures with galaxy clusters and large voids between them, the primordial universe is believed to have been nearly homogeneous with slight variations in matter density. To understand how the observed hierarchical structure was formed, researchers have developed a one-dimensional analogue of the universe that can simulate the evolution of a large number of matter particles. Investigations to date demonstrate that this model reveals structure formation that shares essential features with the three-dimensional observations. In the present work, we have expanded on this concept to include two species of matter, specifically dark matter and luminous matter. In our simulation, luminous matter is treated in a way that loses energy in interaction. The results of the simulations clearly show the formation of a Cantor set like multifractal pattern over time. In contrast with most earlier studies, mass-oriented methods for computing multifractal dimensions were applied to analyze the bottom-up structure formation.

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